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School of Public Health
Los Angeles, California 90024

DANFA PROJECT - FINAL REPORT
CORRIGENDUM

The following corrections/additions refer to Appendix 10: Personnel

I. GHANAIAN STAFF
- F. University of Ghana Campus at Legon
  - 4. Demographer - Dr. G.M.K. Kpedekpo
    Full time: 1970-1971
    Short-term consultant: 1971-1979

II. UCLA STAFF
- B. At Los Angeles Campus
  - 2. Faculty - Ms. Cheryl E. Servais: 1972
  - 5. Editors -
    Ms. Melinda Alpaugh Ojermark:
    1977-1978
  - 8. Demographer - Dr. J.C. Bhatia
    Consultant: 1975-1977
    Full time: 1977-1979
  - 9. Computer Programming Consultants -
    Dr. Pat Britt: 1970-1979
    Ms. Lili Sohrab: 1975
  - 10. Mass Media Specialist -
    Mrs. Mona Yazdi Grieser
    Consultant: 1975-1978

Danfa Project
Final Report

Ghana

THE DANFA COMPREHENSIVE RURAL HEALTH

AND

FAMILY PLANNING PROJECT, GHANA

FINAL REPORT

September 30, 1979

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Department of Community Health
P.O. Box 4236
Accra, Ghana

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ACKNOWLEDGMENT

The Danfa Comprehensive Rural Health and Family Planning Project, Ghana was supported partly by the Government of Ghana and partly through USAID contract AID/CM/afr-IDA-73-14

PREFACE

The Danfa Comprehensive Rural Health and Family Planning Project, with its focus on service, teaching and research in rural health care represents the fruition of plans set into motion during the nineteen sixties. At that time, Ghanaian planners saw the need to systematically improve methods of providing rural primary health care which included family planning. The Danfa Project was initiated by the University of Ghana Medical School and the Project has become the cornerstone of the Medical School's program of teaching and research in rural health care.

External assistance was sought by Ghana to accelerate the normal process of institution building required to meet all Danfa Project objectives. In 1969, the United States Agency for International Development provided funds for a feasibility study. This funding continued with the major Danfa contract in 1970. Under terms of this agreement with Ghana, AID negotiated a contract with the University of California at Los Angeles School of Public Health (UCLA). This marked the beginning of a remarkably harmonious and productive relationship. The main role of UCLA was to provide an extra pair of hands to help primarily with research and secondarily with training. The AID contract ended in September 1979 and facilitated work in a variety of areas which is reported in these pages.

Well before the end of the AID Danfa contract, the decision had been made by the University of Ghana Medical School to continue the basic program of service, teaching and research developed during the life of the Project. New staff positions were created which were filled by Danfa trainees and appropriate fiscal allocations to facilitate their work were made by the Government of Ghana. The value of the Project has been recognized and the Government of Ghana has made the decision to continue the Project with its own resources at the expiry of the AID contract. The continuing collaboration between the University of California and the University of Ghana is linked in an institutional arrangement of long standing.

Through the years, the Project has contributed to the strengthening of Ghanaian health services. Health workers at all levels have received part of their training at Danfa or under Project auspices. Training manuals produced by the Project have been officially accepted and are being used currently by the Ministry of Health. Information generated by the Danfa Project has been used within Ghana and by other countries, agencies and foundations.

Many shared in the planning and operation of the Project. Tribute must go to those visionary planners in Ghana who so accurately foresaw health care needs and how to go about trying to meet them. To those officials in Ghana and in the United States Agency for International Development who gave support, encouragement and advice at the beginning of the Project and all through its life, even when unexpected problems and uncertainties intervened, we give special thanks. We also wish to extend our sincere thanks to the many representatives of the World Health Organization, who through the years have acted as a sounding board for ideas, have graciously shared much valuable experience with us and have given good advice. Similarly, deep appreciation goes to all the villagers and their chiefs and elders who have faithfully and patiently cooperated. The Project staff have been particularly capable and loyal and have frequently worked long hours under difficult circumstances; very great thanks and appreciation to them.

Finally, we wish to commend those of the Ghana Medical School/UCLA team who have contributed so much effort to completing this Final Report, attempting to do justice to almost ten years of work while still keeping the total length of the report within reasonable limits. The efforts of the editing staff were particularly essential, especially those of Ramona Beth Wassenberg (Senior Editor) and Debra Boyd. Lily Knutson, Administrative Assistant, has been irreplaceable. The typing services needed were enormous and we thank especially the Word Processing Center staff of the UCLA School of Public Health and the UCLA Danfa Project typists.

The submission of this report is the responsibility of UCLA under its contractual agreement with USAID. However, its writing and production have been a joint effort of the Ghana Medical School/UCLA team.

Those associated with the Danfa Project, or simply "Danfa" as it has come to be called, feel a great sense of pride and gratitude in being associated with a project that has so much practical significance for health care in Ghana and which continues to have excellent support there.

Dr. S. Ofosu-Amaah,
Danfa Project Codirector
University of Ghana Medical School

Dr. Alfred K. Neumann,
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University of California, Los Angeles

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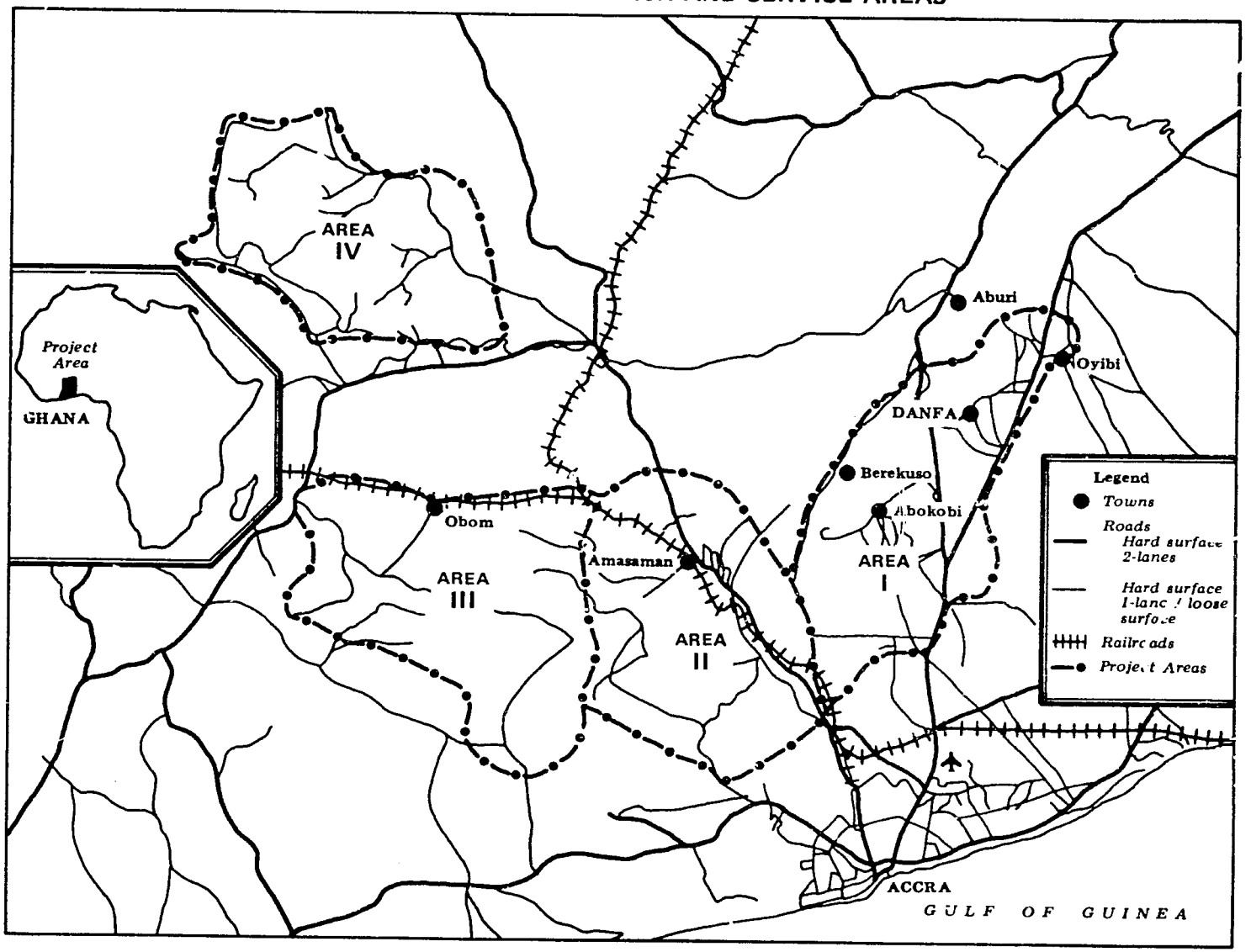
DANFA PROJECT: RESEARCH AND SERVICE AREAS



ABBREVIATIONS

AID	United States Agency for International Development (or USAID)
DCH	Department of Community Health, University of Ghana Medical School
GNFPP	Ghana National Family Planning Programme
HC	Health Center
HCS	Health Center Superintendent
HEA	Health Education Assistant
IDS	Institute of Development Studies, University of Sussex, U.K.
ISSER	Institute for Statistical, Social and Economic Research, University of Ghana
IUD	Intrauterine Device
MCH	Maternal and Child Health
MFU	Medical Field Unit
MO	Medical Officer
MOH	Ministry of Health, Ghana
PAC	Policy Advisory Committee
PHN	Public Health Nurse
PPAG	Planned Parenthood Association of Ghana
PROP	Project Paper (USAID)
RMO	Regional Medical Officer
SPH	School of Public Health, University of California at Los Angeles
TBA	Traditional Birth Attendant
UCLA	University of California at Los Angeles
UGMS	University of Ghana Medical School
USAID	United States Agency for International Development (or AID)
VDC	Village Development Committee
VHW	Village Health Worker

Danfa Project
Final Report
summary conclusions
and recommendations

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SUMMARY

The Danfa Comprehensive Rural Health and Family Planning Project is a service, research and training project designed to help find solutions to health problems and to demonstrate feasible methods of delivering effective health and family planning services in rural Ghana.

S1. NATIONAL BACKGROUND

The pattern of health problems in Ghana is similar to that of most other West African countries and has an especially important impact on maternal and child health. Maternal health problems include mortality and morbidity from hemorrhage, infection and toxemia associated with pregnancy. Child health is especially diminished by the interaction of malnutrition and infectious diseases, many of which are partially or wholly preventable.

In comparison to most other countries in the region, Ghana has experienced a relatively favored economic position during this century due to substantial export earnings from cocoa, timber, gold and diamonds. Yet, the Government of Ghana has recognized that the delivery of effective health care to the majority of rural Ghanaians has been inadequate. There have been plans to expand rural health services. However, the acquisition of needed budgetary resources has been impeded, to some extent by the deceleration of growth of real national income per capita that has accompanied the political and economic instability of the past 15 years, and in part by the historically high concentration of resources in urban hospital facilities.

In 1969, the Government of Ghana recognized the importance and consequences of the rapid growth of population in Ghana and issued an official population policy. A year later it established the Ghana National Family Planning Programme, with the objective of making family planning services accessible to all Ghanaians.

S2. HISTORY OF THE DANFA PROJECT

In 1964, the University of Ghana Medical School (UGMS) decided that one of its responsibilities would be to train general medical officers to supervise rural health teams. To do this, a demonstration rural

district was needed, not too far from the capital (Accra), where the Department of Community Health could conduct research, training and service activities. Eventually the Danfa District was selected and in 1970 the Danfa Health Center was opened.

In order to rationally allocate scarce resources to the entire country, the Department of Community Health concluded that there was a need for more systematic collection and analysis of rural health information. Furthermore, the Department thought that research was required to help determine how the family planning services that were mandated by the national population policy could be best implemented in rural Ghana. As a result the Danfa Project was conceived.

External assistance for the development of the research component of the Danfa Project was obtained from the United States Agency for International Development (USAID). The University of California at Los Angeles, School of Public Health (UCLA) was identified to collaborate in the Project. The Project agreement between the University of Ghana Medical School and the USAID Mission to Ghana was signed in April 1970 and the first Project Paper (PROP) signed in May of that same year. The PROP indicated that four UCLA staff members were to be assigned to Ghana: a Chief of Party who would be responsible for management, an epidemiologist, a family planning/MCH specialist and a health educator. A health systems analyst was added to the staff in 1973. It was agreed that the Ghana Medical School would be fully responsible for the service components of the Project. UCLA was to be principally responsible for providing any assistance necessary for the research components and would also participate in some of the planning and teaching activities of the Project.

S3. GOALS AND OBJECTIVES

The goal (or purpose) of the Danfa Project was to assist in initiating a demonstration rural family health program which would help improve the health and welfare of the people, especially in rural areas. The objectives of the first phase of the project (1970-1975) as outlined in the 1970 Project Paper were:

(a) "To investigate the state of the rural community and the factors associated with effective participation in health programs."

(b) "To undertake research into the most efficient means of utilizing available manpower and other resources in the operation of health post-centered comprehensive rural health services."

(c) "To train doctors, sanitarians, midwives, community health nurses and other health personnel, both separately and in teams, for their role in rural health work."

(d) "To provide manpower oriented and equipped to handle the problems of the community."

At the time the Project was designed, controversy existed, both within Ghana and in international circles, concerning the most cost-effective way to deliver family planning services. Many thought that the most effective program would combine comprehensive health care and family planning services to produce a synergistic effect on fertility reduction, partly as a result of increased child survival, and partly as a result of increasing contacts with women in need of family planning. Another group thought that to insist on comprehensive health services would delay implementation of family planning services. They believed that the provision of family planning education and services alone would result in acceptable rates. A third group thought that sufficient motivation already existed and that couples would readily accept family planning if only effective contraceptive methods were made available. Finally, a fourth group believed that fertility reduction was primarily dependent on socioeconomic improvements and that, as these occurred, Ghanaian couples would seek out ways to reduce their fertility without the need for special programs.

One of the major research efforts, then, of the Danfa family planning program was to implement a quasi-experimental research design to help resolve this controversy and to carefully evaluate these four alternate arguments regarding the implementation of national family planning policy. Four research areas in the Danfa Project district were identified, each one to receive services corresponding to the four alternate arguments presented above. (See Table S-1).

Table S-1: Health Services Provided in Four Project Areas, Danfa Project, Ghana, 1972-75

	SERVICES PROVIDED			
Area	Comprehensive Health Care Program	Health Education Program	Family Planning Program	Standard Ministry of Health Services
I	YES	YES	YES	YES[a]
II	NO	YES	YES	YES
III	NO	NO	YES	YES
IV	NO	NO	NO	YES

[a]Equivalent.

In carrying out the original research design the family planning program was bound by two constraints. First, its operations had to be replicable within anticipated Ghanaian resources. Secondly, the family planning service inputs had to be comparable in quantity and quality in the three service areas. To assure this comparability, the same personnel were initially used to provide family planning services in all three areas.

An external evaluation by USAID was carried out in 1975 to assess progress already made and the need for redirection of effort or emphasis. The evaluation team recommended that the Project be continued to its proposed termination date with increased availability and participation of senior Ghanaian staff and increased participant training of Ghanaians overseas. Because of a Government of Ghana decision (based partially on the Danfa experience) to integrate family planning with basic health services (Area I approach), and because of the high degree of population mobility and the socioeconomic differences between the four research areas, the team recommended the de-emphasis of the four cell research design.

As a result, a new Project Paper was prepared in 1976 which adopted new objectives suggested in part by the evaluation team:

(a) Institutional Development and Training: Strengthening of institutional capability at the Ghana Medical School to conduct research and training of doctors and other health workers in the delivery of rural health and family planning services.

(b) Information Transfer: Transfer of information derived from Project activities to relevant Government of Ghana agencies on an ongoing basis.

(c) Operational Research in Health and Family Planning: Demonstration of several different health care models to include family planning as an integrated component suitable to the Ghanaian context.

(d) Epidemiological Investigation: Investigation of the state of a rural Ghanaian community, concentrating on factors associated with health and family planning behavior.

S4. PROJECT ORGANIZATION AND MANAGEMENT

To foster harmonious working relationships and in recognition of the directive role of Ghanaian principals, a number of conditions were agreed to by the several cooperating parties:

(a) Project goals and objectives would be developed jointly by UGMS and UCLA.

(b) The Project would have two Codirectors, one Ghanaian, the other from UCLA. In case of disagreement, the Ghanaian view would prevail.

(c) Prospective staff for the UCLA team would have to be approved by both Codirectors.

(d) Every effort would be made to promote genuine collaboration through joint UGMS-UCLA staffing of Project committees.

(e) There would be a UGMS Project budget provided by USAID, separate from UCLA, giving the medical school the authority to hire requisite Ghanaian staff under local personnel practices.

(f) Nearly all service costs and most training costs would be borne by UGMS.

(g) All data generated by the Project would be available both in Ghana and at UCLA.

(h) Published materials would generally be co-authored by at least one Ghanaian and one UCLA staff member.

(i) A formal Project review conference would be held at least once a year.

Project evaluation in Ghana resulted in the development of a "central services organization" which consisted of a pool of vehicles, personnel, and other support services which could be used in a variety of activities. This resulted in significant economies of scale. As a result a number of studies and programs could be carried out, many of which would have constituted major projects in their own right.

Research manpower was particularly important. Mappers, field interviewers and research assistants were usually middle-school leavers recruited and trained by the Project. Their supervisors were usually University of Ghana graduates who were trained and directed by senior Project staff. Initially, the Vital Events Registration Assistants were part-time volunteers. Because they were not recording an adequate proportion of events, the Project recruited full-time, paid, Vital Events Registration Assistants in 1974 with a marked improvement in reporting.

The Project developed an effective data processing section consisting of two programmers and several assistants. The University of Ghana's IBM 1130 computer was used, and the Project added a tape drive unit and adapted several software packages to it. Most initial survey data were processed in Ghana. However, some of the processing in the last two years was done at UCLA because the University of Ghana lacked the more advanced computer and software necessary for the final analyses.

After the second PROP, some of the UCLA responsibilities were transferred to UGMS, such as vehicle supervision, data processing supervision, and the administration of overseas participant training. Moreover, the Department of Community Health assigned two of its senior medical officers who had recently returned with MPH degrees to supervise Project activities in Areas I, II and III and participate in research design and analysis. Field priorities were shifted to reflect the revised objectives and the de-emphasis of the original hypothesis testing.

Over the years, the Danfa staff at Los Angeles were involved in UCLA staff recruitment, bibliographic, editing and writing services, electronic data processing, short-term consultation, the ordering and dispatch of supplies and equipment, fiscal accounts, and aiding in the overall planning and implementation of the Project. They were supported in these tasks by UCLA's central administrative offices: The Office of the Coordinator of Overseas Programs (OCOP), the Chancellor's Committee for International and Comparative Studies (CCICS), the UCLA Contracts Office, Accounting Office, and Central Purchasing Office.

S5. HEALTH STATUS

The investigations into the health of the rural community concentrated primarily on the status of physical health and on the sociodemographic and environmental factors related to it. Baseline demographic analysis showed that the district had a young population: 49% under 15 years. Educational levels in Area I were somewhat higher than most of rural Ghana; 44% of adults had attended school at some time and 72% of children 6-15 years were currently enrolled. The population was highly mobile, complicating the capture of vital events and the maintenance of the desired sample size of the longitudinal surveys, which suffered an attrition rate of 50% over the five-year period.

The greatest proportion of preventable morbidity and mortality occurs in mothers and children. These two groups also account for most of the utilization of ambulatory health care services. Maternal mortality is extremely difficult to estimate in a small, rural population. A special attempt midway through the Project produced an estimate of four deaths per 1000 live births, but with wide confidence intervals. An analysis of pregnancy-related complaints seen during the first year of Danfa Health Center operation suggested that only a small percentage of maternal problems were being seen.

Child mortality at the 1972 baseline was serious but not as severe as that seen in less developed African countries or in other parts of Ghana. The infant mortality rate in Area I was estimated to be 54 per 1000 and the preschool mortality rate 16 per 1000. Thus, at least 12% of children born still die before age five. Children in the Danfa district are endangered by a number of infectious diseases, especially

malaria, measles, pertussis, diarrhea, respiratory disease, worms, skin infections and poliomyelitis. These infectious diseases can interact with malnutrition to increase the risks to health.

Mean birth weight for infants born at or near term and delivered at the Danfa Health Center from 1970 to 1973 seemed to indicate that infants in Area I of the Danfa Project district begin their lives in a normal nutritional state. However, the first Village Health Survey showed that nutritional status declines in early childhood. In the age group 5-35 months, 33% of children's weights fell below 80% of standard (normally only 3% of international reference groups fall below 80% of the standard weight-for-age). There was a drop in mean weight-for-age and height-for-age compared to standards for the period 12-35 months in males and 18-35 months in females. There was then some "catch-up" between three and ten years and then a further falling off during the usual period of the adolescent growth spurt (11-17 years). Rapid catch up occurred again between 18 and 25 years, but the mean weight-for-age and height-for-age never reached 100% of the standard.

These findings are significant because diminished nutritional status seems to reduce immunologic competence and results in more severe infections, and because final growth attainment may be below genetic potential in some children. This could compromise their intellectual or motor performance. The identification of heights and weights lower than international standards during adolescence (11-17 years) is also important, and it may be that adolescent nutrition is in need of more attention than it has received in the past.

The Village Health Survey and the special malaria surveys showed that malaria was an important problem, not only in the preschool children but also in the school-age children. At any one time, 41% of children under eleven years harbor malaria parasites in their blood. Malaria was also the most frequent diagnosis made at the Danfa Health Center or its satellites in 1972, accounting for 31% of all patient visits.

The incidence of measles seen at the Health Center was only 40% of the expected number. This could have been due to the smallpox-measles eradication program that had been conducted in the area for several years. The reported incidence of whopping cough was also low for reasons that are not clear. Serological studies suggested that it was a more prevalent problem than respondents had indicated.

Diarrhea constituted 21% of the complaints recorded for children under five at the Health Center but, despite the frequency of this complaint, significant dehydration was uncommon. Respiratory complaints were second only to malaria in frequency at the Health Center. The most common helminth problems in the Danfa Project district are Ascaris (roundworm) and Necator (hookworm).

Children were examined in the Danfa district to assess the impact of endemic poliomyelitis. The observed prevalence of lameness attributable to poliomyelitis was 7 per 1000 school-aged children, and the annual incidence was estimated to be at least 28 per 100,000 population. Although no evidence for an epidemic was found, these rates were comparable with those in the USA and Europe during the years of severe epidemics. This was one of the Project's most significant findings because it suggested that the frequency of poliomyelitis in tropical endemic countries has always been as great, if not greater, than that experienced by temperate countries during epidemic periods in the twentieth century. It is also suggested that the total annual incidence of paralytic poliomyelitis in the world may be reduced by only 25% since the advent of polio vaccine. Partly as a result of this study, poliomyelitis immunization is being given increased emphasis in Ghana and many other developing countries.

Skin tests showed that tuberculosis was only a moderate problem in the Project district compared to more highly endemic areas of the world. Only 3% of children under five had positive tuberculin reactions. The greatest danger seemed to occur during adolescence when tuberculin conversion increased from 15% in 5-14 year old children to 42% in people 15 years and older.

Though an important problem in other parts of Ghana, Schistosomiasis is not significantly prevalent in Area I of the Danfa Project district; guinea worm is of more serious concern. An outbreak in 1973 led to a special epidemiological survey which showed that most of the problem was confined to Area II where attack rates as high as 80% among males 25-44 years old were found in some villages. The study was particularly important because of its economic implications. The average work loss in untreated adults was more than five weeks and usually coincided with peak agricultural activities.

The first Village Health Survey asked questions about prior immunization in children under five. In Area I, 44% reported prior smallpox vaccination (60% actually had a smallpox vaccination scar), 23% reported prior measles vaccination, 8% prior pertussis vaccination and only 7% prior BCG vaccination against tuberculosis.

The baseline longitudinal survey included a morbidity section on illnesses and related sequelae in the two weeks previous to the interview. Twenty-four percent of persons said that they had been ill at some time in the previous two weeks, and of these 39% said that they had suffered some restriction in activity. Seven percent of the school children lost at least one day from school. The average loss of productive time per member of the working population in the Project district was 0.6 days in the two-week period.

The crude death rate observed during the first registration period (1971-1972) varied from 10 per 1000 population in Area IV to 15 per 1000 in Area III. The rate in Area I was 12 per 1000. These rates are about 20-50% lower than the national estimates and are probably due in part to under-enumeration during this period.

There are a number of important factors that affect health status. Well being is enhanced in the Danfa Project district by clan ties that provide stable role models and much personal security. There is a strong tradition of community support for village self-help activities. In the first Health Practices Survey, 37% of households in Area I reported that at least one member was involved in a cooperative community activity. The longitudinal KAP surveys indicated that education, either formal or informal, and people's perception of the causation of a particular disease help to determine how they attempt to cope with the disease.

Nutrition is a very important determinant of health status. Perhaps related to several decades of health education work in the Greater Accra Region, the knowledge of proper nutrition was relatively high in the Danfa Project district. Prolonged breastfeeding is the rule; the average woman breastfeeds her infant for 16 months. This promotes strong maternal-infant bonding as well as ideal nutrition and protection from many diseases for the first six months of life. The addition of weaning foods, usually maize porridge, commonly starts between three and five months of age; a high protein food such as legumes, fish or meat is

usually added between six and 12 months of age. Unfortunately, at least 40% of the mothers waited until after 12 months of age before adding protein foods.

Environmental factors are also important. The climate and geography of the district is conducive to the support of malaria vectors that are difficult to control. The first Health Practice Survey showed that, although a large majority of the population over six did dispose of human waste under reasonably sanitary conditions, 90% of children under six defecated near the home in areas likely to be frequented by other children.

Another environmental factor is water supply. The Project district overlies hard pre-Cambrian rock that contains very few aquifers. As a result, shallow wells are impossible and there are very few locations where even deep drilled wells are feasible. There are also very few natural springs to feed gravity flow systems. As a result many villages rely on seasonal rain water or on surface waters such as streams and ponds. In Area I, 58% of the people lived in villages that were served by a branch of the capital city's water supply. While the supply could be erratic, these people were usually able to obtain a reasonable supply of sanitary water.

The system factor found to have the most impact on health (operating through delivery of health services) is distance between the patient's residence and the health service facility.

S6. HEALTH CARE DELIVERY

The original health care targets according to the first Project Paper were:

- To establish a fully functioning family health center in a rural area.
- To establish a record system that would link census files and health center records.
- To establish a health education program emphasizing maternal and child health.
- To organize ongoing operations research studies.

By 1975 most of these targets had been reached. The preparation of the new Project PROP enabled the Ghana Medical School to formulate long term, but specific objectives. Not all were to be completed by the time this final report was to be written but targets were set so that there would be substantial progress in many of the areas of endeavor. The primary health service objective, according to the revised Project Paper of 1976, is the demonstration of several cost-effective health system models that include family planning as an integrated component.

The major sub-objectives are:

- To develop systems for increased accessibility of health services by development of the satellite clinic concept and other community-based services using volunteer or traditional health workers.
- To develop methods of increased community participation in the health care system.
- To increase the effectiveness of human, physical and financial resources by analyzing costs, carrying out functional analyses, standardizing patient management regimens and developing innovative uses of personnel.
- To develop systems that improve quality of care by establishing minimum standards of preventive and curative care, functional job descriptions and operational manuals.
- To develop systems that improve environmental sanitation.

The original strategy for the provision of comprehensive health services was twofold: first, a service program based at the Health Center but with home visiting by community health nurses, and village sanitation projects supervised by the Health Center Sanitarian; secondly, a health education program based in the villages that relies on Health Education Assistants. As time progressed, it became clear that a program based primarily at a health center or relying primarily on health professionals would not reach a large percentage of the population with many of the essential services. Thus, the program was modified to bring the services closer to the villages in which the people resided, first through satellite clinics and later through village-based malaria prophylaxis, immunization

and primary health care programs. Multiplication and extension of health professional skills was achieved by training village volunteers to provide many of the services needed in their own villages.

The maternal and child health services were the most important part of the health care program. The objectives of the maternal health care program were:

- To reduce maternal mortality by 30%.
- To reduce maternal morbidity.
- To reduce fertility and increase birth intervals.

This was to be done by improving obstetrical services and making family planning information and services accessible to all the population. Obstetrical care is rendered by three groups: traditional birth attendants (TBAs), the Danfa Health Center staff, and the obstetrical staff of the Mampong Tetteh Quarshie Memorial and Korle Bu Hospitals.

The child health care program was developed using a matrix that charted disease problems according to prevalance, severity and susceptibility to attack. Based on early analyses of child health problems, the following objectives were defined:

- To reduce the infant mortality rate by 30%.
- To reduce the preschool mortality rate by 50%.
- To reduce infant and preschool morbidity rates due to:

Malnutrition	Pertussis
Malaria	Helminthiasis
Measles	Accidents
Diarrhea	Poliomyelitis
Tuberculosis	

HEALTH CENTER SERVICES AND SATELLITE SERVICES

Health Center services included maternal and child health care, inpatient care for minor medical problems, and agricultural extension. Soon after services began, the UGMS-UCLA Project team undertook a number of activities to improve the Health Center's efficiency and effectiveness.

The use of the family folder for medical records was found to be impractical. Patient retained records were recommended and "Road to Health" weight cards were introduced for child care. Job descriptions were developed. Functional analyses resulted in a number of changes including the introduction of daily (rather than weekly) MCH clinics, combining maternal with child health clinics; and the pre-packaging of drugs. An MCH procedures manual was written and a formulary developed which limited the number of drugs that could be used. The Child Welfare Clinics were reorganized into the "under-fives clinic" pattern developed by Morley in Nigeria. Finally, a study of the proportion of target population served at the Health Center revealed that 70% of the patients seen there lived within a three mile radius of the Health Center. Therefore, three satellite clinics were started in facilities supplied by the villages in order to improve accessibility.

All Health Center and village-based services did not begin simultaneously. The progressive involvement of the community in the provision of services can be divided in three phases. Phase I included four programs:

- Health education
- Nutrition
- Sanitation
- Training of traditional birth attendants

Phase II was marked by the introduction of two new community-based programs:

- Malaria prophylaxis
- Immunization

Phase III in the development of community-based programs was the Village Health Worker (VHW) program.

PHASE I: HEALTH EDUCATION

In order to determine the impact of health education alone as well as its impact when integrated with Health Center-based services, two different models of health education were implemented: an integrated

district model in Area I, and an independent regional model in Area II. Danfa Project inputs in Area II included health education and family planning, without comprehensive health services.

In order to test a new method of delivering health education services at the village level, a new community health worker was created, the Health Education Assistant (HEA). The HEAs were selected from existing uni-purpose workers; Community Health Nurses, Nutrition Technical Officers, Sanitation Assistants and Family Planning Field Workers. All HEAs (four each for Areas I and II) received training in maternal and child health, sanitation, nutrition, family planning, and in health education methods and materials. Most HEAs are women.

For purposes of better coverage, Area I was divided into five sub-areas for health education. Four of the sub-areas are covered by the same four HEAs while the fifth sub-area has been the responsibility of the other Danfa Health Center personnel. Thus, this model combines the widely accepted policy of "all health workers as health educators" with an approach that utilizes specially trained personnel with health education and motivation as their primary foci of activity.

The health education program in Area II consists of health education provided at the Amasaman Health Post (run by the Local Council), at the family planning clinics and, independently, in the communities in the area. Each of the four HEAs is assigned a cluster of villages and she plans and implements her field activities in ways similar to her counterpart in Area I. The major difference between the two models is in the nature of the relationship of the health education program to other health services. In the independent model of Area II, the HEAs operate independently but collaborate with other frontline workers in their service area.

The activities of the HEAs include:

- Comprehensive health education coverage of all villages in Areas I and II.
- Creation of lines of communication between Health Center staff (Area I) or the Amasaman Health Post (Area II) and villagers.
- Concentration on the use of preventive measures to improve health.

- Use of multi-disciplinary approaches in attacking rural health problems.
- Provision of health care through an established system of referrals and follow-ups.

PHASE I: NUTRITION

All members of the health team are involved in activities of the nutrition program, the objectives of which are:

- To prevent malnutrition, especially in mothers and children. This is done through promoting the cultivation of improved and diversified foods, by means of a demonstration garden at the health center, group talks, and private counseling of mothers. This promotion is done in cooperation with the agricultural extension agency.
- To identify persons at risk of developing malnutrition.
- To identify persons with any degree of malnutrition. This is facilitated by following the growth of children as recorded on the "Road-to-Health" weight-for-age cards.
- To rehabilitate those found to be malnourished. This is done by counseling, home visiting, the provision of supplemental foods where necessary and careful follow-up.

PHASE I: ENVIRONMENTAL SANITATION

After the Health Center Sanitarian developed close working relationships with village leaders, measures were taken to stimulate the formation of Village Development Committees (VDCs). Village needs are assessed as a cooperative effort and targets developed. Water supplies have been improved by dredging and cleaning ponds; improving storage in earthen containers in the home; and by developing cooperative self-help projects to connect villages to the region's piped water supply. Excreta disposal has been improved through the construction of 101 communal pit latrines in 61 villages in Area I from 1971 to 1978. Groups of villagers have been assigned responsibility for the maintenance of refuse disposal sites. The sanitarian has provided information on improved home construction and in three villages cooperative housing societies have been

formed with 250 members. Small homes of modern construction have been built by the Department of Rural Development using self-help labor to defray costs.

PHASE I: TRAINING OF TRADITIONAL BIRTH ATTENDANTS

One approach to solving the problem of maternal mortality has been to train traditional birth attendants (TBAs), who already perform more than 75% of all deliveries in Ghana. This solution has several advantages:

- It is less expensive.
- It is less dependent on transportation.
- It allows childbirth to take place in a more natural setting.
- After training, the TBA is a resident agent for health education in the village.

In 1972, 263 TBAs were registered by the Project staff in Area I, II and III; a ratio of 1:137 population. Most were elderly and illiterate, and half were men. The mean annual number of deliveries was seven and only 6% performed more than 20 per year.

After conducting a survey of the TBAs knowledge and practices, a program was carried out to train the TBAs to monitor women during pregnancy; to recognize and refer women at high risk or with complications; to use safer delivery techniques; to care for the cord properly; and to enlist their aid in promoting improved MCH practices and family planning.

Follow-up supervision by the Public Health Nurse and Health Center midwife has been crucial to maintaining the interest of the TBAs. Evaluation is based on their reports and special birth questionnaires administered since 1974 by the Vital Events Registration Assistants. These evaluations show that each trained TBA is performing more deliveries than previously, that they are now rendering prenatal care, that they are using the sterile cord packs to care for the umbilical cord after delivery, and, according to their own report, that they are referring women for family planning services.

PHASE II: MALARIA PROPHYLAXIS

Malaria meets the criteria of a disease that must be given attention in any MCH program in West Africa. It is prevalent, serious, and susceptible

to attack. Major eradication efforts are not considered feasible in most of Africa at this time; rather, control measures are recommended. The Danfa Project selected pyrimethamine chemoprophylaxis as the most feasible method of control and set the objective of reaching each month all pregnant women seen in the prenatal clinics and 80% of children 0-10 years.

Although Health Center staff were used during the first year to distribute tablets to children living nearby, volunteers were used exclusively in subsequent years because they proved more effective. In the first five months of the program, 87% of the households with children under five participated at least once, and half participated three or more times. During the first five years of the program from 1973 to 1977, the mean monthly coverage was 38% of children under six and 83% of school children 6-10 years. Results of malaria surveys showed lower parasite rates and parasite densities in Area I (the only area receiving prophylactic treatment) compared to Area II. Results of this program indicate that volunteers can be very effective in distributing malaria prophylaxis tablets at the village level.

PHASE II: EXPANDED IMMUNIZATION PROGRAMS

Because of a number of problems, the exclusive Health Center-based approach to immunization had historically resulted in low levels of coverage in many African countries, including Ghana. Therefore, a combined Health Center and mass village-based approach was chosen by the Project. The priorities for prevention were measles, whooping cough, tetanus, tuberculosis and poliomyelitis.

An annual cycle seemed most feasible for replication nationwide and a schedule recommended by a PAHO conference on immunization was chosen. Under the expanded immunization program, children receive BCG, DPT and oral polio vaccinations once in the first year of life, and DPT, oral polio, measles and smallpox vaccinations once in the second year of life. In addition, children under one are supposed to receive another DPT-polio vaccination at the Health Center.

There are 61 villages in Area I. Initially, 18 collection points were identified for vaccination so that no one would have to walk more than one mile to be vaccinated. Even then, intensive health education

was necessary to achieve good participation by the population. Using PED-O-JET guns which greatly speed the vaccination process, Project staff are now able to vaccinate all of Area I in three days. During the three programs carried out in Area I from 1974 to 1976, an average of 51% of the children under age two were vaccinated each year.

PHASE III: THE VILLAGE HEALTH WORKER PROGRAM

In order to consolidate a number of volunteer health activities, the Village Health Worker (VHW) program was developed. Community acceptance was an important consideration from the program's start and village representatives joined Project staff and government health officials in determining the program's objectives, designing the curriculum and screening candidates for training. Three villages participated in a pilot study after which six additional villages were chosen as program sites; 15 men and five women were selected for training from the nine villages.

A training manual was prepared based on a WHO-produced manual. Prevention of disease was particularly emphasized during training although simple diagnostic and curative measures were included. Basic recordkeeping, referral and supervision procedures were also discussed. Training lasted 11 weeks, for a total of 110 hours of instruction.

Supervision of VHWs is a joint effort of the trainers, the Village Development Committee and, where applicable, other more senior village-based health workers. Regular continuing education of the VHW is also provided. Despite problems in receiving promised remuneration from villagers, the VHWs seem satisfied with their voluntary status and enjoy the prestige of serving as "village doctor". Older, more established VHWs have proved the most satisfactory in terms of stability and commitment.

In the first 15 months of the program these 20 volunteers delivered a significant amount of primary health care and were involved in 14,015 patient encounters. This represents 3.1 service encounters per person in these villages per year--a high rate of utilization. However, the ultimate success of a demonstration project depends on its incorporation into the national health program. Based on the Danfa experience and a similar WHO-sponsored project in Kintampo, Ghana, the Ministry of Health is now examining the feasibility of launching a nationwide program to make Village Health Workers their frontline primary health worker.

EVALUATION

The first level of evaluation was directly related to the evaluation of the attainment of the specific objectives of the initial (1970) and revised (1976) Project Papers. This level consisted of a number of functional analyses of the health delivery system. After the start of the satellite clinics, the percent of the population living within four miles of health services rose from 34% to 85%, and the percentage of the residents in Area I seen at least once during the year rose from 29% in 1970-71 to a high of 56% in 1973. The utilization of child and prenatal clinics nearly doubled. There was a drop in the percent of children under five seen at the Danfa clinics from 1972 to 1976 which could be attributed to the increased availability and participation in village-based services. A number of other functional analyses were carried out to improve clinic efficiency. Many were described previously (see Health Center Services).

Table S-2 shows various unit costs for operating the Danfa Health Center/satellite system (not including drug costs for non-Area I residents served).

Table S-2: Operational Costs of the Danfa Rural Health Center and Satellites Per Unit Noted, Cedis (Dollars)

	1973	1974	1975	1976
Per Patient Visit	1.30(1.13)	2.52(2.19)	2.98(2.59)	3.84(3.34)
Per Person in Area I	2.49(2.17)	4.42(3.85)	4.75(4.13)	5.05(4.39)

In 1975-76, the five rural health centers examined by another study group had per patient visit costs ranging from ₵2.17 to ₵4.32, with an average of ₵3.05. Danfa's cost per patient visit was ₵2.98 in 1975 and ₵3.84 in 1976. Thus, operational costs at Danfa appear to be in line with those at the only other rural health centers available for comparison.

While the Health Center and satellites, health education and family planning programs constituted the major share of the costs of the comprehensive health services package in Area I, several other important components were also provided. These were the antimalaria, immunization and traditional birth attendant programs. Table S-3 shows the package component costs on a per capita basis, including drug costs for non-Area I residents.

Table S-3: Area I Comprehensive Health Services Program, Per Capita Operating Costs, Cedis (Dollars)

	1973	1974	1975	1976
Danfa Health Center and Satellites	2.66(2.31)	4.83(4.20)	5.19(4.52)	5.65(4.92)
Health Education	0.57(0.50)	0.60(0.52)	0.70(0.61)	0.73(0.64)
Family Planning	0.25(0.22)	0.43(0.38)	0.51(0.44)	0.52(0.45)
Plus F.P. Health Education[a]	*0.09(0.08)*	*0.10(0.09)*	*0.14(0.12)*	*0.15(0.13)*
Plus F.P. by Danfa H.C. Staff[a]	---	---	---	*0.14(0.12)*
Antimalaria Program	0.04(0.03)	0.10(0.09)	0.12(0.10)	0.13(0.11)
Immunization Program	---	0.22(0.19)	0.09(0.08)	0.10(0.09)
TBA Program	0.02(0.02)	0.06(0.05)	0.07(0.06)	0.07(0.06)
TOTAL	3.54(3.08)	6.24(5.43)	6.68(5.81)	7.20(6.27)

[a]To avoid double counting, not counted in family planning.

In direct comparison to per capita recurrent cost estimates of ₵10.00, ₵7.54 and 6.42 for three districts studied by the University of Sussex Institute of Development Studies group, the per capita operating cost of ₵7.37 for the Danfa Area I comprehensive package appears to be in an appropriate range. However, the cost of the Danfa comprehensive package is probably greater than the amount the government presently spends in the rural area, but nevertheless is in a feasible range if the Ministry is able to attain its avowed goals of greater equity in the distribution of fiscal resources. Admittedly, this kind of equity can be arrived at only slowly, given large sunk capital investments in hospitals which must remain functional, but the government is making a start in this direction by putting a moratorium on further capital investment in upper level facilities.

The second level of evaluation measured the Project's effects on health-related knowledge, attitudes and practices. The results of longitudinal surveys of knowledge, attitudes and practices in the same population may be influenced by the learning experience from the prior survey. Thus, the actual attitudes and practices of the population may differ from those reported. Nevertheless, various surveys late in the Project indicated that 87% of women obtained prenatal care, that 74% of deliveries were performed by trained personnel, and that the TBAs were using sterile cord packs for cord care after delivery. The longitudinal Child Practices Survey of 1977 demonstrated increased understanding of disease causation and more appropriate behavior for treatment, either at home or elsewhere. The 1976 Health Practices Survey showed improvement in health-related behavior; 72% of children two to five years had weight-for-age cards in Area I, 69% had birth certificates and 50% had a positive history of immunization.

The third level of evaluation is an assessment of the Project's impact on health status. The ultimate goal of any health program should be the maintenance or improvement in a population's health status. However, the measurement of the impact of health services on morbidity and mortality is notoriously difficult. Even if changes in health status are detected, it is usually impossible to attribute them solely to health service interventions.

There is no single index that can be used to reliably assess the morbidity of an entire community. Project studies showed a lower prevalence of positive malaria indices in Area I compared to Area II. This was not reflected in a reduced percentage of malaria cases seen at the Health Center, but this could be due to misdiagnosis by Health Center staff or to increased motivation to seek early treatment for mild attacks of malaria. Project studies also showed that measles and whooping cough were maintained at low levels of incidence. Anthropometric studies indicated an improvement in the nutritional status of children. However, data were more variable from year to year than anticipated and improvements of similar magnitude were seen in all four Project research areas, including Areas III and IV where no nutrition program was carried out. Therefore, it is difficult to say that the health care program in Area I

had a definite impact on malnutrition. No other significant changes in morbidity could be detected with methods available.

In Area I, the crude mortality rate was observed to fall from 12.4 per 1000 population in 1971-72 to 6.2 in 1976-77. This decrease was statistically significant although these observed rates are most likely underestimated for all years but perhaps especially for 1971-72 and 1976-77. Since the greatest under-reporting probably occurred in 1971-72, the down trend is probably real.

A significant reduction in child mortality rates was observed in Area I; from 24.7 per 1,000 population in 1971-72 to 18.1 in 1976-77, which is statistically significant. The rates are more variable in the other three Project areas and no statistically significant trends could be discerned. The observed reduction in Area I was 27%. This reduction was due primarily to a reduction in preschool mortality (the age group most likely to benefit from the Project's health programs) rather than in the infant mortality rate.

The analysis of program impact on health status illustrates the very difficult problems involved in the collection and interpretation of morbidity and mortality data in a small, mobile rural population in a country such as Ghana. The reductions shown in malaria morbidity and possibly malnutrition are encouraging, as is the maintenance of relatively low levels of measles and pertussis. If the reductions in death rates are real it indicates that the child health program is improving the health of preschool children especially.

Because the magnitude of the errors that may have occurred in the collection, recording, and processing of mortality events cannot be known, the degree to which the comprehensive health care program was responsible for changes of the magnitude described above is not certain. Nevertheless, the statistically significant changes observed in these rates in Area I, where the comprehensive program operated, and the absence of changes in the other three areas suggests that the trends in reduction in Area I may be real and that, despite the marked deterioration in economic conditions during the study period, the program did have a significant impact on health status.

S7. FERTILITY

The observed crude birth rate (CBR), 45 per 1000 population, was somewhat lower than expected given the 1970 national figure (48 to 52 per 1000) but when standardized to the national Ghanaian population it became 56, a very high rate. There was a high rate of natural population increase (3.2% annually) and high fertility rates (GFR=222 live births per 1000 women 15-49 years; TFR=7.6).

Ghanaians have traditionally desired large families, as reflected by one of the highest fertility rates in the world. The mean number of desired children for men was 9.8 and for women 6.6. Nevertheless, there were indications of a change in attitude towards control of fertility. Whereas studies conducted in 1965 showed that only 8% of women in the Accra rural area approved of family planning, 72% of the baseline 1972 sample expressed approval. Knowledge about family planning had also increased with 65% of respondents reporting knowledge of the pill. However, use of modern family planning methods was minimal.

In the Danfa Project district the age of menarche has been steadily diminishing over the past decades probably due to better nutritional status. The baseline KAP survey showed that the average woman reported menarche at 15 years, was married at 19 and had her first pregnancy that same year. Marriage in the survey area is a fluid relationship with stages of mutual consent and marriage by customary rites. Remarriage rates are high among women during their reproductive years and among men at all ages.

The level of education was found to be related to reproductive behavior and attitude. The more educated the respondent, the more approving was that respondent toward smaller families. Christians, who composed 51% of the sample, were more supportive of smaller families than Muslims or traditional believers. The more children a couple has, the less likely they are to want additional children, so that 39% of women with five or six children wanted no further children. Some women, unfortunately, find that they are unable to have any children. We found that 2% of women in the Project district suffer from primary infertility; another 4% suffer from secondary infertility.

Danfa demographic studies have shown that the average woman has seven or eight live births by the end of her childbearing years. One or two children die in early childhood leaving her with five or six living children. The mean birth interval is about 30 months. Breastfeeding is practiced in almost all cases and lasts for about 16 months if a pregnancy does not supervene. In one of the survey samples of non-acceptors, it was found that abstinence only lasts five months. An examination of acceptor registration forms containing information about pregnancies occurring before starting family planning showed that the risk of conception after a live delivery is at least 10% by 12 months, 33% by 18 months and 50% by 24 months. The result is a fertility rate among the highest in the world with three of every ten women aged 20-40 delivering a child each year.

In spite of a very pronatalist tradition, there were many reasons why couples tried to limit their fertility. The most common reason was to ensure an adequate spacing between births. Although women may not have been aware of its anti-fertility effect, breastfeeding has been and still is, the most important child-spacer in countries such as Ghana because of the anovulatory effect of lactation hormones. Abstinence (after childbearing) was another method but may have minimal impact in this district because it is only practiced for the first five months after delivery when the mother is usually not ovulating because of lactation hormones.

In a recent study, rhythm was used in 18% of all birth intervals. However, ideas of what constituted the "safe period" of the menstrual cycle varied widely and two-thirds of traditional midwives interviewed gave times of safe periods that fell wholly or partially into what is scientifically considered to be unsafe periods! Despite this, respondents in the Project district reported rhythm to be rather effective, with a low accidental pregnancy rate of only eight per 100 woman-years use. Although this could reflect inaccurate reporting, it may be worthwhile to investigate in greater detail the nature and impact of rhythm and other traditional methods of fertility control in rural Ghana.

S8. FAMILY PLANNING

From 1972 to 1975 the Danfa Project family planning program was organized to conform to the constraints of the original research design. Thus, during this period the program consisted principally of family planning education provided by Health Education Assistants (HEAs) in Area I and II and family planning services provided by the family planning team in Areas I, II and III. No Project family planning services were offered in Area IV, the reference area.

Following the de-emphasis of the research design in 1975, additional service components were added with the objective of examining the cost-effectiveness of other ways of providing and expanding family planning services.

FAMILY PLANNING EDUCATION

The Project has learned that simply making contraceptives available is not sufficient by itself to attract significant numbers of family planning acceptors in rural Ghana. Rather there are two essential elements. One is education which must include both motivational support and information about methods. The second is the accessibility of contraceptive services.

Several types of personnel were involved in family planning education:

- Health Education Assistants
- Family planning team members
- Health Center staff
- Volunteer Village Health Workers
- Traditional birth attendants
- Acceptors themselves

FAMILY PLANNING SERVICES

The family planning service program gradually evolved into a package made up of four family planning delivery components: the family planning team (a mobile unit), the Health Center staff, the village-based primary care program, and the commercial program. Each of these four components could stand alone if the resources needed for the other three were not available.

The family planning team is composed of a family planning nurse, a Family Planning Assistant, a clerk and a driver. In 1972, three clinic sites were selected for family planning services in each of the three areas. The family planning team was not posted to any one clinic; rather each of nine clinic sites was visited by the team once every two weeks. The first time the team visits a village, as many interested villagers as possible are assembled for a short talk on family planning and villagers select the method they desire. No consent from a spouse is required as a condition of receiving services, and no charge is made for services.

An important modification of the family planning team's work was the extended program. Nine months after the program was initiated, an analysis was made of the numbers and percentages of acceptors as a function of the distance they lived from any of the three family planning clinic locations in their area. Most acceptors came from the immediate villages where the clinics were held. Since the time of the family planning team was not being fully utilized in the nine existing clinics, their work was extended to cover a larger number of villages. They now visit an additional village on their way to one of the nine regularly scheduled clinics; nearly 70% of the population in each area are reached in their own villages at least once every four months. From the back of the vehicle they are able to provide most services. Women who want IUD's have them inserted in their own homes. In the first few months after beginning this program, the monthly acceptance rate doubled; before that it had begun to fall as numbers of women needing services in the clinic villages diminished. Furthermore, since the onset of the extended program, the geographic distribution of acceptors has closely paralleled that of the population in each area.

The second component to be introduced with the utilization of Health Center staff to integrate more completely family planning services into the MCH clinics. The family planning clinics had always been integrated with the times and locations of the MCH clinics. However, family planning services were not available on a daily basis, nor were they provided by the regular MCH staff. Although a separate family planning team, working in a less hectic atmosphere, might be able to provide a higher quality service, it is economically more realistic to

have services provided on a daily basis by the regular clinic staff. For this reason, resident clinic nurses and midwives in all three areas have been phased into the delivery of family planning services. After a short in-service training program they are able to offer all family planning services, except IUD insertion.

Although in-service training was provided for all clinic staff, the community health nurses, working in under-five's clinics, were most successful in recruiting new acceptors. These nurses see large numbers of mothers 9 to 18 months after delivery when mothers are most anxious to ensure adequate child spacing. Immediate postpartum programs can have only limited impact in rural Africa where most women deliver at home and where the IUD is not popular. Rather, it is in the widespread under-five's clinics or child welfare clinics where the most rapid increase in family planning acceptance can occur. This approach has now been adopted by the Ministry of Health, and Project staff have worked with them in developing a family planning training manual for all Ministry of Health personnel which is now used in its regional training programs.

A third component developed was the village-based primary care program. In this program volunteer Village Health Workers are trained to assist in providing primary health care, including family planning services. Our experience is still limited, but in nine months this group of Village Health Workers recruited 21 acceptors per month. This compares with six acceptors per month recruited in these villages through the other two approaches during the first five Project years. The advantages of VHWs are the ready accessibility to information and services from a person who is part of the community structure, and a greater cost-effectiveness than that of the mobile team. The mobile family planning team will eventually spend more time supervising these community distributors than providing direct services. In this way, community distributors could greatly multiply the work of trained family planning workers.

Finally, the fourth component, a modest commercial program, was introduced in 1977 in Area II. Foam and condoms were offered for sale at Ghana National Family Planning Programme (GNFPP) clinic prices at small kiosks in the more populated towns in Area II. There were few sales and when the shopkeepers (who were allowed to retain all monies

collected) were asked why, they answered that the people preferred to get the same contraceptives free at the Danfa clinics.

EVALUATION AND RESULTS

At times, there has been some pessimism that the traditional culture in rural Africa is so pro-natalist that family planning services would gain only very limited acceptance if offered. On the contrary, Project results for the five-year period show that there is reason for optimism. In order to conform with overall Project goals and the need for replicability, the Danfa family planning program was not especially intensive or aggressive. Yet, there have been siginficant changes in family planning knowledge, attitudes and practices and in some measures of fertility.

The improvement of knowledge and approval of family planning that was noted in the few years before the Project began continued during the life of the Project. During the 1977 longitudinal KAP survey about 90% of men and women in Area I said that they knew about modern methods such as the pill and approved of family planning, compared to 70% in 1972. The number of couples in Area I reporting that they ever used modern contraceptives increased from 11% in 1972 to 34% in 1977. This compares to an increase in Area II from 7% in 1972 to 21% in 1977, and in Area III from 2% in 1972 to 8% in 1977; a marked difference that may be partly related to different Project inputs in the three areas. Despite a high level of knowledge and approval of family planning in Area IV, even at the baseline, there was no significant increase in the use of contraceptives in that area, presumably because services were not readily accessible. This contradicts the argument of those who say that, with increasing socioeconomic level and knowledge of family planning, people will seek out services themselves, and that therefore, making family planning services accessible is not important.

The typical female acceptor is 28 years old, married, illiterate, and accepts the pill. Important socioeconomic factors associated with acceptance were age, literacy, religion and occupation. Ninety percent of female acceptors were married and in three-fourths of the cases the acceptor said that she had spoken to her spouse about family planning and that he approved. Of married male acceptors, 78% reported that they

had discussed family planning with their wives; literate men were more likely to do so that illiterate men.

During the five years of the program there were 3,743 family planning acceptors, 45% of whom were men. The pill has been the most popular method among women and its popularity seems to be increasing. Although the acceptance of the IUD has been negligible in Areas II and III, 17% of female acceptors have consistently chosen the IUD in Area I.

Table S-4 shows acceptor rates representing only women and couples resident in the Project district who accepted in Danfa family planning program clinics. These rates are expressed as a percentage of all women of reproductive age, married and unmarried.

Table S-4: Acceptor Rates per 100 Women of Reproductive Age (WRA) by Area, 7/72 to 6/77

	Area I	Area II	Area III	Areas I,II,III combined
Female Acceptors[a] per 100 WRA	27.2	16.7	5.8	15.4
Couple Acceptors[b] per 100 WRA	37.6	31.0	14.2	26.1

[a]WRA is the mean no. of women of reproductive age (15-44) married and unmarried in population during period July 1972 to June 1977.

[b]Assumes that each man who accepts family planning is associated, on the average, with one woman of reproductive age. Thus, acceptance rates for couples are all female and male acceptors divided by the mean number of WRA during the period July 1972 and June 1977.

Again, Area I shows a markedly higher rate of acceptance than Areas II or III, especially among women, and Area II far surpasses Area III. Although not a controlled experiment, it seems that the increased acceptance in Area I is related to lower child death rates present at the start of the Project which continued and, very importantly, to the increased contacts with women in need of family planning in the Project's maternal and child care clinics.

There were several distinct increases in the numbers of acceptors being seen each month: with the start of the extended outreach of the

family planning team in June 1973, and again with the initiation of daily services by the Danfa Health Center staff in April 1976. Although there was a decrease in early 1977, this was abruptly reversed in June 1977 with the involvement of the Village Health Workers in family planning. Each new program component appeared to increase the number of acceptors and provide services to certain couples who would not have been reached by any other component. These acceptance rates are encouraging and are probably the highest yet observed in Africa, south of the Sahara.

Two-thirds of the female acceptors said that they accepted in order to space births but one-third said they accepted either to delay their first pregnancy or to stop having children entirely. However, the health of the child was not the most common reason women gave for using contraceptives. Rather it was to protect their own health. The second most common reason was freedom to work or study and to allow time for another child to become older and able to look after the next baby. Health of the child was only the third most common reason given.

Danfa program acceptors used the contraceptive methods for significantly long periods of time. For all methods, 36% of female acceptors surveyed in the 1977 follow-up study were still practicing 12 months after acceptance. This is less than the mid-Project survey in which 46% of women reported continued use at 12 months. The lower rate in 1977 could be due partly to the decreased use of the IUD which has the highest continuation rate in the Danfa program (65% at 12 months). Men reported much higher continuation rates than women; 70% at 12 months.

The most common reasons women gave for stopping use of family planning methods were side effects (26%), accidental pregnancy (22%), planning a wanted pregnancy (22%) and supply problems (12%). The accidental pregnancy rate (for all types of contraceptives, except IUD) is too high and it is clear that the ideal contraceptive--safe, effective and practical for use in rural Africa--has yet to be found.

The system factors that were found to be important for successful family planning services in rural Ghana are:

- Information and motivation
- Accessibility of services
- Quality of services
- Choice of contraceptives

Wherever significant numbers of couples have accepted modern family planning methods and used them correctly for a reasonable length of time, fertility change has been observed when studied by accurate methods. Still, the Project attempted to directly assess fertility change in family planning program acceptors. The extended use effectiveness rate is defined as the percent of acceptors (or if male acceptors, their female partners) who did not become pregnant for a specified period after acceptance, regardless of whether they continued to use the method or not. Follow-up studies showed that 60% of Danfa female acceptors had not become pregnant 12 months after acceptance. Men reported an even higher rate of use effectiveness. The reduction in the risk of pregnancy for the 12 months after acceptance was 55% in women and 85% in the partners of male acceptors. Birth intervals increased by about six months in acceptors after they had used family planning.

A study of components of fertility in acceptors and controls showed that the acceptors used modern contraception 18% of the time during the five-year period. During the entire five-year period acceptors had a higher general fertility rate than did non-acceptors (271 per 1000 women compared to 245 for non-acceptors). However, it must be noted that they are a much more fecund group than their age-matched controls, with a general pregnancy rate of 823 per 1000 woman-years exposure without contraception compared to 637 in controls. This rate for acceptors was reduced by 75% (to 208 per 1000 woman-years) when exposed and using any modern method of contraception. Using the IUD the risk reduction was 100%.

Based on analyses of births recorded by the dual collection system for vital events, the observed birth rate was estimated to have fallen in Area I from 43 to 33 per 1000 population and the general fertility rate from 226 to 178 per 1000 women aged 15-49. The changes in birth and fertility rates were statistically significant only in Area I. However, because of problems encountered in the collection system and probable under-enumeration in some years it is not certain that these results accurately reflect the true rates during each of the Project years. Nevertheless, since there was probably a greater under-enumeration in the first registration period (1971-72), it is likely that any reductions in rates reflect actual trend directions and that the program did contribute

to a real reduction in the birth rate in Area I during the five Project research years.

The health status of children born just prior to birth intervals during which there was use of modern family planning was examined. The mean duration of breastfeeding was prolonged by about one-half month for intervals in which any contraception was used, and by two and one-half months when the method was the pill. This is a very important finding. Up until now the concern had been whether the pill reduced the quantity or quality of milk. This question cannot be answered by these studies, but it appears that the pill often prolongs breastfeeding because it prevents the pregnancies that often occur during lactation in these fecund acceptors, and which often result in the mother's abrupt termination of lactation. Thus, there may be a trade-off: some women prolonging their lactation because of the pill; others suffering a diminished quantity or quality of milk. No significant difference was found in mortality rates or nutritional status between children born before contracepting intervals and those born before non-contracepting birth intervals.

The family planning program costs for Area I are outlined in Table S-5. Most significant is the per capita cost of $0.65 (total family planning program cost divided by total population of the three Project areas). This is a feasible cost in many African countries.

Table S-5: Danfa Family Planning Program Costs, Areas I, II and III, 1976

	Cedis (₵)	U.S. Dollars ($)
Family Planning Team	₵ 21555	$ 18743
Health Education Component	5044	4386
Health Center Components[a]	3237	2815
Contraceptives	5509	4790
Total	₵ 35345	$ 30734

Cost per capita (all 3 areas)[b] ₵ 0.75 ($ 0.65)
Cost per new acceptor (1976)[c] ₵23.00 ($20.00)

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[a]Danfa Health Center (₵2380) Amasaman Health Center (₵857)
[b]Exchange rate $1 = ₵1.15
[c]Assume one-half of total costs for new acceptors.

S9. INSTITUTIONAL DEVELOPMENT AND INFORMATION TRANSFER

INSTITUTIONAL DEVELOPMENT

Project outputs required to strengthen the Medical School's institutional capability included:

- Training of doctors, medical students and other health care workers to better understand and manage rural health problems.
- Developing training methodologies for all levels of health workers, including traditional practitioners and volunteers.
- Training specialists with the full range of capabilities needed in the current and future teaching and research programs of the Department of Community Health, University of Ghana Medical School.

The training provided by the Project dealt with two categories: local training and that occurring outside of Ghana. Local training included the training of research interviewers and assistants, professional health workers, traditional birth attendants, Village Health Workers, and medical students. Medical students experience the Danfa Project first-hand; it is the heart of the community health program of the Ghana Medical School. The medical student interaction with the faculty and other health workers in the Department is most intense during their period in the Danfa Project district. Since 1970, nearly 500 Ghanaian medical students have participated in the community health experience at Danfa. Students from many health training institutions of the Ministry of Health spend short periods studying the programs at Danfa. These include students from the Public Health Nursing School, the Nursing Training College, and the Health Center Superintendent School.

Overseas participant training was crucial to the strengthening of the Ghana Medical School's teaching and research capability. Some personnel spent short periods attending seminars or intensive programs, while others studied for a year or more earning university degrees and conducting valuable field studies. A total of 19 Ghanaians used the participant training resources of the Danfa Project for 22 different training experiences.

Most of those who took part in the participant training program worked for some time in the Danfa Project before the specified training was undertaken and nearly all worked for the Project subsequent to their return. Of the 19 persons who were involved in the Danfa participant training program, eleven are presently with the Department, and five persons occupy positions in the Ministry of Health which facilitate their teaching or consulting with the Department. Only three participants are out of direct contact with the Danfa Project and Department of Community Health. These training programs expanded the staff of the Department of Community Health and increased its teaching and research capabilities. The Department's capacity to gather, analyze and disseminate information and to play a significant role in improving the health of the people of Ghana is now demonstrable.

In addition to staff expansion, the University, the Medical School and the Department of Community Health acquired various pieces of equipment, vehicles and appliances which had been purchased with UCLA contract funds for Danfa Project use. The University IBM 1130 Computer was greatly enhanced by the addition of a tape drive system purchased, by agreement with USAID, from funds made available through the UCLA contract to expedite Danfa data processing.

INFORMATION TRANSFER

The transfer of information has occurred at two levels: informally, through experience within the Project; and formally, through seminars, workshops, published materials and special training manuals, and by formal meetings with various divisions and units of the Ministry of Health, the Ghana National Family Planning Programme, the Planned Parenthood Association of Ghana, and through the Policy Advisory Committee of the Danfa Project.

There have been a number of important informal mechanisms of communication. The Ministry of Health divisions which have been closely associated throughout the Project include MCH and Family Planning, Health Education, Nutrition, Communicable Disease Control and the Health Planning Unit. From its inception, the Health Planning Unit of the Ministry of Health has been intimately associated with the Department of Community Health and has also directly requested Danfa Project findings such as morbidity patterns, costs of services, and strategies for primary health care.

Experience gained in the Project became part of the basic information which went into the formulation of the Primary Health Care Strategy for Ghana. Members of the Department and Project also served on various committees of the Planning Unit and have taken part in seminars organized by the Ministry of Health covering topics of family planning, traditional midwifery, child health and health education.

Innumerable visitors came to Danfa to view Project activities and met with Project senior staff. While time consuming for staff, these visitors provided an opportunity for exploring problems and solutions related to primary health care and they were important in disseminating information outside Ghana.

One of the important formal mechanisms instituted for facilitating information transfer from the Project to other agencies of the Government was the Policy Advisory Committee (PAC). Membership of the Committee included a number of high level officials from the Ghana Medical School, the Ministry of Health, the Ghana National Family Planning Programme, the Ministries of Economic Planning, Education, Social Welfare, Rural Development, the Central Bureau of Statistics, and the Institute for Social, Statistical and Economic Research (ISSER). The purpose of the PAC was to foster collaboration, optimal attainment of the Project objectives, and flow of information from the Danfa Project to the agencies represented. The PAC antedated the 1976 Project Paper and generated some of the ideas found therein.

An equally important formal mechanism has been the publication of articles and manuals. Over 50 journal articles and monographs describing Project activities or findings have been published or are now in press. There are approximately 30 additional publications in progress. At least 25 conference presentations also have been given throughout the world since the Project began.

Several manuals have been produced including:

- A Program Manual for Traditional Birth Attendants--Organization, Training and Evaluation (1977). The TBA training manual was accepted for use by the Ministry of Health in 1978.
- Manual A and B for Training Serving Personnel of the Ministry of Health in Family Planning (1977). This manual was produced in collaboration with the Ministry of Health.

- Preliminary Manual for Trainers of Village Health Workers (1977). The MOH has been provided with this manual for potential use in MOH training efforts of VHWs or similar village-level personnel.
- Manual of Maternal and Child Health Procedures (1972). This is used by Danfa Health Center personnel.

Two additional manuals are planned dealing with malaria prophylaxis and expanded immunization programs.

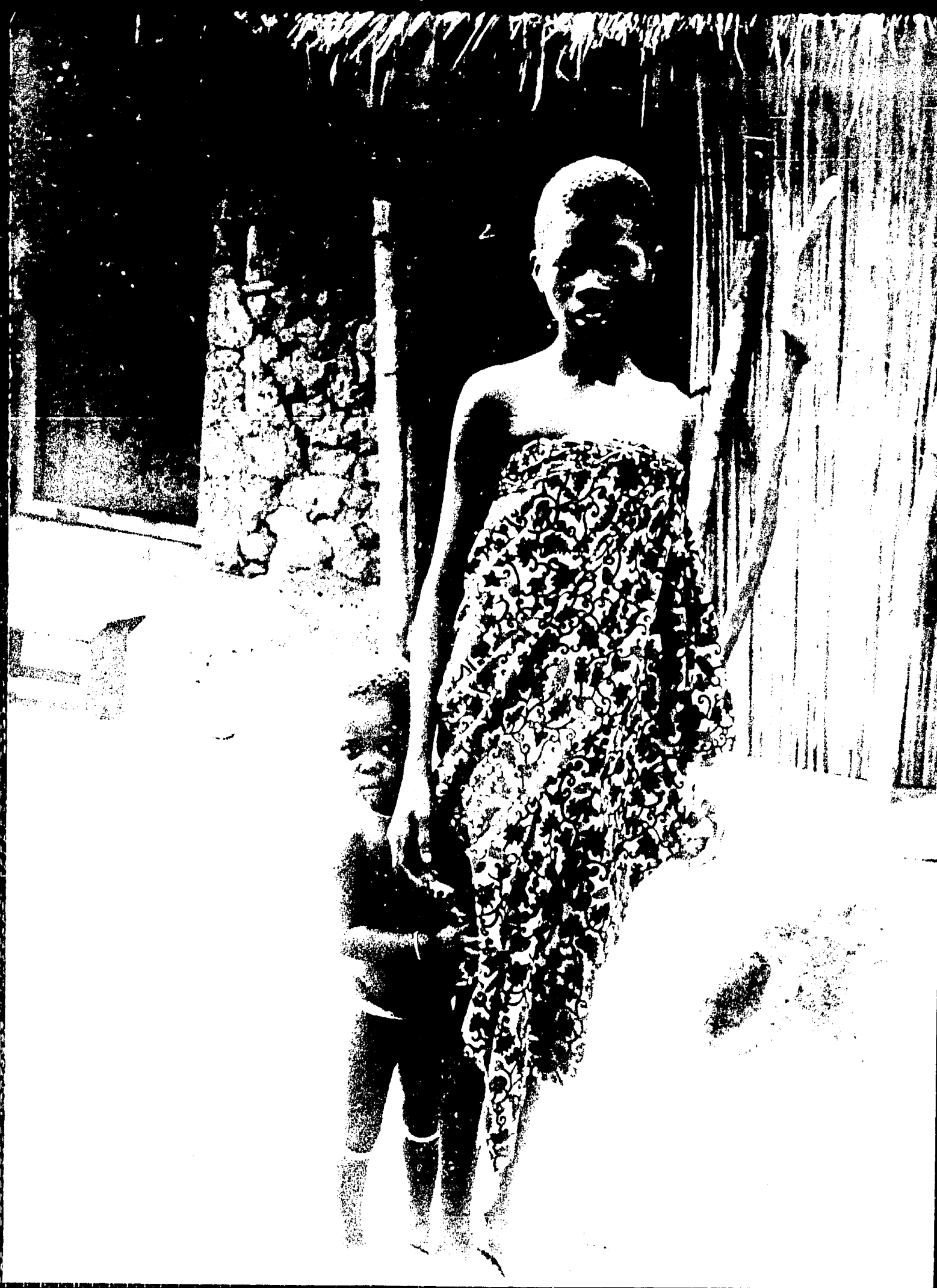
Futhermore, Monographs 9, 10 and 11 constitute working manuals of field activities developed by the Project and applicable to other rural health service/research programs:

- Conducting a Rural Health Survey: Experience from the Village Health Survey, Danfa Project, Ghana. Monograph No. 9. (1975).
- Mapping and House Numbering Methods in a Rural Health Project. Monograph No. 10. (1976).
- Experience in Selecting, Training and Supervising Interviewers in a Rural Health Project. Monograph No. 11. (1976).

S10. ATTAINMENT OF GOALS AND OBJECTIVES

The phase of formal research and development that was supported by the USAID contract has come to a close. Much has been learned about the health status of rural Ghanaians and the factors that affect it. Innovative approaches have been implemented to expand the work of health centers in a cost-effective manner and to involve the people in solving their own health problems. It has been demonstrated that rural Ghanaians approve of family planning and will use effective contraceptive methods if provided with the necessary information and services. The Danfa research experience and the participant training program have greatly enhanced the capability of the Department of Community Health of the Ghana Medical School to teach, to plan and evaluate health programs, and to conduct field research. A number of important conclusions and recommendations have resulted from this phase of the Danfa Project which are described in the following section.

The Danfa Project will continue indefinitely as the most important training experience of the Department of Community Health in both its undergraduate and postgraduate programs. Through a variety of formal and informal mechanisms, the Department will continue to make the results of its work known to relevant ministries and agencies in Ghana and elsewhere in the world, and to offer recommendations for improving the health of rural Africans.



Danfa Project
Final Report
summary conclusions
and recommendations

CONCLUSIONS AND RECOMMENDATIONS

		(CR-1)
CR1	Health Care Delivery	(CR-1)
CR2	Family Planning	(CR-6)
CR3	Ongoing Supervision and Evaluation of Family Health Programs	(CR-9)
CR4	Institutional Development	(CR-10)
CR5	Information Transfer	(CR-12)
CR6	Project Organization and Management	(CR-12)

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendations in this section are presented as follows:

1. Health Care Delivery
2. Family Planning
3. Ongoing Supervision and Evaluation of Family Health Programs
4. Institutional Development
5. Information Transfer
6. Project Planning and Administration

CR1. HEALTH CARE DELIVERY (See also Section 6.16)

Baseline analyses of morbidity and mortality rates suggest that the health status of the population of the Danfa district was somewhat better than expected given the health statistics from other parts of rural Ghana or most other countries in Africa. General socioeconomic development, prior health services and proximity to Accra undoubtedly played a role in significantly improving health status in the Danfa Project district over the past several decades. Nevertheless, the Danfa health programs implemented over the past five years appear to have accelerated this process and to have significantly improved health status.

Despite certain social, economic and health improvements that also have reduced death rates during this century elsewhere in Ghana, significant health problems still remain. Because of economic difficulties over the past 15 years, it has become impossible to maintain existing health care facilities and programs at their former level of funding in constant dollars and it is difficult, therefore, to plan expansions of health care services.

In considering the expansion of primary health care to rural areas such as the Danfa health district, it is important to be realistic and to consider only those service programs that can be implemented under existing national resources. The essential criteria of a feasible rural health care program for Ghana are:

- It must deal with the major causes of morbidity and mortality to the extent feasible with existing technology.

- It must be accessible to the entire population and result in high participation rates.
- It must be feasible for implementation with *existing* national resources.
- Its most important objectives must be capable of being evaluated.

It is likely that sufficient funds will not be available in Ghana in the next ten years to build, supply and staff all the health centers and health posts that the Ministry of Health had previously planned. Even if they were able to do so, the Danfa experience has shown that strictly health center-based care does not necessarily deal with the major causes of morbidity and mortality and that it is often not accessible or utilized by a large percent of the population who live more than three miles away.

In fact, primarily for reasons of accessibility, the Danfa program evolved into a more village-based primary health care program. Based on this experience, there are several recommendations:

Health Care Recommendation 1:
VILLAGE-BASED PRIMARY CARE USING VILLAGE HEALTH WORKERS SHOULD BE TESTED IN VARIOUS REGIONS OF GHANA.

This is perhaps the only feasible method at this time of bringing health care to rural areas in Ghana that will have a significant impact on health status. In some circles, such village-based care is being referred to as first level care. In concurrence with the Institute of Development Studies (IDS), University of Sussex report, it is suggested that funds to implement such a program must be found in existing national resources. This will require the reduction of certain existing health care costs, and the utilization of the saved funds for implementing rural health care. Two important ways of realizing these savings are through the reduction and control of drug supplies and more efficient use of staff.

A village-based primary health care program is not easy to implement. It requires careful planning, training and supervision, but above all, a high level of national morale and a will to succeed in this venture. Any such village-based primary health care program in Ghana must include the following components:

- First aid for common injuries and illnesses.
- Health education, especially in nutrition, sanitation and family planning.
- Community cooperative efforts in water supply, refuse disposal and nutritional supplements for malnourished children.
- Malaria treatment and chemoprophylaxis.
- Expanded village-based immunization against measles, pertussis, tetanus and tuberculosis.
- Training of traditional birth attendants.
- The community distribution of contraceptives.
- Surveillance of child growth and development.
- Surveillance of disease incidence especially reportable and important communicable disease, maternal mortality and, if possible, vital events.

Health Care Recommendation 2:
RURAL HEALTH CENTERS, WHICH WILL BE NEEDED TO PROVIDE SECOND LEVEL CARE AND TO SUPPORT THE VILLAGE-BASED PROGRAM, MUST BE MADE MORE EFFICIENT.

This could be accomplished by the following:

- Reduce the size and cost of health center construction. The Danfa Project has demonstrated that services can be adequately provided in modest facilities often provided by the communities themselves.
- Reduce the size of the staff. Health center staff rosters are much larger in Ghana than those found in East Africa, for example.
- Simplify patient records. The use of patient-retained records such as those now used for children (Morley type) should be used for all age groups. Not only is this more efficient, but it is more desirable from the patient's and the health worker's point of view. Family folders are not of practical use in the typical busy African outpatient clinic.
- Organize satellite clinics to help expand secondary level coverage.
- Offer daily maternal and child health services, including family planning.

- Pre-package commonly used drugs and, if possible, have them dispensed by the health worker seeing the patient.
- Reduce the drug formulary to include only those drugs that are commonly needed, effective, and least expensive. Other special or less frequently needed drugs should be available only to the Health Center Superintendent.

Staff from these second-level centers would spend a significant proportion of their time supervising the village-based primary health care program. This would include resupply of drugs, in-service training, and advice and consultation on medical and health matters.

Health Care Recommendation 3:
HEALTH PROGRAMS MUST ADDRESS THE MAJOR CAUSES OF MORTALITY AND MORBIDITY.

Specifically, health programs must include:

- A maternal health program. Women must be provided with safe and accessible prenatal and delivery services, either at health facilities or by training traditional birth attendants.
- A malaria prophylaxis program. One that utilizes village volunteers can be very effective in distributing malaria prophylaxis tablets, as demonstrated in the Danfa Project. There is about a 78% reduction in the risk of parasitemia in the month after taking the tablet.
- An expanded immunization program. Immunization is one of the most cost-effective methods available for reducing mortality and morbidity. Aggressive and innovative methods are needed to bring immunization services to children in villages.

Health Care Recommendation 4:
HEALTH EDUCATION MUST BE AN INTEGRAL COMPONENT OF EVERY PROGRAM BECAUSE IT IS ESSENTIAL TO ACHIEVING SIGNIFICANT PARTICIPATION OF THE POPULATION IN HEALTH PROGRAMS.

The Danfa Project found that health education did not significantly affect health status measures when it was separate from comprehensive health services. The health education was most effective when it was part of routine

program schedules and when immediate action on the part of the population was possible. The Project also found that the health education component was able to bring about a significant increase in the level of family planning acceptance in Area II and, in conjunction with comprehensive health services, led to an even greater level of acceptance in Area I.

Mechanisms for the integration of health education are:

- Train level two health staff associated with health centers or health posts in community development and health education techniques.
- These health workers identify, train and coordinate the activities of village volunteers.
- Organize comprehensive coverage of rural health districts by assigning responsibility for supervising health programs in specific communities to individual health workers.
- Integrate health education into routine annual and monthly program schedules in primary and preventive health care.
- In order to make health education most effective:
  (a) It must be integrated into comprehensive health care.
  (b) Where this is not possible, educational efforts must be focused on existing community health and development programs.
  (c) Opportunities must be provided for immediate behavior change.

Health Care Recommendation 5:

TRAINING MUST BE MADE MORE EFFECTIVE AND MORE RELEVANT TO PROGRAM OBJECTIVES.

In designing any training program, whether prior-to-service or in-service, the tasks that each health worker must perform must be identified. Then each task must be analyzed to determine the knowledge and skills required to perform the task. Important objectives in improving training are:

- Training must be competency-based. Each worker must be trained to become competent to perform each required skill and must be tested to be certain that the worker has the required knowledge and skill before proceeding to learn the next task.

- Job description of Ministry of Health personnel must be reassessed and revised to bring them in line with current health service needs and objectives. The revised job descriptions must then be made available to all Ministry of Health personnel.
- Appropriate in-service training exercises must be developed to help MOH personnel on the job adapt to the new job roles. In-service training must also become a routine part of the professional life of all MOH personnel.

CR2. FAMILY PLANNING (See also Section 8.16)

Based on the experience of the Danfa family planning program, the three most important conclusions are:

- Interest in fertility reduction is significant in this rural population.
- People need information and services if they are to act on this interest.
- If information and services are provided, results will be acceptable.

Recommendations for expanding family planning services in rural Ghana and elsewhere in Africa based on these conclusions and the Danfa experience follow.

Family Planning Recommendation 1:
FAMILY PLANNING SERVICE COMPONENTS MUST IMMEDIATELY BE INTEGRATED WITH OTHER HEALTH SERVICES.

The integration of family planning with other health services is often regarded as being much more complicated than it really is. There are many countries in Africa where health services are reasonably accessible to 50% of the population. The easiest and most cost-effective way to immediately integrate family planning with other health services and also to rapidly expand the numbers of current acceptors is to train all serving health personnel to deliver family planning services as a regular part of their other duties. This can be done rapidly if training in IUD insertion is excluded initially. Such training is especially important for nurses who conduct the

maternal and child health clinics. Thus, we recommend integrating family planning and maternal and child health clinics as to time, place and personnel. In other words, a nurse who conducts an under-fives clinic would offer, as one of a number of clinic services, family planning advice and methods to mothers of children attending the clinic.

Family Planning Recommendation 2:
MOBILE FAMILY PLANNING TEAMS SHOULD BE USED TO EXPAND AND SUPPORT OUTREACH PROGRAMS AND HEALTH CENTER PROGRAMS.

These teams would be involved in three main activities:

- Outreach Programs. The Danfa experience has shown that women will not walk far for family planning services. This problem can be partially overcome by contacting women when they are visiting the MCH clinics for other reasons. In areas that are poorly served by MCH clinics, outreach programs are justified. The extended program of the Danfa family planning team demonstrated that acceptor rates can be doubled by having a mobile family planning team visit outlying villages as infrequently as once every four months. Employing such a schedule a team can cover a district of 200 sq. miles (500 sq. km) and 60,000 population.
- Supervision of Village-based Family Planning Programs. During outreach village visits the family planning team can recruit and supervise village volunteers who can act as village agents for family planning and be able to motivate other villagers and supply them with contraceptives. These volunteers may be teachers, TBAs, members of women's groups, or Village Health Workers. Although such a village-based family planning program could stand alone, it would be more efficient to integrate it with other village-based primary health care programs. Even in an integrated program, the family planning team could still play a useful support role.
- In-Service Training and Support of Health Service Staff. As part of their district responsibilities, the family planning team can train serving health personnel in family planning. This responsibility could be ongoing and include refresher courses, supervision where appropriate, collection and feedback of monthly returns,

consultation for problem cases, monthly IUD insertion, or weekly clinics during very busy days in certain urban locations.

Family Planning Recommendation 3:
VILLAGE-BASED FAMILY PLANNING SERVICES MUST BE DEVELOPED.

In rural areas a village-based family planning program using volunteer family planning workers such as Village Health Workers can be very effective. Once organized it is relatively inexpensive to maintain. However, the start up costs in time and money should not be underestimated. Moreover, continued support and supervision must be vigorously maintained. Because this support often requires expensive vehicles and personnel, it can be more easily justified if it is combined with the support of other village-based programs such as TBA training, malaria prophylaxis, village-based primary care, or other outreach family planning services. The mobile family planning team can be used to help support this activity.

Family Planning Recommendation 4:
COMMERCIAL DISTRIBUTION PROGRAMS MUST BE EXPANDED.

These supplement those family planning services provided by health personnel. Commercial contraceptive distribution sources may be especially important for unmarried men and women anxious to avoid unwanted pregnancy and who prefer the anonymity of a commercial source.

Each of the four components recommended above (integration of family planning with other services, utilizing mobile family planning teams, developing village-based family planning services and commercial distribution programs) could stand alone if the resources needed for the other three were not available. However, the benefits of family planning are such as to warrant the integration and implementation of all four program components in rural Ghana.

Family Planning Recommendation 5:
FAMILY PLANNING SERVICES SHOULD BE PROVIDED FREE OF CHARGE.

Although the Danfa Project did not conduct a controlled study of the impact of charges for service on acceptance rates, it was the impression that free services facilitated acceptance by many poor rural men and women. At the

very least, a controlled study should be undertaken to determine if there is a disincentive in charging for family planning services.

CR3. ONGOING SUPERVISION AND EVALUATION OF FAMILY HEALTH PROGRAMS.

Supervision and evaluation is one of the major components of project management. It is brought to attention here because it is the component that often receives the least emphasis. Ongoing or internal evaluation is stressed because too often evaluation is taken to mean a periodic external review of results at long intervals. This usually results in the detection of problems or deficiencies at a stage so late in program implementation that remedies cannot be effected in time to assure program objectives. The success of many of the Danfa health and family planning programs was achieved by the constant supervision of Project workers and evaluation of short-term implementation targets. To assure attainment of objectives in similar projects, several recommendations are offered.

Evaluation Recommendation 1:
EVALUATION AND SUPERVISORY PROCEDURES MUST BE AS SIMPLE AS POSSIBLE WITH RAPID FEEDBACK OF CONCLUSIONS AND SUGGESTIONS.

Evaluation Recommendation 2:
EVALUATION AND SUPERVISION MUST OCCUR ON ALL LEVELS.

- Community Level Evaluation. Village-based primary health care programs require careful monitoring and supervision. These should be a collaborative effort of the Village Development Committees (VDCs), the Village Health Workers, TBAs and other village workers. Objectives and methods of assessment must be jointly agreed upon.

  For example, using record books of the type prepared for the Danfa TBA training manual, even illiterate Village Health Workers would be able to tally visits, diagnoses and nutritional status. The VDC or council of elders might agree to record vital events in the villages. Supervisors could easily consolidate such village level reports to develop service utilization rates, morbidity rates, and vital rates for their district.

- Health Center and Health Post Level Evaluation. Again, objectives and methods of assessment must be jointly developed by staff and supervisors. Job descriptions and standards of performance must be prepared. Controls on access to drugs and equipment are important to avoid pilferage or overutilization. Regular weekly or monthly staff meetings aid in the review and evaluation process.
- District and Regional Level Evaluation. District and regional objectives must be clearly and quantitatively stated. Attainment of short-term implementation objectives must be constantly monitored by supervisory personnel through frequent visits and meetings with peripheral staff. Data collection must be carefully and simply organized. Analyses of data and feedback of results to peripheral staff must be rapidly carried out. This can be aided by using computer processed forms or cards where facilities permit. But if electronic data processing is used it must be kept simple and the amount of data regularly generated kept to the absolute minimum so that district staff have the time and capability to analyze it.

CR4. INSTITUTIONAL DEVELOPMENT

The Danfa Project has demonstrated that a medical school can act as a research and development unit of the Ministry of Health. This kind of collaborative relationship can utilize those skills often found in a medical school setting to help solve national health problems.

To foster such relationships, the following recommendations are made:

Institutional Development Recommendation 1:
DEMONSTRATION PROJECTS OF SERVICE, TEACHING, AND RESEARCH, SUCH AS THE DANFA PROJECT, SHOULD BE DEVELOPED IN OTHER COUNTRIES, AND IDEALLY, IN EACH MAJOR REGION OF THOSE COUNTRIES.

These should be joint collaborative efforts of medical schools (and possibly other professional schools) and Ministries of Health. Experience in these project districts should form an important part of the training of medical students, nurses and other health professionals.

Institutional Development Recommendation 2:
TEACHING STAFF WITH THE NECESSARY SKILLS TO PARTICIPATE EFFECTIVELY IN THESE PROJECTS MUST BE DEVELOPED.

The skills of particular importance are:

- Teaching methods, especially competency-based training
- Epidemiology
- Biostatistics
- Maternal and child health
- Family planning
- Control of infectious diseases
- Research methods and survey design
- Health economics
- Management
- Demography
- Electronic data processing

Institutional Development Recommendation 3:
MEDICAL SCHOOLS OR OTHER TRAINING INSTITUTIONS SHOULD AID IN PREPARING TRAINING MANUALS.

The development of these training and operational manuals should be based on the experience of a demonstration project. If produced in collaboration with the appropriate divisions of the Ministry of Health and its training institutions, they can help assure a high standard of preventive and curative care.

Institutional Development Recommendation 4:
MEDICAL SCHOOLS SHOULD RECEIVE ADEQUATE SUPPORT TO PARTICIPATE IN THESE ACTIVITIES.

Important here is the creation of new staff positions in the medical school for trained faculty, the strengthening of electronic data processing capability, the development of editing, illustration and publishing capabilities, and the provision of necessary operating funds through either regular budgets or donor assistance.

CR5. INFORMATION TRANSFER

Demonstration projects can only reach their objectives if there is active collaboration between the project staff, the medical school, other training institutions, the Ministry of Health, and other relevant government ministries or agencies. To foster this collaboration, there are several recommendations.

Information Transfer Recommendation 1:
A POLICY ADVISORY COMMITTEE OF THE PROJECT, COMPOSED OF REPRESENTATIVES FROM ALL RELEVANT AGENCIES, MUST BE ORGANIZED.

This committee would set project objectives and review findings for incorporation into national health policy.

Information Transfer Recommendation 2:
PROJECT EXPERIENCE MUST BE INCORPORATED INTO THE CURRICULUM OF MEDICAL SCHOOLS AND OTHER TRAINING INSTITUTIONS.

Information Transfer Recommendation 3:
PROJECT STAFF MUST DEVELOP FORMAL AND INFORMAL RELATIONSHIPS WITH RELEVANT GOVERNMENT MINISTRIES AND AGENCIES.

These should include memberships on advisory committees, formal and informal consultations, and participation in workshops, seminars, and conferences.

Information Transfer Recommendation 4:
PROJECT STAFF MUST BE ENCOURAGED AND AIDED TO TRANSMIT PROJECT EXPERIENCE BY MEANS OF PUBLISHED ARTICLES, MANUALS AND CONFERENCE PRESENTATIONS.

CR6. PROJECT ORGANIZATION AND MANAGEMENT

A number of lessons have been learned during the collaboration of UCLA and the Ghana Medical School in the Danfa Project which should be considered by others who might be involved in similar projects.

- The development of a demonstration project and the strengthening of the host country institution is of necessity a long-term project requiring five to ten years to come to full fruition. The time required is often greater than that initially anticipated.

- The possibility for any domination by donor country institutions which are involved as major participants must be avoided. True collaboration and protection of the prerogatives and involvement of the host country institution and staff can be assured by the kind of arrangements developed in the Danfa Project: co-directorships, joint staff meetings, and joint authorship of papers.
- The independence of the host country institution must be assured. In areas of disagreement the host country institution must have the final decision making authority.
- The host country institution must be provided with a separate local personnel budget. If there is external assistance and participating donor country institutions, the host country institution must be provided with a separate budget to hire and control local staff under local personnel practices and salary scales.
- Economic and political difficulties may arise during the course of the collaboration and, therefore, contingency plans may be necessary.
- Host country colleagues should be available in all key categories of activity. If they are not, consideration should be given to dropping these categories of activities from the project work plan.
- The time available for host country participants to be involved in the project must be realistically assessed. Their other national and international advisory and teaching responsibilities must be considered.
- Long-term longitudinal research studies engender many problems because of changing priorities, staff turnover and population mobility. The most successful research studies are usually those that can be planned and completed in a short period of time by the same staff.
- Extensive demographic studies should be avoided because of their complexity and cost. Retrospective sample surveys will often suffice to obtain estimates of vital rates. If other demographic information is required it may be preferable to coordinate these activities with the national census.
- Data processing capability must be realistically assessed and, if possible, work tailored so that it can be analyzed using equipment existing within the host country.

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1. NATIONAL BACKGROUND (1-1)

1.1	National History	(1-1)
1.2	Geography and Climate	(1-1)
1.3	Sociodemographic Background	(1-2)
1.4	Economic Environment	(1-3)
1.5	Major Health Problems	(1-4)
1.6	Organization of Health Services	(1-5)
1.7	Population and Family Planning	(1-7)

1. NATIONAL BACKGROUND

1.1 NATIONAL HISTORY

Ghana, located on the Gulf of Guinea in West Africa, was formerly known as the Gold Coast in colonial times. Ghana achieved its independence from Great Britain on March 6, 1957. Its first government was headed by President Kwame Nkrumah, who was deposed on February 24, 1966 by military coup. The deposing military group, the "National Liberation Council," voluntarily gave way to an elected civilian government on September 3, 1969, headed by Prime Minister Kofi A. Busia. Dr. Busia's government was replaced on January 13, 1972 by another military government, the National Redemption Council, and later by the Supreme Military Council. The latter was due to be replaced by an elected civilian government on July 1, 1979; however, this date has been delayed for at least three months by a new Military Revolutionary Council.

1.2 GEOGRAPHY AND CLIMATE (1)

Ghana is located a few degrees north of the equator on the southernmost aspect of the bulge of West Africa. To its north is Upper Volta, on the east Togo, to the south the Gulf of Guinea, and to its west the Ivory Coast. The country is approximately rectangular in shape, with its greatest distance running north-south. It occupies slightly over 92,000 square miles and its climate is tropical.

The climate is affected by the moisture-laden winds from the Atlantic as well as the hot, dry winds coming down from the Sahara desert to the northeast. Rains are present from March to October, with the heaviest rains in May to July and September to October; there is more rain in the south, where the Danfa Project district is located. November to February tends to remain quite dry, with only occasional rain. In the south, which includes the capital, Accra, the mean maximum monthly temperature is in the range of 74-86° F. (23-30°C.) In the northern area around Tamale, the mean maximum monthly temperature range is 64-95°F. (18-35°C.).

During the rainy periods, mosquito breeding increases and there is a rise in the incidence of malaria. During the dry periods, the dusty northeastern desert winds lead to an increase in eye irritations and respiratory infections. The more humid areas of the south help to promote skin infections. Most of the Danfa Project district lies in the low plains, north

and northwest of Accra. However, a portion is located on the Aburi ridge, an escarpment. In addition, some of the northwestern Project district areas are rain forest.

1.3 SOCIODEMOGRAPHIC BACKGROUND

According to the 1970 census, about 70% of Ghana's 8.6 million people live in rural areas. Urban population, however, is rapidly increasing. According to one estimate, Ghana's two major cities, Accra and Kumasi, experienced growth rates of 22% and 39%, respectively, from 1966 to 1970 (1). Such explosive urban growth has posed serious problems since health and other social services are increasingly strained to meet the needs of urban dwellers, many of whom arrive without the skills necessary to compete in an already tight employment market.

Ninety-nine percent of the population is African; the remainder are of European, Asian or Middle Eastern extraction. In 1960, foreign immigrants (mostly from neighboring African countries) composed 12.3% of the population (2). The Alien Compliance Order of 1969 required immigrants without necessary papers to leave Ghana. The precise effect of the Order on population growth is unknown; however, demographers assume that the once considerable impact on population growth as a result of foreign immigration from neighboring countries has been reduced.

Of the indigenous population, 40% belong to the Akan ethnic group, 12% are Ewes, 12% Mole-Dagbani, 10% Ga-Agdangbe and about 5% Grusu. The remainder belong to the Guan, Gurma and Central Togo groups. Over 100 separate subgroups and corresponding dialects exist in Ghana; ethnic boundaries are ill-defined and most parts of the country are ethnically mixed. English is the official language in Ghana and is most prevalent in urban (primarily southern) areas where colonial influence was stronger (1).

Forty-five percent of the population are Christian. Thirty-eight percent are traditionalist (animist) and 12% Muslim (2). Seven percent claim no religious affiliation. A relatively high proportion of Christians are in the southern part of Ghana, where the Project district is located (1).

In 1970, over 43% of Ghanaians had attended school, a marked and rapid increase from the 1948 level of 4%. The increase was particularly noticeable in urban areas and among males. The majority of rural adults have not received formal education. The Education Act of 1961 made elementary

education free and compulsory (2). In 1969, government expenditure for public education amounted to 79.4 million cedis (1 ₵ = approximately U.S. $1 in 1969) or about 21% of the government's total expenditure budget (1). Growth of middle and secondary education has not been as rapid, and a lack of secondary level facilities makes it difficult for many to continue education at that level (2).

Detailed demographic information is given in Section 1.7.

1.4 ECONOMIC ENVIRONMENT

Ghana's natural resources are relatively abundant and include timber, industrial diamonds, bauxite, manganese dioxide and gold. Cocoa, however, is the country's major commodity. Combined with timber, it amounted to 78% of Ghana's exports in 1970 (2) and about 15% of the gross domestic product (1). About 20% of the working population are involved in cocoa farming. Virtually all cocoa farming is located in southern Ghana--no cash export crops are grown in the north and the population there is primarily engaged in subsistence farming.

In 1970, 84% of males and 64% of females at least 15 years old were "economically active"; 70% were actually employed. Annual per capita income in 1970 was estimated at $262 (2), higher than many other African countries.

In 1970, 57% of the population were involved in some type of agriculture or fishing--a 5% drop from 1960, but still representing the mainstay of Ghana's economy. Professional, technical, production and service employment fields experienced the greatest increase during that time, from 19% of all employed in 1960 to 28% in 1970 (2).

Despite Ghana's richness in mineral resources and cocoa, the national economy suffered during the 1960's. Rapid population growth drastically slowed the increase in per capita income to about 0.5% per year between 1960 and 1965, although the gross domestic product experienced a 3.2% increase during that time. Balance of trade has fluctuated markedly; a trade surplus of ₵48 million in 1970 was followed by a trade deficit of ₵71 million in 1971 (1), largely due to variances in the world market price for cocoa, changes in import licensing controls, and currency instability. Of late, rising prices of imports, particularly petroleum products have further adversely affected the country's economy.

1.5 MAJOR HEALTH PROBLEMS

Limited reliable data make it difficult to quantify and compare health problems in the various areas of the country. Quantification of health problems in the study area was one of the objectives of the Danfa Project.

The pattern of mortality and morbidity is similar to many West African countries, although Ghana's more favored socioeconomic position in the past may have resulted in above average health status for the population as a whole. Life expectancy at birth is estimated to be 48 years (3). Other vital statistics are shown in Table 1-1 (Section 1.7).

The major health problems particularly affect maternal and child health. Maternal health problems include especially mortality and morbidity from hemorrhage, infection and toxemias of pregnancy. Apart from the important perinatal problems, child health is diminished by the interaction of malnutrition and infectious disease. The most important infectious disease is malaria which is predominantly of the more serious falciparum variety. The other serious infectious disease problems are measles, gastroenteritis, pertussis, pneumonia, tetanus, tuberculosis, typhoid fever, schistosomiasis (snail fever), onchocerciasis (river-blindness), intestinal helminths, guinea worm, yaws and leprosy. Smallpox appears to be under control and no cases have been reported since 1968. Arborvirus infections are common and small outbreaks of yellow fever are occasionally seen (4,5).

Accidents and hepatitis are important problems of young and middle-aged adults. Older people are afflicted by heart disease, hypertension, strokes and pneumonia. Anemia is common in all age groups (4,5).

Contaminated water supply, housing and the improper disposal of human excrement and garbage pose serious environmental health problems, particularly in the rural areas. The larger cities, such as Accra and Kumasi, have good water sources, whereas the smaller towns and villages lack adequate supplies. Human waste disposal for most of the country is inadequate and garbage collection or disposal facilities are limited. The accumulation of refuse provides breeding sites for insects and rodents.

The poor sanitation level no doubt plays a considerable role in the prevalence of diarrhea and parasitic diseases. Helminthic diseases such as those caused by hookworm and ascaris (round worms) are widespread. Guinea worm affects not only the health, but also the economic status of those infested in many areas of Ghana, including some villages in the Danfa Project district (6,7,8).

1.6 ORGANIZATION OF HEALTH SERVICES

Before the Danfa Project began and during the Project's early history, the Government of Ghana's budget provided about $2.00 per capita annually for all health services (9). However, in the past, expenditures have favored clinically-oriented urban facilities, and coverage of the rural areas, with 70% of Ghana's population, has not been sufficient. While there are about 160 hospitals comprising slightly over 10,000 beds (about one bed per 1,000 population), at least half of these beds are in the cities (1). Most of these hospitals are government operated, but the various religious missions still continue to operate more than one-quarter of the total hospitals.

At the end of 1970 Ghana had about 670 physicians; about half were non-Ghanaian (9). The majority of doctors, nurses, midwives and other health personnel are concentrated in larger towns and cities.

Various plans to strengthen health services in rural areas have been proposed, but acceptance and implementation have been erratic. For that reason, a National Health Planning Unit was established by the Ministry of Health in 1975. Since its inception, the Unit has gradually developed a cadre of personnel who have been helping to plan long-range health programs to strengthen services in rural areas. The Unit has used the findings of field projects at Bawku, Brong-Ahafo, Danfa and other areas to assist in the formulation of such rural health service schemes.

All physicians in Ghana were trained abroad prior to the establishment of the University of Ghana Medical School (UGMS) in 1964. The UGMS is physically located adjacent to the Korle Bu Hospital campus in Accra. The first Medical School class graduated in 1969. By the 1969-1970 academic year, a total of 263 students had been enrolled during those first five years of operation (1). During each of the past three years an additional ten dental students have been added to the roster. An estimated 250-350 Ghanaian physicians who have received medical school or postgraduate training abroad have not returned to practice in Ghana.

In view of the inequities between urban and rural health care services in Ghana, one of the functions of the Danfa Project was to develop village-based health workers who could, under the supervision of the trained personnel of the Health Center, provide primary health care at the village level. The new Planning Unit of the Ministry of Health has been developing a long range plan to train and utilize similar workers throughout the country. Its goal is to

have these community-based services available countrywide by the year 1990 (10).

Health planning is decentralized to the regional level but budget allocation is centralized. Each of the nine regions of the country has a Regional Medical Officer. The regions are divided into over 50 districts. There is a severe shortage of District Health Officers to supervise peripheral activities; only a handful are currently available. In 1979 the Ministry of Health began to train District Management Teams to help meet the need for additional district level supervisory staff.

Local government health services are provided through rural health centers and health posts, but they are relatively few in number. Each health center and health post is meant to serve approximately 40,000 and 15,000-20,000 people, respectively. However, due to road conditions, limited transportation and long distances, it is doubtful that the services reach more than 25-40% of those for whom they are intended, depending on the population density of the areas in which they are located (11). Perhaps 70% of Ghana's population lack ready access to its health services.

The foremost needs in Ghana's health care system are:

(a) The development of peripheral primary health care networks sensitive to the needs of various regions.
(b) Personnel to staff the networks.
(c) District level supervisory staff.
(d) A logistics system to coordinate supply distribution.

These needs must be met at a cost Ghana can afford, and pose some of the health service delivery issues which the Danfa Project addressed. Hence, to improve access to medical services, the Danfa Project recognized the importance of satellite clinics and community-based primary health care workers to bring the services closer to the people. At the same time, it is clear that the environment of village life and individual attitudes and behavior are major factors affecting Ghana's rural disease pattern. Investment of medical resources alone would be unsuccessful in improving health status. Therefore, the Project also addressed health education and community participation issues.

1.7 POPULATION AND FAMILY PLANNING

1.7.1 Demographic Rates

Although considered a sparsely-populated continent, many parts of Africa are becoming rather densely settled. One such area is the African west coast. This area is in the second phase of demographic transition with high birth rates but with death rates that have dropped by as much as 50% over the past century. As a result there is growing interest in fertility reduction both within the government and among the people.

Although earlier data are not reliable, it is clear that Ghana has experienced a marked population growth during this century and probably a fourfold increase since 1920. Population density has increased from about nine persons per km^2 in 1920 to 36 persons per km^2 in 1970. The 1970 census reported Ghana's population as 8.6 million (12); the estimate for 1978 is 10.9 million, assuming an annual rate of natural increase of 3% since 1970 and no net immigration or emigration. There is a high dependency ratio in Ghana (102) with 47% of the population under 15 years.

Important demographic statistics are shown in Table 1-1.

Table 1-1: Important Ghanaian Demographic Statistics

Population (1970)	8.6 Million (12)
Population (1978)	10.6 Million (est.)
Population (2000)	18-22 Million (13)
Crude Birth Rate (CBR; 1970)	50 per 1000 (3)
Crude Death Rate (CDR; 1970)	19 per 1000 (3)
Rate of Natural Increase (1970)	3% (3)
Population Women 15-49 (1970)	1.8 million (12)
Total Fertility Rate (TFR; 1970)	6.9 (3)
General Fertility Rate (GFR; 1970)	211 per 1000 women aged 15-49 (14)

Age Specific Fertility Rates (1970):

Age Group	Birth per 1000 Women (14)
15-19	155
20-24	304
25-29	297
30-34	265
35-39	186
40-44	103
45-49	49

Infant Mortality Rate (1970): 133-137 per 1000 live births (3)
Maternal Mortality Rate (1970): 10 per 1000 live births (2)

1.7.2 Organization of Family Planning Services

Family planning, particularly attempts to ensure adequate spacing of children, has been traditionally practiced in Ghana. By far the most important factor promoting increased birth intervals has been, and still is, prolonged breast feeding (15), i.e. about 16 months. Couples have also tried to prevent conception directly through abstinence, rhythm and, occasionally, abortion.

Modern family planning and the population issue began to receive widespread attention in Ghana after the 1960 census data revealed a surprisingly high rate of population growth. President Nkrumah's administration believed that Ghana's future economy could accommodate the anticipated increase in population, and his government prohibited the importation and sale of contraceptives, but did not prohibit their use. Some agencies, however, were interested in family planning even during this time when the government's position was equivocal. The Christian Council of Ghana, whose staff advised married couples on family planning and fertility, established medical advice centers in Accra, Kumasi and Ho in the early 1960's (16).

In 1966 there was a change in political administration in Ghana, and with it a major shift in attitude toward the population issue. In 1967 Ghana became the first sub-Saharan African country to sign the United Nations' proclamation which identified the population problem as a significant consideration in planning for development, and which espoused family planning

as a basic human right. Also in 1967, the Ghana Planned Parenthood Association was formed and began offering services the following year (16).

The government of Ghana's strongest commitment to family planning came in 1969 when the Ghana Manpower Board issued its recommendations concerning national population policy which the National Liberation Council published as an official policy paper (17). Thus, Ghana became one of the first African nations to officially establish a population policy.

The March 1969 statement firmly established a population policy which commits the Government to provide those who wish to restrict their family size with the means for doing so. In January 1970, the government gave approval for the establishment of a national family planning program. The Ghana National Family Planning Programme is situated within the Ministry of Finance and Economic Planning. There are two operating divisions. The Services Division administers and plans clinic activities in the public and private sectors (using existing facilities and personnel) and directs the distribution of nonprescription contraceptives via commercial outlets. The Information and Education Division oversees public information activities (2). The Ministry of Health has major responsibility for providing contraceptive services, patient education and training of family planning service personnel (18).

The Ghana National Family Planning Programme's initial overall target was to recruit at least 200,000 contraceptive users (about 10% of the female population, 15-49 years) by the end of the fifth year (1975). It became clear early in the Programme that yearly progress was falling short of the projected targets. Only about 2.5% of the fertile female population had accepted family planning in the first two years of the Programme, and the majority of the services were available only to urban women since rural activities were extremely scarce.

An evaluation of the Ghana National Family Programme has been published recently (2). There had been 142,000 new acceptors during the first five program years. By 1975-76, there were 192 clinics and an estimated 53,000 current users.

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2. HISTORY OF THE DANFA PROJECT (2-1)

2.1 Events Leading to the Development of the Danfa Project (2-1)

2.2 Early History of the Danfa Project (2-2)

2.3 The Need for External Collaboration (2-2)

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2. HISTORY OF THE DANFA PROJECT

2.1 EVENTS LEADING TO THE DEVELOPMENT OF THE DANFA PROJECT

The Danfa Project evolved out of the concern for the people's poor health status, especially in rural Ghana as expressed in various government health planning reports. Government planners had officially recognized the need to expand basic rural health services. In the mid-1960's officials of the newly established University of Ghana Medical School (UGMS) had decided that one of its responsibilities would be to train general medical officers who could handle emergencies as well as direct and supervise health teams in a rural setting. The connection between the Ghana Medical School and the Ministry of Health (MOH) is evident by the fact that the first Dean of the Medical School, Dr. E. O. Easmon, was a former Director of Medical Services. Also, the first Ghanaian Codirector of the Danfa Project, Dr. F. T. Sai, had been a former Deputy Director of Medical Services for the Ministry of Health. Thus, both the Ministry of Health and the new Ghana Medical School had key personnel with a concern for a realistic distribution of medical services, particularly in the rural areas.

The Department of Preventive and Social Medicine (now known as the Department of Community Health) had as its first head Dr. S. N. Otoo, who had also been the Vice-Dean of the Medical School. The community health activities of the Department of Preventive and Social Medicine centered around urban community health problems, such as those in the urban-based James Town Project which emphasized maternal and child health.

After the phaseout of the James Town Project, the Department of Preventive and Social Medicine continued activities involving service and research in both the rural and urban populations. In 1965, the Ghana Medical School formally requested the United Nations Development Program (UNDP) to fund an urban and rural demonstration project. Although the proposal was found acceptable to the UNDP, the priorities of national development at that time did not permit the requisite funding to be approved. Consequently, the Medical School decided to develop the rural component of the proposal utilizing Ghanaian resources.

2.2 EARLY HISTORY OF THE DANFA PROJECT

Dr. F. T. Sai succeeded Dr. Otoo as the head of the then Department of Preventive and Social Medicine, and under the direction of Dr. Sai the organization of the Danfa Project began in 1966-67. Funding from Ghanaian government resources was approved through the Council for Higher Education.

From the very beginning, the need for the identification of a rural community where studies could be satisfactorily conducted was recognized. Several criteria were considered in selecting a location including environment, health and community motivation factors. For example, the rural area was to have a typical rural environmental situation (including problems of water supply, disposal of human excrement and trash), as well as the willingness among the villagers to carry out self-help activities. However, since the community chosen would also serve as rural health training site for medical students, its location could not be too far from the Medical School. Hence, the Department decided to investigate the feasibility of the nearby Ga rural district. Following numerous consultations and interviews with various chiefs and people from several rural Ga communities, the Danfa district was selected.

During a consultation staged with the people of several Danfa district villages, they expressed the need for health clinics, pipeborne water, schools, improved roads and street lights, as well as other needs.

Because of the high priority rating given by the villagers to clinics, the Department decided to begin the activities in the Danfa district by providing a health center. Danfa Health Center construction took about one and one-half years. The villagers provided the labor, the Ghana Medical School supplied the materials and the Department of Social Welfare and Community Development carried out the technical supervision. The Ministry of Health approved the location of the Health Center close to the village of Danfa because this complied with the projected district development plan. The construction of the Health Center was completed by the end of 1969 and officially opened on January 16, 1970 by the then Prime Minister Kofi A. Busia.

2.3 THE NEED FOR EXTERNAL COLLABORATION

The service and teaching programs of the Department of Preventive and Social Medicine were well underway by the time the Danfa Health Center opened. The Health Center provided medical students with a suitable field

location for their rural surveys (epidemiologic and other) and for the first time provided villagers in communities near the Health Center with accessible primary health care.

In order to rationally allocate scarce resources to the entire country, the Department of Preventive and Social Medicine concluded there was a requisite need for more systematic collection and analysis of rural health information. In 1969 the government established an official population policy which called for a national family planning program. As with primary health care, the Department of Preventive and Social Medicine thought that research was needed to determine how family planning could be properly introduced and maintained in a rural area.

Therefore, with the previously stated concerns in mind, Dr. F. T. Sai sought external assistance for the development of the research component of the Danfa Project. A formal request was submitted to the USAID Mission to Ghana. This request was subsequently approved and the School of Public Health at the University of California at Los Angeles (UCLA) was identified to collaborate in the Project. One component of USAID assistance was a progressively decreasing local currency budget provided by USAID over a five-year period, during which time there would be an increasing Ghanaian contribution.

2.4 USAID-UCLA COLLABORATION FEASIBILITY STUDY

UCLA was requested to carry out the three-phase feasibility study in September 1969, December 1969, and concluding with a definitive study in April 1970. Many discussions were held at these times between the UCLA representatives and numerous individuals in Ghana who represented the Ghana Medical School, the Ministry of Health, the Ministry of Economic Planning, the Department of Social Welfare and Community Development, the University of Ghana and other institutions. During the course of these preparatory studies, the arrangements for conducting the research activities were discussed, particularly with representatives of the Department of Preventive and Social Medicine.

In general it was agreed that the host-country participants would be fully responsible for the service components of the Project whereas the teaching components would be shared where possible by the Ghana Medical School faculty and the proposed UCLA long-term team. UCLA was to be principally

responsible for providing the necessary assistance for Project research activities. The Project agreement between the University of Ghana Medical School and the USAID Mission to Ghana was signed in April 1970 and the first Project Paper (PROP) was signed in May of that same year. The PROP indicated that four UCLA staff members were to be assigned to Ghana: a Chief of Party who would be responsible for management, an epidemiologist, a family planning/MCH specialist, and a health educator. It was also agreed that the UGMS would provide counterparts for each of the UCLA staff.

One other very important decision reached during the definitive phase of the feasibility study in April 1970 bears special comment. In discussions held with the USAID Mission to Ghana, a departure from the usual practices for recruiting local personnel was agreed upon. USAID removed the sizeable funding required for Ghanaian staff from the UCLA budget. This facilitated long-term good relationships with Ghanaian staff to be recruited, and avoided dichotomous salaries and employment practices between those Ghanaians employed by the Project and those working with other departments of the UGMS or the University. USAID Mission to Ghana agreed to provide a local currency budget to be handled by the Ghana Medical School. This budget was to cover costs of employing local personnel and purchases of locally required field supplies and equipment. Thus, the UGMS, working within University rules and procedures, would be able to handle hiring, disciplining and firing of local staff.

2.5 EARLY PROJECT PLANNING AND ADMINISTRATION

While UCLA was assembling its long-term team described above, the members of the Department of Preventive and Social Medicine had begun to recruit local individuals to be trained as mappers. By the time the UCLA team arrived in Ghana in early August 1970 the mapping and identification of villages had begun. Discussions were being held between representatives of the Department of Preventive and Social Medicine and the various village chiefs and elders to establish the rapport needed to conduct the planned Project activities, and a system was being established for regular contact with the villages.

Due to the size and complexity of the Danfa Project, a special administrative committee was established at the Ghana Medical School immediately after the Project began. The Department of Preventive and Social Medicine, headed by Professor F. T. Sai, was to be technically responsible for the Project. Dr. Sai, the first Ghanaian Codirector of the Project, arranged

for the special administrative committee comprised of representatives of the Medical School administration (the Executive Secretary, Medical School Accountant and the Assistant Registrar) and Project officers from the Department of Preventive and Social Medicine. Initially, the Head of the Department of Preventive and Social Medicine represented his department, but this soon proved not to be feasible in view of the growing complexity of the Project's activities. As a result, it was decided that the Ghanaian Project Field Coordinator and his UCLA counterpart (the Chief of Party) would be added to that administrative committee. In the latter years of the Project, the Head of the Department (Codirector) returned to the committee.

The committee's principal functions were to control the local currency budget which had been established by agreement between the USAID Mission to Ghana and the Ghana Medical School to oversee personnel actions (hiring, disciplining and firing), to arrange portside and airport clearance for equipment and supplies being sent to Ghana by UCLA, and generally, to handle policy relationships with other government agencies where budgetary or personnel commitments were involved. In the first two years of the Project this committee met every two weeks. Later on, it met monthly and in the latter year or two of the Project, the committee met only when necessary.

All members of the Department of Preventive and Social Medicine were assigned to the Danfa Project for varying percentages of their time. The Field Coordinator, Dr. Frederick K. Wurapa, spent the greatest part of his time in this capacity. The Department members also functioned as counterparts to the UCLA team members. Cooperation was obtained from the Planned Parenthood Association of Ghana, the Extension Division of the Faculty of Agriculture of the University of Ghana and the Ministry of Health to provide certain essential field staff and training opportunities.

After the first year of complex operation, the UCLA staff thought it necessary to add an administrative assistant in Ghana. Furthermore, because of the technical problems in data collection and processing, cost analysis, and meeting sampling and statistical requirements, a health systems analyst was added to the staff after two and one-half years of Project operation.

A summary of the history of major events is presented in Table 2-1.

Table 2-1: The Danfa Project History of Major Events, 1965-1979

Event	Year
Resources approved by the Council for Higher Education for rural training center	mid-1960's
Selection of the Danfa district as the training center site	1967
Beginning of Danfa Health Center construction	1968
Publishing of a national population policy	1969
Request by the Medical School for USAID funding	1969
Feasibility Study	1969
Official opening of the Danfa Health Center	1970
Ratification of the first PROP	1970
Identification of UCLA to collaborate in the Project and signing of the Project agreement	1970
First external evaluation	1975
Opening of the Obom Health Post	1975
Ratification of the second PROP	1976
Final Review Meeting in Ghana	1979
Publication of Final Danfa Project Report	1979

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3. GOALS AND OBJECTIVES

(3-1)

3.1 The First Danfa Project Paper (PROP), 1970 (3-1)

3.2 The 1975 Danfa Review (3-3)

3.3 The Second Danfa Project Paper (PROP), 1976 (3-4)

3. GOALS AND OBJECTIVES

3.1 THE FIRST DANFA PROJECT PAPER (PROP), 1970

It is clear from the preceding historical description of the Danfa Project, that the impetus for developing such a Project and the conceptual basis for Danfa evolved in Ghana.

The overall purpose of the Project was simply to "help improve the health and welfare of the people," with particular focus on the rural masses. Accurate information about rural communities and their health problems, systematic research into short and long-term solutions, and mobilization and training of appropriate manpower at all levels was required.

The strategy was to emulate in the health sector what already had been successfully done in agriculture, that is, to develop and operate a rural research, demonstration, evaluation, teaching and service center which would assist in designing methodology appropriate for nationwide implementation.

Specifically, the goals of the first Danfa phase (1970-1975) were outlined in the 1970 Project PROP:

(a) "To investigate the state of the rural community, its physical amenities, its social organizations, the factors that make for an effective participation in health problems and programs."

(b) "To undertake research into the most useful and efficient means of utilizing available manpower and other resources in the operation of Health Post-centered comprehensive rural health services."

(c) "To train doctors, sanitarians, midwives, community health nurses and other health personnel, both separately and in teams, specifically in their role for rural health work."

(d) "To provide manpower oriented and equipped to handle the problems of the community."

As discussed in Section 1.7, Ghana had an official policy favoring a national family planning program by 1969; however, details of how this was to be implemented and accomplished, especially in rural areas, remained to be specified.

Family planning is considered primarily a health sector matter in Ghana. The Danfa Project was to give significant attention to the family

planning aspects of rural health services and to integrate a family planning component into its health care programs.

In terms of formulating the original research design, family planning was the most challenging of all Project components. Since family planning was a specific national policy, the Ministry of Health was anticipating that the Danfa Project would provide clear guidelines to direct the introduction of family planning into Ghana's rural areas. Project planners expected that family planning would take the most time and research to yield useful data. However, careful consideration and planning were devoted to the other Project components: health education, curative and preventive health care (with an emphasis on the latter), training at all levels (including village-level volunteers and traditional birth attendants) and extension of primary health care into rural areas using village-based health workers.

Four hypotheses regarding acceptance of family planning were to be tested, and a four-cell research design was constructed by dividing the Project district into four areas (initially of approximately 12,000 to 15,000 people each). Table 3-1 illustrates the service components in each of the four areas, based on the following arguments:

(a) Area I: One approach contended that couples would have fewer children if convinced that those they have now are more likely to survive childhood. Proponents of this concept believe that family planning programs should be integral to a program of curative and preventive services stressing maternal and child care and nutrition. (Area I included the Danfa Rural Health Center).

(b) Area II: A second approach argued that provision of family planning services in conjunction with an intensive educational campaign promoting good health practices and family planning would be sufficient to achieve high levels of acceptance. Moreover, such a delivery system could be effective in the absence of comprehensive health services.

(c) Area III: A third argument assumed that simply making family planning services readily available would facilitate favorable change without concern for any health services or special educational program. If this were so, then a successful family

planning program could be implemented in areas of the country where the main health service system was unlikely to reach for some time.

(d) Area IV: A fourth approach averred that attitudes change toward family planning as a result of economic growth and an expanded educational system, regardless of special programs or services. Area IV, in which no services were to be added by the Project, was to serve as a reference area.

Table 3-1: Scope of Services Provided

Area	Comprehensive Health Care	Health Education Program	Family Planning Program	Standard Ministry of Health Services
I	Yes	Yes	Yes	Yes (equivalent)
II	No	Yes	Yes	Yes
III	No	No	Yes	Yes
IV	No	No	No	Yes

3.2 THE 1975 DANFA REVIEW

By mid-1974, principal Project staff and USAID agreed that an external evaluation was needed to assess progress already made, the extent to which Project goals and objectives had been attained and the need for redirection of effort or emphasis. Reassessment of emphasis had become particularly important since the Government of Ghana had recently adopted as official government policy the integration of family planning with basic health services. This meant, of course, that the rigorous testing of the family planning hypotheses was no longer critical. Instead, it was becoming important to determine the most effective methodology for integration of such services, especially where Ministry of Health services are sparse.

Accordingly, a six-member Evaluation Team representing the American Public Health Association, USAID and Ghana visited the Project in March 1975. Field visits and meetings with government and non-government personnel were arranged. All Project information and data were placed at the Team's disposal.

A Preliminary Evaluation Report was issued a few weeks later and the codirectors and UCLA Chief of Party met with the Evaluation Team at USAID in Washington, D.C. to review the report. In general, Project representatives were in accord with the Evaluation Team's report, although there were some areas of disagreement.

In brief, the Team's final report recommended:

(a) The Project be continued to its proposed termination date with increased availability and participation of senior Ghanaian staff and increased Ghanaian participant training overseas.

(b) The revised goals should be:

- Training
- Operational research
- Epidemiological investigations
- Institutional development

This reorganization of goals reflected the Team's view that the constraints imposed by the experimental design interfered with full implementation of training, operations research and epidemiological investigation.

(c) Project activities should concentrate on experimenting with integrated health and family planning service innovations and their relative costs, disseminating information rapidly, exploring methods to adapt or replicate Project surveys nationwide, extending research into significant health problems and their prevention, and expanding training at the Danfa site. Field activities should be emphasized.

The Evaluation Report prompted a decision to rewrite the Project Paper (PROP) in order to codify the Project staff's own thinking about the direction of the Project in view of the Evaluation Team's recommendations and conclusions.

3.3 THE SECOND DANFA PROJECT PAPER (PROP), 1976

The joint Ghana Medical School/UCLA team which reviewed the Evaluation Team's report worked closely with the USAID Mission to Ghana in helping to prepare the 1976 PROP. This PROP adopted the goals recommended by the

Evaluation Team but with some slight modifications: (1) more emphasis was placed on institutional development, and (2) information transfer was made an explicit goal. The goals were:

(a) Institutional Development and Training: Strengthening of institutional capability at the Ghana Medical School to conduct research and training of doctors and other health workers in the delivery of rural health and family planning services.

(b) Information Transfer: Transfer of information derived from Project activities to relevant Government of Ghana agencies on an ongoing basis.

(c) Operational Research in Health and Family Planning: Demonstration of several different health care models to include family planning as an integrated component suitable to the Ghanaian context.

(d) Epidemiological, Behavioral and Demographic Studies Investigation: Investigation of the state of a rural Ghanaian community, concentrating on factors associated with health and family planning behavior.

In accordance with the recommendation of the Evaluation Team, these revised goals reflected a movement away from the emphasis on family planning hypothesis testing, deemed less crucial because of the Government of Ghana's policy decision to integrate health and family planning services. However, the UGMS/UCLA senior staff believed that intermediate indicators or "process" analyses could provide accurate bases for inferring the success of the various experimental modalities and their relative effect in reducing fertility.

Strategies adopted to achieve these goals are highlighted below.

INSTITUTIONAL DEVELOPMENT AND TRAINING

Details of Project activities designed to strengthen institutional development are presented in Section 9.

Briefly, the training of all levels of health workers was the main component of institutionalization.

In the 1976 PROP, it was contemplated the following would be accomplished by 1979:

(a) An institutionalized health/family planning research and analysis process for continuous planning and implementation of integrated rural health delivery programs.
(b) A rural-oriented teaching and training institution linked to ongoing operational programs in health, family planning and nutrition.
(c) Institutionalized system of communication/interaction between the Ghana Medical School, the Ministry of Health and the Ghana National Family Planning Programme to operationalize Medical School research results.
(d) Institutional relationship and interaction between UCLA/UGMS in such areas as training, research, analysis and evaluation.

INFORMATION TRANSFER

Details will be found in Section 9 and Appendix 8.

Information transfer to pertinent Ghanaian government and non-government entities had been implicit since the beginning of the Project and was recognized as vital to implementation and to replication. Strategies to attain this included formal and informal methods:

(a) Formal links with Government of Ghana agencies, especially the Ministry of Health (in particular the Planning Unit) and the Ghana National Family Planning Programme.
(b) Annual Project Review Meetings, to which a broad circle of Ghanaian experts were invited.
(c) Publication of Danfa-related articles in professional journals.
(d) Publication of monographs and papers.
(e) Informal conferences and meetings in Ghana.
(f) Presentation of Danfa data in papers, at professional meetings, and at conferences with representatives of foundations, voluntary organizations and multilateral agencies such as the World Health Organization (WHO) and the Food and Agricultural Organization (FAO).
(g) Production of training manuals.
(h) Training workshops and seminars.

OPERATIONAL RESEARCH

For details please see Sections 4, 5, 6, 8 and 9 and Appendices 1, 3, 4, 5 and 9.

Demonstration and evaluation activities included operation and study of several complementary approaches to health and family planning service delivery. Objectives were:

(a) To develop systems for increased accessibility of health services by:

- Continuing evolution and evaluation of the satellite clinic concept.
- Continuing development and evaluation of community-based and mass approaches to delivery of preventive and promotive health services.
- Experimenting with and evaluating extended services through village volunteers, traditional birth attendants and resident village health workers.

(b) To develop methods of increased community participation in the health care system by:

- Experimenting with programs of community education including the design, implementation and evaluation of various approaches to the community.
- Involving the community both in planning and the implementation of health care programs.
- Identifying for future involvement other members of the traditional health system apart from traditional birth attendants.

(c) To increase the effectiveness of human, physical and financial resources by:

- Analyzing costs to assure that services do not exceed near-term possibilities and examining costs and effectiveness of alternative approaches.
- Carrying out functional analyses of services, subsystems and components.
- Standardizing and simplifying patient management procedures, including drug regimens.

- Developing innovative uses of health personnel by means of task analysis, development of job descriptions, simplified operational manuals and in-service training.

(d) To develop systems that improve quality of care by:

- Establishing feasible minimum standards of preventive and curative care for major health problems.
- Establishing improved management methods (including functional job descriptions and operational manuals).

(e) To develop systems that improve environmental sanitation by:

- Exploring means for improvement of rural water supply.
- Demonstrating improved methods of village refuse and excreta disposal.
- Demonstrating self-help methods of vector control feasible for rural villages.

(f) To develop coordinated research and applied programs with systematic flow and feedback of information by:

- Maintaining formal links with the Ministry of Health at all levels.
- Conducting workshops with specialized personnel of operating agencies.

EPIDEMIOLOGICAL STUDIES

For details please see Sections 5, 6, 7 and 8, and Appendices 2, 3, 4, 5 and 6.

Objectives were:

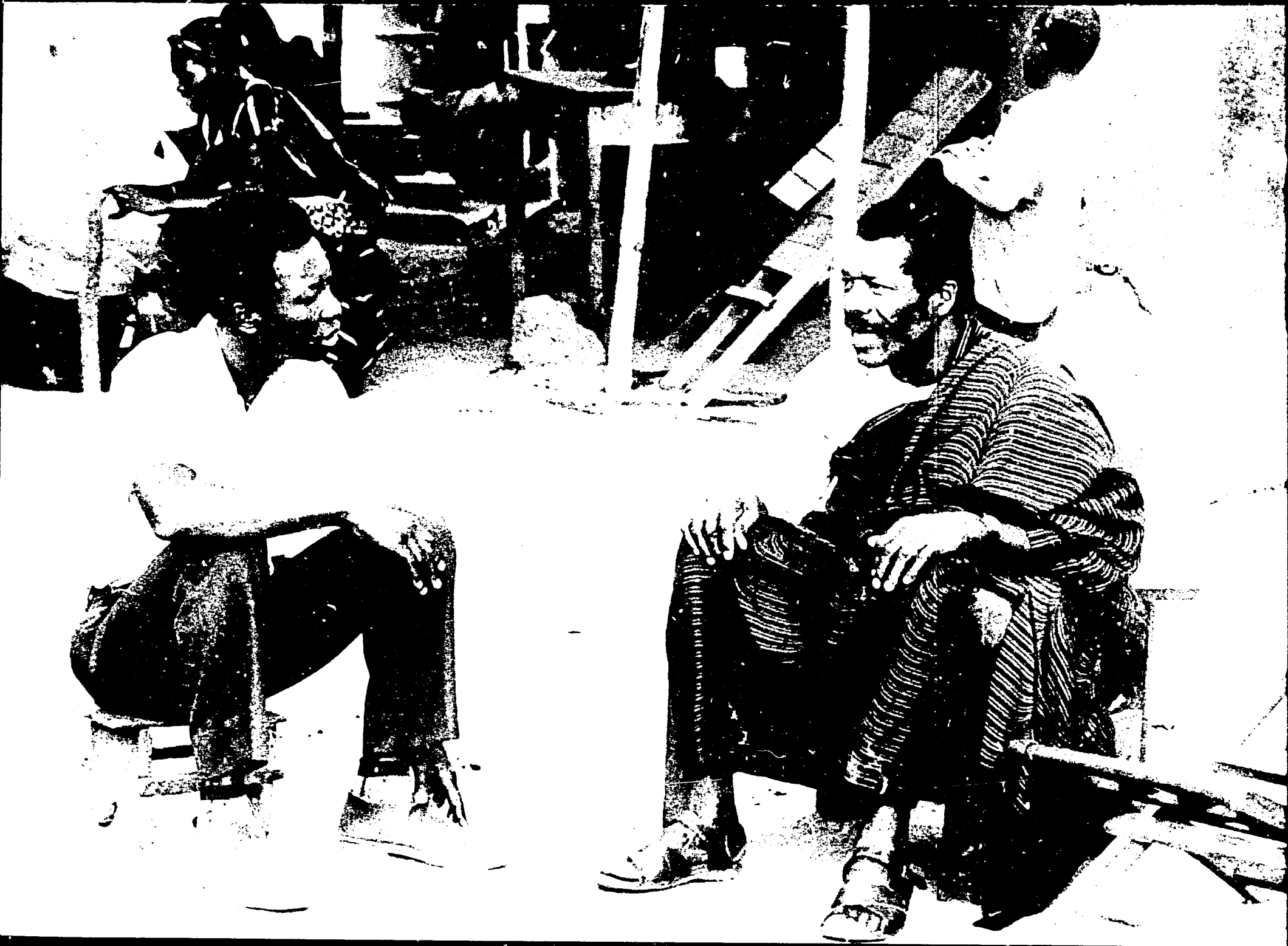
(a) To determine baseline indices of fecundity and fertility as measured by:

- General Pregnancy Rate (GPR)
- General Fertility Rate (GFR)
- Age Specific Fertility Rate (ASFR)
- Total Fertility Rate (TFR)
- Birth Rate (BR)
- Rate of Natural Population Increase (NPI)

(b) To determine the population's baseline knowledge, attitudes and practices concerning fertility and family planning and to investigate associations with other socioeconomic variables.

(c) To assess health problems in the population in terms of prevalence and impact.

(d) To define the relationship between sociodemographic and environmental factors and health status.



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4. PROJECT ORGANIZATION AND MANAGEMENT (4-1)

4.1 Collaborative Relationships (4-1)
4.2 Organization in Ghana (4-5)
4.3 Reorganization in Ghana to Conform to the Second PROP (4-16)
4.4 Organization of Danfa-Related Personnel at UCLA (4-20)
4.5 Conclusions and Recommendations (4-21)

4. PROJECT ORGANIZATION AND MANAGEMENT

4.1 COLLABORATIVE RELATIONSHIPS

In order to foster harmonious international working relationships and in recognition of the directive role the Ghanaian principals played in Project planning and implementation, a number of conditions were agreed to by the several cooperating parties before the Project began:

(a) The Project goals, objectives and activities would be developed jointly by the University of Ghana Medical School (UGMS) and UCLA.

(b) The Project would have two Codirectors, one Ghanaian, the other a member of the UCLA faculty. All matters of policy and implementation would be decided jointly. Similarly, a Ghanaian Field Coordinator from the UGMS Department of Community Health (DCH) and the UCLA Chief of Party would be responsible jointly for field operations. In case of disagreement, the Ghanaian view would prevail.

(c) The Ghanaian Codirector would be consulted regarding the composition of the UCLA team residing in Ghana. Prospective staff for the UCLA team would be approved by both Codirectors.

(d) Every effort would be made to promote genuine collaboration between the Ghanaian and UCLA staffs, primarily through joint staffing of executive, research, teaching and operations committees and field operations teams and through consultation.

(e) UCLA requested that USAID reduce the proposed UCLA Danfa budget and provide a separate UGMS Danfa budget. This arrangement would give the Medical School the authority to hire the requisite Ghanaian Danfa staff under local personnel practices and prevailing salary scales and to dismiss or discipline them as required.

(f) Nearly all the service costs, most of the teaching/training costs, and part of the research costs would be borne primarily by the University of Ghana Medical School and secondarily by the Ministry of Health.

(g) UCLA staff would concentrate principally on the Project's research efforts and would be involved in some of the teaching/training activities.

(h) All data generated by the Project would be available both in Ghana and at UCLA.

(i) Initial publication of Danfa material would be in the Ghana Medical Journal. Thereafter, Danfa material would be published wherever appropriate in the world literature. Published materials would generally be coauthored by at least one Ghanaian and one UCLA staff member.

(j) A formal Project review conference would be held at least once a year involving representatives from the University of Ghana Medical School, other departments within the University, the Institute of Statistical, Social and Economic Research at the University, the Ghana Ministry of Health, the Ghana National Family Planning Programme, other interested Ghanaian agencies, UCLA, USAID and representatives from other universities, agencies and governments outside of Ghana.

In retrospect, all of these decisions proved useful in promoting the smooth administration of Project activities and a productive exchange of information and ideas between the Department of Community Health (DCH) and UCLA staffs. The Project continued the spirit of institutional collaboration which for many years had been characterized by an active faculty and student exchange program between the University of Ghana and the University of California. In particular, joint meetings and joint planning of field operations helped to maintain collaborative ties between the UCLA and Ghanaian groups. Early in the Project, the codirectors, the Ghanaian Field Coordinator and the UCLA Chief of Party agreed that it would help to avoid polarization of points of view (Ghanaian staff versus the UCLA team) if separate team meetings of each group were limited and Joint Staff Committee meetings were held instead. In these joint meetings Project problems were fully discussed to obtain a concensus. and counterparts could voice their differences and obtain input from the balance of the Joint Staff Committee membership. In the beginning, the Joint Committee met weekly, then fortnightly and after almost two years, monthly meetings became the practice. In the last years of the Project, as program details and administrative problems lessened, it was necessary to meet only quarterly.

During the first year of the Project, the Ghanaian Field Coordinator and UCLA Chief of Party met weekly and later fortnightly with the Ghanaian Codirector to resolve policy issues as they arose, such as staff recruitment and training, costs, proposed replication of Project activities and relationships with various government agencies.

Centralized monitoring of Project publications and research activities also proved to be critical in maintaining harmonious and fruitful work relationships. The first reports and announcements of the Project were made by Ghanaians. A Publications Policy and guidelines for special research studies associated with the Project were developed early in the Project. (See Appendix 8). These guidelines give the Ghanaian and UCLA codirectors the authority to review all papers that are about the Project or are based substantially on Project-generated information, in order to insure high quality publications and a fair distribution of the credit for work done in the Project. The Publications Policy required staff interested in publishing the Project's findings to fill out a short form and submit it to the codirectors (and until the last few years to the Ghanaian Field Coordinator and the UCLA Chief of Party as well). The form included the preliminary title, authors and a brief outline of the proposed paper. The application was reviewed and changes were suggested as required. The final manuscript was also reviewed by the codirectors before publication. A publications status report on papers in progress was frequently circulated and a publications list was maintained and periodically updated to show proposed, completed and published articles. These lists were made available to all pertinent staff. (See Appendix 8).

Continuity of senior staff and in-depth orientation of new staff also helped to foster smooth administration of the Project. The UCLA codirector, Dr. A.K. Neumann, and the UCLA Chief of Party, Dr. I.M. Lourie, participated in the Project's feasibility study (1969-1970) and remained with the Project until its termination. There were three Ghanaian codirectors (Dr. F.T. Sai from 1970 to 1972, Dr. S.R.A. Dodu, who served as Acting Codirector from 1972 to 1975, and Dr. S. Ofosu-Amaah from 1975 on). The transitions from one codirector to another were accomplished with a minimum of confusion, in large part because of in-depth orientation given new senior personnel by the UCLA Chief of Party and the Ghanaian Field Coordinator. Dr. F.K. Wurapa was involved in the feasibility study for the Project and served as Ghanaian Field

Coordinator until the Project's final year. Despite several changes in Ghana of national government administrations and of national health officials, support from the Ghanaian staff and institutions involved with the Project remained steadfast.

Close contact was maintained between the DCH and the UCLA School of Public Health International Health Unit by means of regular mail correspondence and frequent visits between the two Project codirectors. Usually, the UCLA Chief of Party acted as proxy for the UCLA Codirector in Ghana. This close communication was especially useful in administering the training provided for Ghanaian participants in the United States. Such contacts also facilitated data processing, the purchase of special equipment and publication activities.

Efforts were also made to coordinate activities between the UCLA campus-based team and the team resident in Ghana. Most of the UCLA/Ghana staff visited the Los Angeles campus at least biannually over the course of the Project to report on progress and to confer on administrative matters with the campus staff. Regular correspondence also was maintained between the UCLA Ghana-based and campus-based groups. An editing/publishing unit based at UCLA took responsibility for the details involved in finalizing manuscripts prepared by Project senior staff, and maintaining and circulating the publications status reports on all manuscripts sent to UCLA for editing and processing.

USAID officials were actively involved in the Project. In Ghana, meetings between the UCLA Chief of Party, the USAID Program Officer and/or the USAID Health and Population Officer were held frequently. The DCH Field Coordinator often attended the meetings as well. During these sessions Project staff reported informally on progress, and administrative issues were discussed (e.g., equipment required, visitors to the Project, budgeting).

More formal meetings between Project staff and USAID/Ghana were held two or three times a year and usually involved both codirectors, the Mission Director and senior Mission staff.

UCLA senior staff met with USAID Washington personnel at least once every few months. Ghanaian staff also met with USAID staff in Washington when possible. USAID staff were briefed on progress, and Project personnel answered questions and received commentary and suggestions from USAID staff. Occasionally, seminars were held in which preliminary observations and

research findings were presented and discussed. Reviews of annual reports and proposed budgets and a formal review of the 1975 evaluation were also conducted in Washington. About ten to fifteen key AID staff from Ghana and Washington visited UCLA over the Project's lifetime to meet with members of the UCLA Danfa support group.

4.2 ORGANIZATION IN GHANA

Figures 4-1 and 4-2 present a conceptual diagram and GANTT chart of Project activities in Ghana from 1971 to the present. This section will present only a brief chronology of events and a description of the administrative and service staff needed for Project tasks. Details of these activities can be found in the various technical sections of this report.

It can be seen from Figure 4-1 that within the Danfa Project, a number of programs and studies were developed, many of which could constitute major projects in their own right. The Project was able to conduct such a myriad of programs primarily because it provided a "central services" organization, consisting of a pool of experienced training, managerial and logistic support personnel who were used in a variety of capacities or activities. Thus, we achieved considerable economies of scale. Each component or program was less expensive than would have been the case had each been independently organized and carried out.

Another important factor facilitating intensive and long-term field research was the deliberate effort made to obtain the permission and cooperation of village chiefs and elders and to maintain good rapport with them throughout numerous surveys. No study or program was begun without prior contact with these village leaders, and only one village out of more than 300 refused to cooperate in a study.

Danfa Health Center services were the first to be inaugurated. After one year of operation, a study revealed that most patients using the Health Center came from only a three mile radius. Two satellite clinics (at Oyibi and Abokobi) were initiated by the Health Center staff to make services more accessible to the more distant villagers. A third satellite clinic (at Berekuso) was started a year later. Each of these satellite locations was in a populous area, four to eight miles from the Health Center. Services were provided by a team sent by the Health Center once a week in each location.

Figure 4-1: Conceptual Diagram of Danfa Project Activities in Ghana, 1971-1978

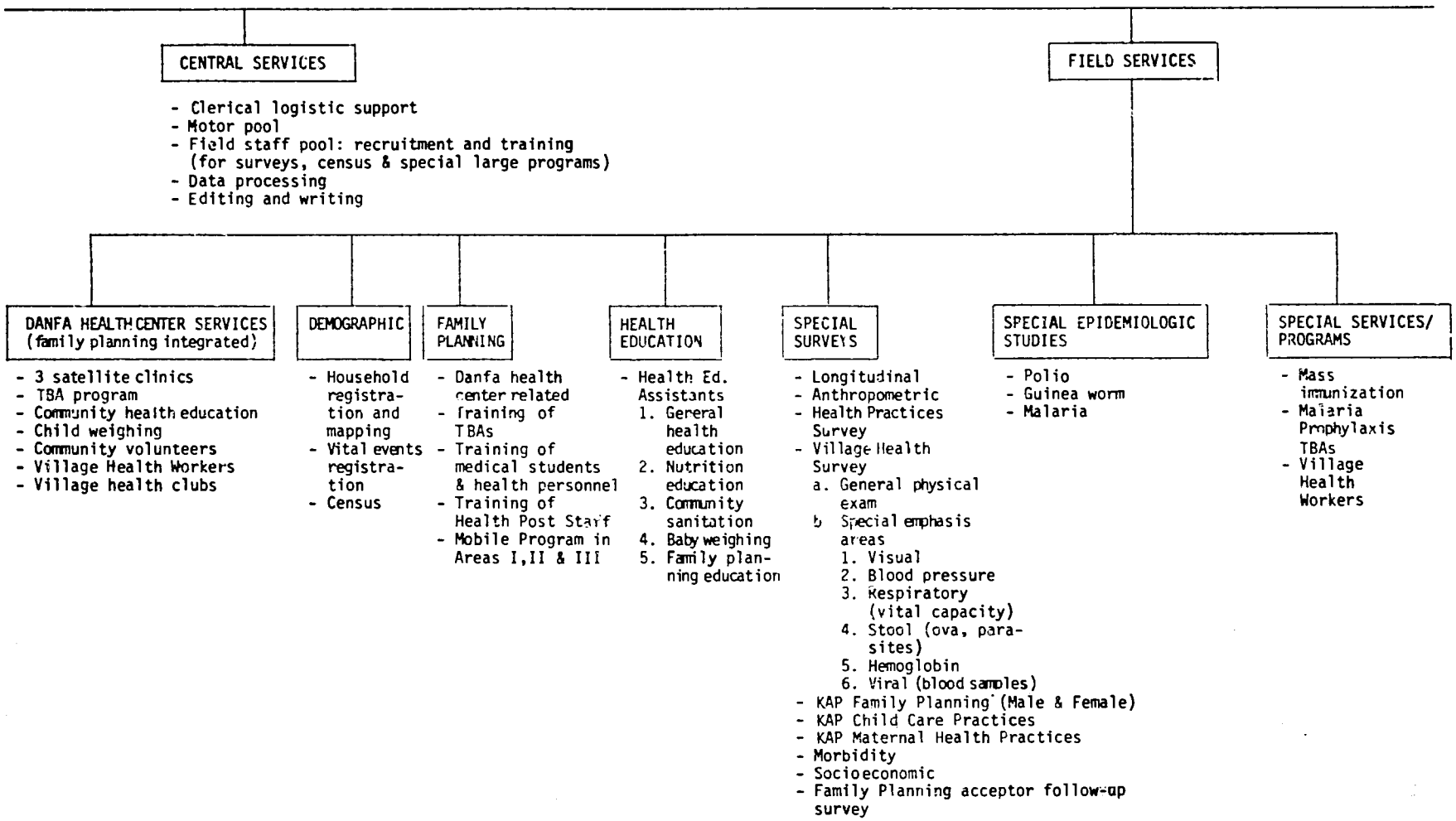
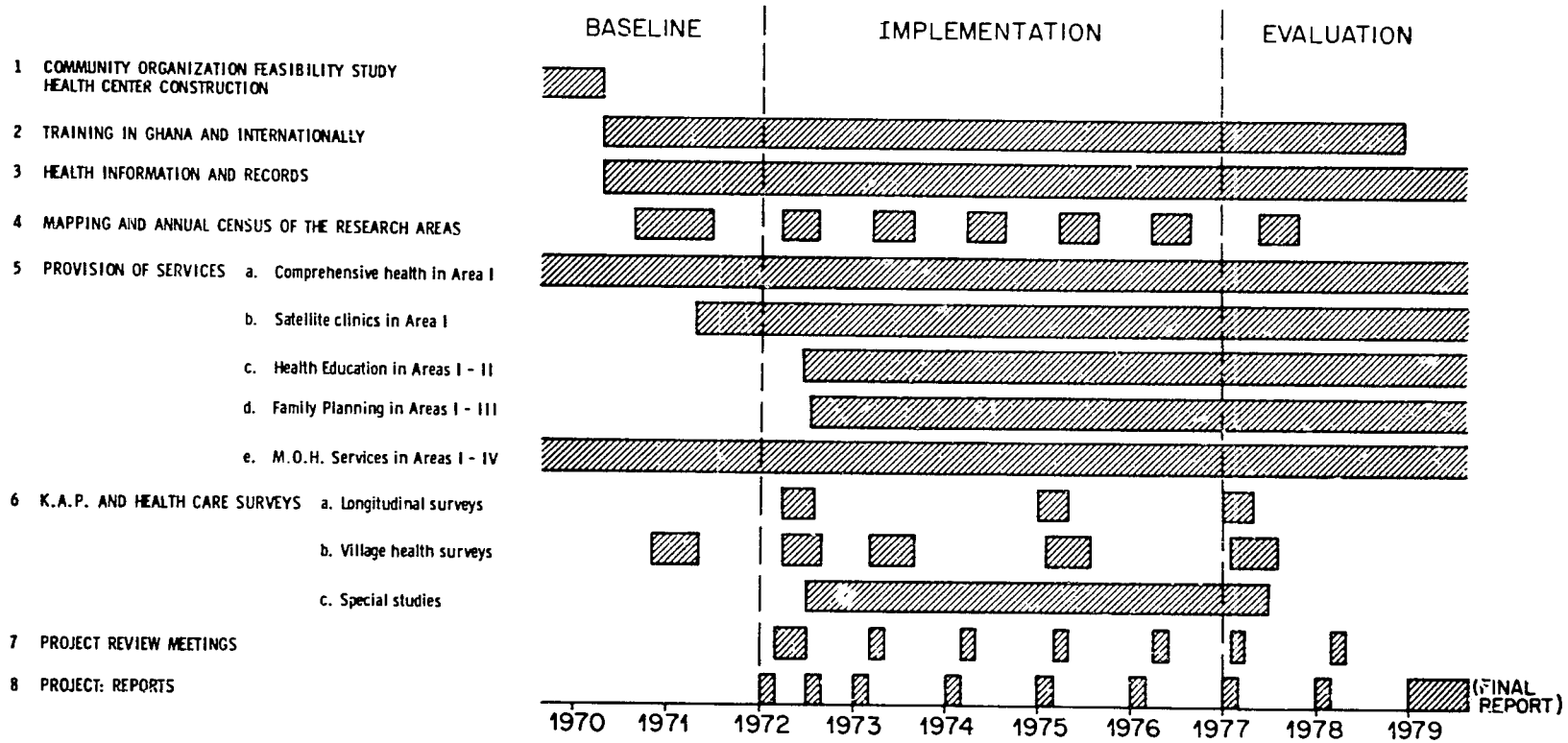


Figure 4-2

DANFA COMPREHENSIVE RURAL HEALTH AND FAMILY PLANNING PROJECT
CHRONOLOGICAL RECORD OF MAJOR PROJECT COMPONENTS 1970-1979



The team brought prepackaged medications and the charts of the patients in each cluster of villages served by the satellite clinic.

In recognition of the fact that traditional birth attendants (TBAs) deliver a significant proportion of babies in the Project area (and throughout Ghana), the Project began to identify TBAs in 1972 and to train them in 1973. Other community health services, such as the Health Education Assistant Program began after July 1972, when the baseline research activities of the Project had been completed. All of the Danfa service activities represented efforts to extend low cost primary health care to the villagers. A more recent notable activity was the Village Health Worker training program which began in 1976 as field work was reorganized to conform with the second PROP.

Demographic activities were initiated during the first and second years of the field work to provide baseline data. As an essential component of many field studies, demographic research continued throughout the life of the Project.

Training of the family planning team began in 1971 and activities began in mid-1972 in Areas I, II and III. After the second PROP, Danfa Health Center and health post personnel were also trained to provide family planning advice and services since the constraints of the original research design were substantially reduced.

The special surveys were an essential part of the research-related components of the Project. The first longitudinal survey, with its various KAP and morbidity instruments began in the second quarter of 1972 and signaled the real beginning of the research operation. This first longitudinal survey was completed in each area before the family planning and Health Education Assistant (HEA) programs were implemented in order to obtain baseline information. The Village Health Survey (VHS) which included general and special-emphasis physical examinations and anthropometric studies, followed the completion of the longitudinal survey. Two and one-half years later the longitudinal and Village Health Surveys were repeated. On this occasion a socioeconomic instrument was added to the longitudinal survey. In 1977, at the end of the five-year period of intensive field research a final VHS and longitudinal survey were carried out. Two family planning acceptor follow-up surveys were also carried out during the five-year research period (1972-1977). Health Practices Surveys were conducted in 1973, 1974 and 1976.

Special epidemiologic studies surveying such diseases as poliomyelitis, guinea worm and malaria grew out of observations made in the field after the Project had begun its research. Each of these studies elicited important information about approaches to preventing and managing these diseases.

The special services and programs shown in Figure 4-1 similarly evolved from observations made by the Health Center staff and the HEAs in the field and were developed to lower morbidity and mortality through preventive services. The Village Health Worker program began late in the first phase of the Project and its further development was accelerated by the need to conform with the second PROP.

Most of these special programs utilized existing Danfa Project resources to conduct the services and subsequent evaluation. The additional marginal cost of "adding one more service" in the field was low. The major problem was the additional work required to analyze data obtained from evaluative studies of each program.

4.2.1 Research Manpower

In order to provide the skilled manpower required to carry out the various Project surveys, a large number of local staff had to be recruited and trained in Ghana. Some of those recruited for the Project received single-purpose training but many were successively trained for different functions and thereby evolved as "multipurpose" workers as the Project progressed. Types of staff recruited for the Project and descriptions of their training are briefly discussed below.

MAPPING AND HOUSE NUMBERING STAFF

As a preliminary to virtually all Project activities, accurate maps of the Project district villages were required and all village houses had to be numbered. Sixteen people were recruited for this purpose by the UGMS. Those recruited were either "school leaving certificate" holders (equivalent to an American secondary school graduate) or "middle school leavers" (approximately equivalent to an American second-year high school student). Project senior staff provided supervision in the field.

Before mapping and house numbering operations were begun, the village chiefs and elders were contacted to explain to them the purpose of the Project and the need for mapping to obtain their cooperation, to give them letters

from government officials authorizing such activities and to answer their questions. Since most villagers first became aware of the Project when mapping began, the mappers themselves were given an orientation to the Danfa Project, and the need to maintain a friendly rapport with villagers was emphasized during their training.

Mapping began in July 1970 shortly before the arrival of the UCLA team. Mapping and house numbering were completed in about 15 months. After the mapping was completed, the Project continued to employ one mapper to update village maps as new construction occurred (1).

HOUSEHOLD REGISTRARS (CENSUS WORKERS AND FIELD SURVEY STAFF)

Two types of workers were recruited to perform household registration: field interviewers and research assistants. Both categories required a "school leaving certificate."

Staff in these categories formed an important central pool of field personnel. After the first group was trained in late 1970 and pilot studies conducted for the census, these staff were retrained to carry out the survey research programs planned for the Project. Originally, eight such field staff were recruited. In subsequent years, additional staff in these categories were recruited and trained as required, either to accommodate for attrition, to increase the size of the staff in order to handle additional surveys, or to conduct more frequent surveys. In the latter years of the field activity the number of these staff varied from approximately 38 to 53 (2).

Research assistants reported to senior staff on the progress of each survey. They learned to edit and code field data and performed the preliminary editing and coding in the field after a specified number of villages had been surveyed. Their activities were reviewed and supervised by middle-level supervisors.

Field interviewers were trained to conduct interviews objectively and to accurately record information. During training and supervision, we emphasized their role in achieving survey and Project goals as well as the importance of accurate reporting. In addition to a "school leaving certificate" we required field interviewers to have the ability to read and write English and at least one of the local languages (Ga, Ewe or Twi), to have had experience living modestly in rural Ghana and to be self-motivated (e.g., evidence of employment soon after leaving school).

In order to more effectively carry out the objectives of the first Danfa Project PROP, longitudinal surveys and Village Health Surveys were organized to be administered three times during a five-year period: at the start, midway through the five-year interval and at the end of Project field programs.

For the longitudinal survey various instruments were employed to determine the villagers' morbidity, maternal and child health practices, fertility and family planning knowledge, attitudes and practices (see Sections 6, 7 and 9 for details). The preparation of the survey instruments demanded field pretesting and concommitant training of the research assistants and field interviewers to carry out their tasks. The questions accepted were translated into the three principal vernacular languages (Ga, Ewe and Twi) of the Project district to ensure that each interviewer would be asking the respondent the same question.

Senior medical members of the Department of Community Health and UCLA team were used to carry out the work of the Village Health Surveys and to supervise the interviewers who assisted with the examination. The Department of Medicine of the Ghana Medical School also provided medical staff as did the Ministry of Health (see Appendix 4).

These interviewers and research assistants were also used for a number of other special studies such as the poliomyelitis survey, the family planning acceptor follow-up surveys, the malaria and immunization follow-up surveys, the guinea worm survey and the survey of the use of child weight cards.

VITAL EVENTS REGISTRATION ASSISTANTS

In order to improve the quality and extent of reporting of births and deaths, it was decided early in the Project that a special category of field worker be established: the Vital Events Registration Assistant. During the early years of the field research, we recruited part-time "volunteers," villagers who were literate in English and who were responsible for vital events recording in their own as well as in a limited number of surrounding villages. A total of 57 were trained for the four Project areas. These temporary field assistants received a small honorarium to help pay for their transportation (where available) between villages.

Within a few years it became apparent that the part-time field assistants were not producing the quality of reporting desired. In 1974 we replaced the

volunteers with 19 full-time paid Vital Events Registration Assistants. These full-time personnel each covered more villages than their part-time predecessors, and did so much more effectively. As a result, the completeness and accuracy of the vital events reporting rose sharply. The training program for the full-time assistants consisted of a series of sessions spaced over several weeks which included discussions on the purposes of the data, instruction in the use of the forms, practice interviews, and critiquing of practice results. Field supervision was done by two research assistants operating out of the Legon office. Periodically, the Vital Events Registration Assistants were brought together for brief discussions of common errors and field problems, and their solutions. A more detailed discussion of vital events registration can be found in Appendix 2.

SUPERVISORS OF FIELD STAFF

Most personnel recruited for field supervision had graduated recently from the University of Ghana, usually from the Department of Sociology. They supervised the field interviewers, research assistants and Vital Events Registration Assistants. These middle-level staff were trained and supervised by the senior staff from the Department of Community Health and the UCLA resident staff. Few of the supervisors had supervisory experience when they were hired. It was the responsibility of the senior staff to train them to competently administer a questionnaire, record information, motivate field staff, and detect falsification of questionnaire forms. We found that if exposed to actual working conditions in the field, the supervisors had more realistic expectations of the interviewers' performance. Over the life of the Project, we employed two to four field supervisors at any one time.

4.2.2 Service Manpower

HEALTH CENTER OPERATIONS STAFF

Staff composition and programs operated by the Danfa Health Center are detailed in Section 6.14.2. Briefly, the staff ranged in number between 18 and 25, about 40% of whom were involved in provision of services to patients. The balance were support staff, i.e., craftsmen and laborers. Most staff were seconded by the Ghana Medical School from the Ministry of Health, although the laborers, carpenters, diesel engine attendants and sanitarian were employees of the Medical School.

FAMILY PLANNING AND HEALTH EDUCATION FIELD TEAMS

To carry out the family planning and health education objectives of the first PROP, we recruited one family planning team and two teams of Health Education Assistants (HEAs). The selection, training and utilization of these workers are described in detail in Sections 6 and 8.

Briefly, the family planning team was headed by a nurse-midwife, who was trained in family planning at the Medical School. A clerk recorded cases and attendance at the family planning clinic. The clerk generally had a "secondary school leaver" background. A family planning assistant (a community health nurse who had attended a GNFPP course for family planning assistants) helped the nurse-midwife to conduct interviews and distribute family planning materials at the clinic. A good and cooperative driver was also essential to the team's smooth functioning.

Each health education team consisted of a community health nurse, a family planning field worker, a rural sanitarian (middle school leaver) and a Nutrition Technical Officer (middle school and occasionally a secondary school leaver). These Health Education Assistants were intended to be multipurpose workers and were given intensive training in nutrition, maternal and child welfare, sanitation, family planning and general health education methods. The teams were under the supervision of a public health nurse who regularly visited the various field workers at their field stations.

4.2.3 Transportation Staff and Vehicles

Numerous drivers were recruited to operate the Project's field vehicles. Initially, it was felt that older men would be less suitable because of the strenuous demands of field work. However, we soon discovered that age, in an otherwise well motivated applicant, need not be a disqualifying factor. The potential applicants were interviewed and given a driving test supervised by a senior staff member. The successful interviewees were then given a physical screening and eye examination. Evaluation of job performance was conducted by various senior staff.

Maintaining the research vehicle fleet was a chronic problem. Vehicle down time and repair costs were greatly reduced when the Project hired its own driver mechanic and ordered spare parts in the USA.

4.2.4 Data Processing Staff

As discussed in Appendix 7, all raw data were processed in Ghana with the exception of data from the first longitudinal survey. Subsequent data analyses were performed both in Ghana and at UCLA; although most of the analyses in the last two years of the Project were performed at UCLA, since the University of Ghana lacked the advanced computer equipment and packaged program capabilities required for the final analyses.

Initially, one computer programmer was hired by the Project in Ghana. This position was augmented in 1974 with an additional programmer seconded from the Peace Corps. Two of the Project's editing/coding staff were trained to run the data processing equipment at the University of Ghana and to do simple programming. Two keypunch operators were also seconded from the Institute for Statistical, Social and Economic Research. Management and supervision of the data processing system was the responsibility of the UCLA systems analyst resident in Ghana. Details of data processing staffing and equipment can be found in Appendix 7.

4.2.5 UCLA Administrative Organization in Ghana

Before Project operations began, the UCLA Codirector conferred with the various administrative and fiscal units at the UCLA campus to obtain advice on banking procedures, money transfer, expenditure reporting, accounting, and auditing arrangements. An overseas accounting expert was sent by UCLA to Ghana to arrange banking contacts, engage the services of an internationally recognized chartered public accounting firm, prepare samples of fiscal accounting and reporting forms and to write a detailed fiscal field procedural manual for the Ghana-based operations.

The guidelines in the manual assisted the Ghanaian accounting firm and the UCLA Chief of Party and administrative assistant resident in Ghana to prepare the detailed monthly expenditure reports. These reports were sent to the UCLA accounting office for review, comment and posting, and to the UCLA Codirector for guidance on future fiscal planning. The monthly expenditure report also provided the UCLA systems analyst with ongoing information about costs.

The logistical planning required to carry out the Project's survey demanded careful coordination by the Field Coordinator and Chief of Party, after Joint Staff Committee meetings determined methodologies and

timeframes. Lists of materials and needed supplies were jointly drawn up by the Ghanaian/UCLA counterparts and reviewed by the Field Coordinator and Chief of Party. The latter placed the required orders with UCLA as early as possible to ensure timely delivery. Some were ordered locally; the UCLA administrative assistant played a vital role locating the sources of the items, obtaining the best price and supervising delivery.

Due to the scarcity of storage space at the Ghana Medical School, most of the vehicle spare parts and other Project equipment and supplies were kept in a storehouse attached to the residence of the UCLA Chief of Party.

A similar scarcity of office space at the Medical School required UCLA team members in Ghana to maintain offices in their residences--a workable arrangement, but not the most satisfactory situation, since communication was hampered by distance.

4.2.6 Ghanaian Central Administration Organization for Danfa Project Operations

From the earliest days of the Project, the Ghanaian Codirector anticipated the need for a Project administrative organization within the University of Ghana Medical School. The formation and function of this group are described in Section 2.5.

The Ghanaians who were to be responsible for the Project's fiscal records were designated by the UGMS administration and trained by the UCLA systems analyst in monthly reporting techniques. Their work facilitated cost monitoring and cost analysis.

Plans had been made early in the Project to transfer to the Ghana Medical School various administrative activities handled by the UCLA Ghana-based and campus-based staffs, as soon as the Medical School (in particular the DCH) could absorb these responsibilities. These functions included: maintaining Project vehicles; supervising procurement and distribution of research forms, equipment and supplies; and administering the participant training activities in Ghana (recruiting, briefing and arranging study sites for candidates in the USA). The implementation of the second PROP helped to formalize the transfer of these responsibilities and establish the transfer dates (see Section 4.3).

4.2.7 Publications, Editing and Information Sharing

A publications unit was established in the DCH in 1975. Responsibilities included editing of manuscripts, distributing published Project materials, preparing a quarterly newsletter, and recording, editing and distributing the minutes of the Joint Staff Committee Meetings and the minutes of the weekly research operations meetings.

4.2.8 Public Relations

The DCH was responsible for briefing visitors to the Project district, arranging orientation programs for them and organizing the annual review meetings and other important Project-related conferences held in Ghana.

4.3 REORGANIZATION IN GHANA TO CONFORM TO THE SECOND PROP

The mechanisms designed to foster collaboration were not markedly affected by the second PROP and continued, for the most part, until the end of field research in July 1977. However, senior Ghanaian staff were involved in the initiation and direction of Project activities at an accelerated pace. In addition, certain organizational changes were enacted.

4.3.1 Manpower

Although few changes were needed in the training or function of research staff, increasing responsibility for their supervision was given to Ghanaian middle-level supervisors and senior research assistants, some of whom had returned from postgraduate training at UCLA and other institutions.

More importantly, the Department of Community Health assigned two of its senior staff (who had returned to Ghana after completing their MPH training at UCLA) as medical officers to the Danfa Project district. Prior to this time there had been one medical officer assigned part-time to Area I only. One of the newly assigned staff was responsible for activities in Area I, the other for developing the new model programs in Areas II and III.

Initially, their tasks were to assess existing data on health problems and services in these areas and to develop a health plan in the geographical areas for which they became responsible. After the plans were discussed with the Department Head and other senior staff, they were used to guide further health service development. These plans included mechanisms for the involvement of community members and other Ghanaian agencies in health

planning. In addition to their management responsibilities, these medical officers were intimately involved in the design and supervision of several field studies and in the analysis of those results.

Gradually, between 1975 and 1978 these and other senior Department of Community Health staff were able to fully assume those responsibilities for the field research that were formerly held by UCLA staff in Ghana. This permitted an acceleration of the phase out of UCLA staff resident in Ghana. The UCLA health education advisor left in July 1975, the epidemiologist in June 1976, the MCH/FP advisor and the systems analyst in July 1977, and finally the UCLA Chief of Party and administrative assistant in April 1978.

4.3.2 Transport

The research vehicle fleet came under full Ghana Medical School control and supervision in October 1976.

4.3.3 Data Processing

A tape drive was installed at the University of Ghana campus at Legon with USAID/UCLA contract funds, and improved software including pre-packaged programs were developed for the system. These improvements not only directly benefited the Project, but also greatly increased the capacity of the University's computer system to process other social and biomedical research data (see Appendix 7).

The supervision of all Project data processing was assumed by a newly appointed DCH staff member who acquired valuable experience before going to UCLA in 1978 to earn a Master's Degree in computer sciences. This individual will return to supervise all of the Medical School's electronic data processing.

4.3.4 Local Administration

Fiscal responsibility for all local research expenditures, including gasoline and repairs of the research vehicle fleet, was transferred to UGMS in October 1976. The administration of the overseas participant training funds also came under UGMS direction at the same time.

4.3.5 Other Reorganization

Priorities of field and research activities and often the roles of field service personnel were shifted to reflect new or revised objectives, and the de-emphasis of the original hypotheses testing. The changes in health care and family planning strategies are discussed in Sections 6 and 8 and are illustrated in Table 4-1.

Table 4-1: Area Service Components Proposed Under New (Second) PROP

	Area I	Area II	Area III
	Danfa Rural Health Center	Amasaman Rural (Local Authority) Health Post	Obom Rural (Min. of Health) Health Post
Additive Health Care Outreach Provided by:			
Satellites	X (3)	--	--
Health Education Assistants	X[a]	X[a]	X[b]
Village Health Workers (VHWs)	X	--	--
Traditional Birth Attendants (TBAs)	X	--	X
Family Planning Dispensing Agents:			
Health Center/Post/ Satellite Staff	X	X	X
Village Health Workers	X	--	X
TBAs	X	--	X
Health Education Assistants	X	X	--
Mobile Team	X	X	X
Supervised Village Volunteer	--	X	--
Commercial Distribution	X	X	X

[a]Village-based service component.

[b]Health post-based service component.

4.4 ORGANIZATION OF DANFA-RELATED PERSONNEL AT UCLA

Appendix 10 lists the Danfa-related personnel in the UCLA School of Public Health and campus administrative offices. Figure A10-1 illustrates the organizational arrangement of the UCLA-based Danfa staff.

The Danfa team in Los Angeles was physically housed in the School of Public Health and was organized to:

- Facilitate the recruitment and orientation of the advisory team.
- Administer the participant training program (until UGMS assumed such responsibility in 1976).
- Provide bibliographic, editing and writing services.
- Provide electronic data processing services not obtainable in Ghana (see Appendix 7).
- Provide short-term consultants.
- Order and dispatch equipment and supplies.
- Maintain fiscal accounts and monitor the budget.
- Assist with the overall planning and execution of the Project.

To assist in the execution of these Danfa-related tasks, there was a considerable UCLA support organization.

Within the School of Public Health the initial Project proposal was carefully reviewed by faculty experts for technical soundness and feasibility and to ensure that personnel and fiscal provisions were adequate to conduct the anticipated studies. All UCLA Danfa staff employed specifically for the Project were hired via the School of Public Health Personnel Office and subject to all customary UCLA recruitment, screening and appointment procedures.

Staff from UCLA's Office of the Coordinator of Overseas Programs (OCOP) were assigned part-time to the Project to help expedite purchasing, bookkeeping and accounting. They worked closely with the UCLA Codirector and UCLA administrative assistant to maintain books which reflected encumberances and projected estimates of fund balances to the end of each fiscal year. This careful accounting helped to avoid overruns and was useful in planning realistic budgets for future years. Copies of these projections were shared with USAID/Ghana and USAID/Washington staff on a regular basis.

As required under UCLA regulations, the Chancellor's Committee for International and Comparative Studies (CICCS) reviewed the political and technical ramifications of the initial Project proposal in 1970 before it was given official approval by the Chancellor. CICCS remained actively involved in the Project as did the Vice Chancellor for Institutional Relations. The Project was reviewed by CICCS on an annual basis.

Other tasks were also performed by UCLA central service organizations. For example, staff from the UCLA Contracts Office spent many person-months helping to develop a UCLA/USAID contract which would help facilitate smooth working relationships and they provided assistance in subsequent contract negotiations throughout the Project's life.

The UCLA Accounting Office received the funds from USAID, maintained the official ledgers, submitted official expenditure reports and provided overseas accounting consultation. The central Purchasing Office processed the many purchase orders, and the Disbursements Section of the Accounting Office processed all travel invoices.

These central UCLA service organizations, working closely with the support team in the School of Public Health, were instrumental in the smooth administration of the Project.

4.5 CONCLUSIONS AND RECOMMENDATIONS

The Ghanaian and UCLA partners are convinced that the collaborative working relationships established during the Danfa Project helped contribute to its success. Several key elements helped foster harmonious counterpart relationships.

- Frequent consultations between the Ghanaian and UCLA partners including joint staff meetings.
- Co-directors from both Ghana and UCLA and similar counterparts at the field level: a Ghanaian Field Coordinator and the UCLA Chief of Party.
- A precondition stipulating that when a difference of opinion existed, the Ghanaian view would prevail.

The collaborative approach such as that used in the Danfa Project is recommended for similar efforts. We recommend joint codirectorships, joint staff meetings, frequent consultation between counterparts and an explicit veto power given to the host country team. We also recommend that the host country institution be allocated a separate budget which gives it (instead of the visiting institution) the authority to hire staff for a project. This arrangement serves to strengthen host country infrastructure and provides more realistic employment circumstances than if the visiting institution were to assume budgetary responsibility for local staff.

The Danfa Project's Publications Policy and the writing, editing and bibliographic search units facilitated the entire information production and transfer process within a framework of genuine collaboration. We recommend that a similar publications policy arrangement be established early in all collaborative projects in which publications are anticipated.

Economies of scale resulted from the creation of a Danfa Project central services organization in Ghana which encompassed personnel recruitment and training, fiscal control, purchasing and inventory, transport, writing and editing, information sharing, and miscellaneous logistic support. Field staff were kept continuously active in sequential field studies. The vehicle fleet was used for the many sub-projects and was seldom idle. The relatively expensive data processing infrastructure and other central services could serve multiple sub-projects with very little incremental cost. A similar management structure is recommended for other complex projects.

Ongoing basic services were physically provided and funded by the government of Ghana. The UCLA Ghana-based staff concentrated primarily on research and secondarily on planning and training. Therefore, there was no danger of jeopardizing basic services by the withdrawal of foreign funds or personnel. This arrangement is recommended.

Primary and middle school leavers and school leaving certificate holders functioned adequately as interviewers, health survey assistants, Vital Events Registrars and data processing assistants. We recommend their use in similar endeavors. Strong middle-level managerial expertise and supervision was essential to efficient and accurate field survey work and data analyses. Specially trained university graduates supervised by senior staff were used for this purpose. We recommend a strong cadre of middle level managers and supervisors to maximize the productivity of health-sector field workers.

Vehicle down time and repair costs were significantly reduced when the Project hired a driver-mechanic and purchased spare parts in the USA. This driver-mechanic was supervised directly by the UCLA Danfa Chief of Party. When the responsibility of vehicle fleet management was transferred to UGMS, the driver-mechanic was supervised by senior staff of the Medical School. We recommend that projects assume responsibility for the maintenance of their vehicles and that they order spare parts directly from the lowest priced vendor.

The UCLA campus-based Danfa support organization provided essential services to the UCLA Ghana-based team and was one of the factors accounting for the excellent continuity of the UCLA team in Ghana. UCLA provided data processing services at a level not obtainable in Ghana. UCLA campus-based staff also managed the Danfa participant training program until 1976, served as a conduit for equipment and supplies, and participated in the ongoing planning and evaluation of the Project.

UCLA maintained a smaller administrative support base in Ghana which, in addition to vehicle fleet management, assisted in the administration of the participant training program, ordered research supplies and provided administrative support to the UCLA Ghana-based team so that they could devote full attention to Danfa research and training activities.

These twin support units at UCLA and in Ghana served to expedite Project work and are recommended to other contractors engaged in similar activities of this magnitude.

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5. HEALTH STATUS

5.1 OBJECTIVES OF HEALTH STATUS MEASUREMENT

One of the goals of the Danfa Project has been to learn about those factors which influence the health of the rural population. (Similar information has been sought regarding factors which affect health services utilization and impact, as well as family planning behavior and outcome; these are reported in Sections 6, 7 and 8.) Information from these studies was used to focus the Danfa health services delivery program to enhance its effectiveness and efficiency.

Health status is not necessarily a self-evident concept. Only recently has a concensus been reached that the definition of health should include physical, mental, and social well-being. Unfortunately, it was not possible--in the rural areas where the Project district was located--to measure mental and social well-being, although it is likely that these characteristics are adversely affected (to a considerably lesser degree than is physical health) by the living conditions and environment encountered by the rural population.

Our investigations into the health of the rural community concentrated primarily on the status of physical health and the sociodemographic and environmental factors related to it. The major objectives of these investigations were:

(a) Determination of sociodemographic characteristics of the population.
(b) Assessment of the prevalence and impact of health problems in the population.
(c) Definition of the relationship between sociodemographic and environmental factors and health status.

5.2 METHODS OF SOCIODEMOGRAPHIC ASSESSMENT

Sociodemographic data were collected in a 1971 baseline census which included information regarding ethnic group, religion, occupation, and educational level of respondents. A resurvey was done each year to identify movement into and out of, the Danfa Project district, and the same sociological data were recorded for immigrants. In 1975, a one-time socioeconomic survey was conducted to characterize the population in terms of

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type of housing, material possessions, and source and quantity of income. The census and vital events registration are described in Appendix 2, "Demography."

5.3 METHODS OF HEALTH STATUS MEASUREMENT

The health problems of the Danfa district population were assessed by monitoring the records of the Danfa Rural Health Center, by a Village Health Survey, special epidemiological surveys, mortality assessments, and by analysis of regional and national health records.

5.3.1 Health Center Records

Each visit to the Danfa Rural Health Center was recorded on patient encounter cards which were specially designed for electronic data processing (EDP). The Health Center staff who attended patients recorded a diagnosis (or diagnoses) which was then digitally coded and the card punched for permanent entry onto tape. From these data files, monthly and annual summaries were compiled of the diagnoses being made at the Health Center. Since the Danfa Health Center was part of the comprehensive health program in Area I and was not generally geographically accessible to people living in Areas II, III, and IV, these data are applicable only in the evaluation of Area I.

5.3.2 Village Health Survey

The Village Health Survey (VHS) comprised a physical and laboratory examination of a sample of about 4,000 persons in each of three years: 1973, 1975, 1977. The physical examination, which was done by physicians, evaluated both acute and chronic problems and included anthropometric measurements of children. In addition, data were obtained regarding restriction of activities due to illness or injury in the previous two weeks. The VHS is described fully in Appendix 4.

5.3.3 Special Epidemiological Surveys

Special epidemiological surveys were done to assess malaria prevalence, poliomyelitis and guinea worm. In addition, medical students carried out less elaborate surveys.

(a) Malaria Prevalence Surveys: Spleen and blood smear surveys were conducted before and during the malaria prophylaxis program in Area I, the treatment area, and in Area II, where there was no special malaria program. Both children 0-5 years and school children 6-10 years were examined and spleen, parasite, and parasite density rates were determined.

(b) Poliomyelitis Survey: While planning the immunization program it was realized that there was very little reliable epidemiological data about the importance of poliomyelitis in tropical developing countries. In fact, most textbooks and reports suggested that poliomyelitis was infrequent because epidemics were rarely seen. The significance of poliomyelitis as an endemic disease was never carefully studied. School children, who are past the period of exposure to the widely prevalent virus, were examined to determine the prevalence of residual lameness attributable to poliomyelitis. Surprising results were obtained and the polio survey became one of the most important Project investigations, having worldwide policy significance for polio vaccination.

(c) Guinea Worm Survey: In 1973, a reported outbreak of guinea worm in a village in the Danfa Project district led to a survey of villages in this area. Prevalence rates were obtained and the epidemiology of guinea worm in this part of Ghana was studied, along with its social and economic consequences.

(d) Medical Student Surveys: During their clerkships at the Danfa Health Center, supervised groups of medical students carried out epidemiological surveys on population samples in Area I. Results of these surveys were used in some of the initial program planning.

5.3.4 Mortality Assessments

Mortality data were derived from the census, from the annual resurvey of the population and from a continuous registration program for vital events. Of particular interest were infant and child mortality rates. An attempt also was made to obtain cause of death data through the vital events registration program, but this proved futile because relatives, as a rule, could provide the registration assistant with only a vague description of the deceased's condition at the time of death.

5.3.5 Analysis of Regional and National Health Records

The determination of health status and health problems at the start of the Project had to depend not only on the analysis of surveys and records in the Danfa Project district, but also on both an historical and current analysis of health problems in Ghana and in the Greater Accra Region (of which the district is a part). The latter analysis is also necessary because certain problems which have been major problems in the past, such as measles, may be temporarily in abeyance, either because of prior control measures or because the problem is in an inter-epidemic period. Furthermore, few deaths occur at the Danfa Health Center and cause of death studies are exceedingly difficult to do in a mobile, rural population. An analysis of regional hospital records provides additional information about major health problems, especially important causes of mortality.

5.4 ASSESSMENT OF HEALTH KNOWLEDGE, ATTITUDES AND PRACTICES

Assessment of health knowledge, attitudes and practices included maternal and child health KAP surveys, health practices surveys (in the past, referred to as the Household Health Related Behavior Survey), an examination of health center records, and other special surveys.

5.4.1 Maternal and Child Health Knowledge, Attitudes and Practices Survey

In 1972, 1975 and 1977, longitudinal surveys were carried out to examine change in knowledge, attitudes, and practices concerning pregnancy and delivery, and the causation and care of some specific problems of infancy and childhood. Data were collected on a group of 900 women in the four research areas. Appendix 3 provides more details of the longitudinal survey.

5.4.2 Health Practices Survey

A survey was done to obtain information on behavioral patterns related to maternal and child health, nutrition, participation in well-child clinics, preventive care programs (such as immunization), and village-level sanitation projects. The baseline data from this survey were used to focus the health education component of the Project. The survey was done in 1973, 1974, and 1976. The second and third rounds of the survey were used to evaluate the health education effort and to refine it as necessary. The Health Practices Survey is described in Appendix 6.

5.4.3 Health Center Records

The EDP patient encounter cards at the Danfa Rural Health Center recorded, in addition to diagnoses and treatments, the patients' sex, age, village of residence, household, status of the presenting problem (i.e., new or continuing), and duration of illness. Utilization of Health Center or satellite programs and coverage of the population could be determined from the patient encounter records.

5.4.4 Special Surveys

In 1974, a large-scale immunization campaign was carried out in the Danfa district. In a follow-up evaluation of the campaign, level of coverage was assessed and reasons for non-participation probed in an immunization survey.

As noted, the epidemiology of guinea worm in the Danfa district was studied. The guinea worm survey included questions concerning water use and its relation to acquiring guinea worm infection.

In 1973, following the initiation of a malaria prophylaxis program for children in the Danfa district, an evaluation of the program was undertaken to determine not only what proportion of the target population was being reached, but also why the balance of the children did not participate.

5.5 OVERVIEW OF HEALTH STATUS FINDINGS

Sociodemographic profiles of the population are presented first, (Subsection 5.6), followed by various aspects of health status at baseline, (Subsection 5.7) and the environmental, cultural and system factors affecting health status (Section 5.8). Data will be presented for all four research areas of the Danfa Project district but emphasis will be placed on describing conditions in research Area I where the bulk of the comprehensive health care services were provided during the first five Project years, and where the greatest change in health status might be expected to occur.

5.6 SOCIODEMOGRAPHY

The major sociodemographic characteristics of the four research areas of the Danfa Project district are shown in Table 5-1.

The population of the Danfa Project district is, in consonance with Ghana as a whole, a relatively young population. Through the years, the population under one year in research Area I averaged 3.5% of the total population, those

under five years of age, 17.7%, and those under 14, 48.5%. By comparison, the 1970 Ghana national census for the somewhat larger area containing the Danfa district produced figures of 3.3%, 17.6%, and 46.3%, respectively (1).

Area I traditionally has belonged to the Ga-Adangbe ethnic group who constitute 63% of the population. Immediately adjacent are traditional Akwapim lands, and as a result of migration, they are now 14% of the populace in Area I. The Ewe ethnic group traditionally have inhabited the territories which comprise the Volta Region of Ghana and contiguous lands in Togo. They have migrated west and now represent more than 7% of the people in Area I and even larger percentages in Areas II and III. The balance of the population of Area I is made up of other ethnic groups, including more than 7% non-Ghanaian Africans. The Ga traditional lands extend well to the south of the Danfa district, including many coastal fishing villages both east and west of Accra (indeed, Accra itself is considered to be a Ga town). As surveys subsequent to the baseline census were to bring out, there is a high degree of movement of population between the Ga agriculture villages of the Danfa Project district and the coastal villages.

When queried about religion, 49% of this population claimed to be Protestants of one denomination or another, while 31% categorized themselves as followers of the traditional religion, 6% as Moslems, and 4% as Catholics; the remaining 10% were classified simply as "other."

Slightly more than 40% of the total population claimed to be economically active. Most of the men were farmers; many others were firewood cutters or laborers. Of the active women, 37% were also farmers and 40% were "traders." Three percent of the adults said they were involuntarily unemployed. The great majority of those persons not economically active were either preschool children or students.

Of the Area I population already beyond school age, 66% had never attended school at all, 14% had left school during or at the end of primary school (the first six years), while 16% had completed primary school and gone into middle school (the next four years). Four percent had completed middle school and gone on to further schooling. Those who were currently enrolled in school represented 27% of the total population: 71% of these were in primary school, 26% in middle school, and 2% in secondary school or technical schools. Seventy-two percent of children 6-15 were enrolled in school compared to 58% for Ghana as a whole according to the 1970 census. Both in

Table 5-1: Sociodemographic Characteristics of the Population of the Four Research Areas of the Danfa Project District

Characteristic	Area I	Area II	Area III	Area IV	All four Areas
Mean Population[a]	15257	13142	18873	16822	64094
% under 1	3.5	3.8	5.3	4.4	4.5
% 0-4 yrs.	17.7	20.6	23.9	19.9	20.7
% 0-14 yrs.	48.5	47.4	51.8	45.9	48.6
% women 15-44 yrs.	17.1	18.0	18.4	17.7	17.8
Ethnic Groups (%)[b]					
Ga-Adangbe	63	46	41	14	40
Akwapim	14	3	1	56	19
Ewe	7	35	24	12	19
Other Ghanaian	9	9	8	8	9
Other African	7	7	26	10	13
Religion (%)[b]					
Protestant	49	26	13	51	35
Catholic	4	9	4	4	5
Muslim	6	6	5	4	5
Traditional	31	50	64	31	44
Other	10	9	15	10	11
Occupation (%)[b]					
Males: farmers	59	58	83	73	70
Females: farmers	36	37	63	66	52
Females: traders	35	40	18	13	25
Education (%)[b]					
Aged 6-15 attending school	72	60	34	69	60
Men over age 15: literate	44	39	23	45	38
Women over age 15: literate	25	14	6	22	17

[a]Period 1971-1977.

[b]Percentages of baseline population (1971).

the Danfa area and in the nation as a whole, men were favored educationally over women.

A very simple "index of development" was constructed by ranking the research areas on each of several socioeconomic characteristics such as housing, household amenities, occupation, and history of travel. Each of the individual variables used was found on preliminary analysis to provide inter-area variation and to be readily acceptable as an ordering indicator of "developedness." The development index showed Area I to be slightly more developed than Area II, and Area II to be slightly better off than Area IV. Area III is much less developed on this scale than the others.

It was mentioned earlier that this is a mobile population. In Area I the average annual total migration rate (sum of in-migration and out-migration) from 1971 to 1976 was 29%; each year 13% of the population, on the average, left the Project area, while 16% had been in residence less than one year. This high level of turnover severely complicated both the capture of vital events, especially by the annual resurvey method, and the maintenance of desired sample size in the longitudinal survey. The latter suffered an attrition rate near 50% over a five-year period.

Detailed demographic methods and data are shown in Appendix 2.

5.7 HEALTH STATUS AT BASELINE

The greatest proportion of preventable morbidity and mortality occurs in mothers and children. These two groups also account for most of the utilization of ambulatory health care services. Infectious disease is important in all age groups.

5.7.1 Maternal Health

Pregnancy-related deaths represent at least 4% of all deaths in Ghana (2). There are no accurate records of maternal mortality but the rate in Ghana is estimated to be between five and 15 deaths per 1000 live births. The leading causes in Ghana are hemorrhage (65%), infection (7%), and toxemia (15%).

Maternal mortality is very difficult to estimate in a small rural population because of mobility, inaccurate recording of cause of death (if any death certificate is completed at all), lack of pregnancy status information on the death certificate, and variability in number of deaths from year to

year. A special attempt to estimate maternal mortality midway through the Project produced an estimate of 4 per 1000 live births but with wide confidence intervals.

Table 5-2 shows the frequency of pregnancy-related complaints seen during the first year of Health Center operation. These data suggest that only a small percentage of the maternal problems were being reported at the Health Center and satellites in 1972. Based on incidence rates in the USA, less than 20% of the expected annual number of cases of bleeding, infection, toxemia or prolonged labor in Area I were being seen. Given the observed conditions of delivery in the village and the estimated maternal mortality rate, we concluded that maternal mortality and morbidity must have been an important problem. In that case, the low reported incidence of pregnancy problems at the Health Center could have been due to poor diagnosis and record keeping by the Health Center staff, poor referral practices by untrained TBAs or the by-passing of the Health Center for maternal complications in favor of regional hospitals.

An analysis of the Health Center record book of pregnant women referred to regional hospitals showed a somewhat higher incidence of complications seen at the Health Center suggesting that complete patient encounter cards may not have been filled out for all referrals. Still it is likely that many complications were not seen at the Health Center and were cared for in the village or by a regional hospital after by-passing the Health Center. See Table 5-3.

Table 5-2: Frequency of Problems Associated with Pregnancy Seen at Danfa Health Center and Satellites, 1972[a]

	Number	No. as % of pregnancies in Area I (1972)	Expected % of pregnancies with these problems[d]
I. Routine Visits			
Antepartum	1639	--	--
Labor & Delivery[b]	85	17	--
Postpartum	37	7.4	--
TOTAL VISITS	1761	--	--
II. Problems			
Bleeding			
Antepartum	7	1.4	
Intrapartum	1	0.2	
Postpartum	4	0.8	
Subtotal	12	2.4	15
Infection/fever			
Antepartum	59	11.8	
Postpartum	0	0	10
Subtotal	59	11.8	
Toxemia[c]	4	0.8	5
Miscarriage	1	0.2	10
Therap. abortion	1	0.2	
Prolonged labor	2	0.4	15
III. Total Problems	79	15.8	

[a]Source: patient encounter cards.

[b]Source: hand tallied Health Center records.

[c]Toxemia = eclampsia and pre-eclampsia.

[d]Based on incidence in USA.

Table 5-3: Pregnancy Related Referrals from Danfa Health Center to Regional Hospitals, January 1970 to August 1973

Number of women referred	143[b]
Referred to TQMH[a] before labor	110
Referred to TQMH during labor	27
Referred to TQMH after delivery	6
Reasons for Referral	
Bleeding or Hemorrhage	35%
Pre-Eclampsia	14
Dystocia	11
Grand multipara	10
Twins or Breech	4
Puerperal sepsis	2
Other	16
Transfer to another area	8

[a]Tetteh-Quarshie Memorial Hospital, the Danfa Health Center referral hospital.
[b]143 women referred had 196 reasons.

5.7.2 Child Health

A profile of the indices of certain child health problems is shown in Table 5-4.

Table 5-4: Indices of Child Health, Area I, Baseline

Infant mortality rate (under one, 1972)[a]: 54 per 1000 (mid-year pop.)
Pre-school mortality rate (1-4 years, 1972): 16 per 1000
Child mortality rate (0-4 years, 1972): 25 per 1000
Percent of children 6-35 months below 80% standard weight-for-age (1972): 33%
Mean hemoglobin (0-4 years, 1972): 10.3
Malaria mean parasite rate (0-10 years, 1973-74)[b]: 41%
Measles incidence (1972): 7.6 per 1000 population
Pertussis incidence (1972): 1.8 per 1000 population
Ascaris prevalence (children 0-4 years, 1972): 33%
Hookworm prevalence (children 0-4 years, 1972): 22%
Poliomyelitis lameness prevalence (school children, 1974): 7 per 1000 children
Diarrhea prevalence (0-4 years, 1972 VHS): 7%
Skin infection prevalence (0-14 years): 22%

[a]Mid-year population used as denominator because of high in-migration.
[b]Area II, non-treatment area.

Child mortality is serious but not as severe as that seen in less developed African countries or in other parts of Ghana. In Area I the infant (under one), preschool (1-4 years) and childhood (0-4 years) mortality rates were 54, 16, and 25 per 1000 population respectively. These are probably underestimated by as much as 30% at the baseline, but still indicate that about 12% of all children die before reaching age five.

Nationally, neonatal deaths account for about 9% of all deaths. Many are due to prematurity that is difficult to prevent or treat, especially in rural areas. The prematurity rate at the Danfa Health Center was 13% from

1970-1973. Neonatal tetanus is, however, an important cause of neonatal mortality that is preventable either by immunization of the mother or by proper cord care. Although neonatal tetanus is not uncommon in the Greater Accra Region, and although 78% of TBAs in the Danfa Project district reported that at sometime in their career they had seen a condition resembling neonatal tetanus, the Health Center staff reported that they had not seen any cases. During a baseline survey, 59% of TBAs used a clean razor blade to cut the cord which may have resulted in a lower rate of neonatal tetanus than in other areas in Ghana where less clean objects (e.g., scissors or machete) are often used.

Table 5-4 indicates that children are endangered by a number of infectious diseases which can interact with the significant degree of mild to moderate malnutrition to increase the risks to health in childhood (see Subsection 5.7.3, "Malnutrition").

5.7.3 Malnutrition

Mean birth weight for infants born at or near term (38-40 weeks gestation) and delivered at the Danfa Health Center from 1970 to 1973 was 3.3 kg, which is 97% of the U.S. standard of 3.4 kg. Only 6% could be classified as small for gestational age, about the same percentage as in the United States. Although the sample is small (only 81 births) and estimation of gestational age by the midwives perhaps not wholly reliable, it would appear that infants in Area I of the Danfa district begin their lives in a normal nutritional state.

However, the first Village Health Survey showed that nutritional status declines in early childhood. Table 5-5 indicates that in the age group 5-35 months, 33% of children's weights fell below 80% of standard (normally only 3% of international reference groups fall below 80% of the standard weight-for-age), and 23% of heights fell below 90% of standard. There is even a larger percentage of children falling below standard in the 11-17 year age group. Arm circumference-for-age was similar to weight for age with 37% of children 6-35 months falling below standard.

Tables 5-6 and 5-7 more graphically illustrate the pattern of growth. The 0-5 age group data is based on a small sample and perhaps should be disregarded, especially since birth weights at the Danfa Health Center appear to be near normal. These tables show that there is a drop in mean weights and

heights compared to standards during the period 12-35 months in males and 18-35 months in females. There is some "catch up" from three to ten years and then a further falling off during the usual period of adolescent growth spurt (11-17 years). Rapid catch up occurs again between 18 and 25 years but the mean weights and heights never reach 100% of the standard.

Table 5-8 shows that mean weight for mean height is below normal from one to 17 years. The departure of these growth patterns from international standards could have several possible explanations:

- It is a normal genetic variant and not related to malnutrition at all.
- It represents a permanent reduction in growth secondary to intrauterine growth retardation with permanent reduction in numbers of body cells.
- It is due to sub-optimal nutrition during childhood and adolescence without total catch up and, thus, results in some degree of permanent reduction in final growth attainment.
- A combination of the above three explanations.

Table 5-5: Percent of Population[a] Falling Below Standard[b] Weight and Height-for-Age by Age Group, Area I, 1972 VHS

Age Group	Weight (Below 80% of std.)	Height (Below 90% of std.)
Birth	6	no data
0-5 months[c]	25	29
6-35 months	33	23
36-59 months	28	21
5-9 years	32	17
10-14 years	64	43
15-19 years	39	19
20-24 years	6	6

[a]Males and females combined

[b]National Academy of Science (USA) Standards

[c]Small number in sample

Table 5-6: Mean Weights and Heights-for-Age as Percent of Standard[a], Area I Males, 1972 VHS

Age Group	Weight mean (kg)	Weight mean÷std x 100%	Height mean(cm)	Height mean÷std x 100%
0-5 months[b]	4.3	77	54.0	92
6-11 months	8.0	89	65.6	92
12-17 months	9.2	86	74.4	94
18-23 months	9.8	82	79.4	94
24-35 months	11.4	86	84.1	93
36-48 months	13.8	91	94.1	95
48-59 months	15.0	88	100.8	95
5-6 years	18.4	90	111.0	96
7-8 years	21.5	84	121.0	96
9-10 years	25.9	83	129.5	94
11-12 years	30.8	79	138.5	93
13-14 years	38.0	75	149.4	92
15-16 years	46.2	74	158.5	91
17 years	50.9	76	165.3	94
20-44 years	59.6	89	167.6	95

[a]50th percentile National Academy of Science (USA) Standards

[b]Small number in sample

Table 5-7: Mean Weights and Heights-for-Age as Percent of Standard[a], Area I Females, 1972 VHS

Age Group	Weight mean(kg)	Weight mean÷std x 100%	Height mean(cm)	Height mean÷std x 100%
0-5 months[b]	5.6	101	58.0	97
6-11 months	7.0	86	63.4	92
12-17 months	9.5	95	75.5	98
18-23 months	10.2	92	77.8	94
24-35 months	10.9	86	83.9	94
36-47 months	14.0	94	94.2	97
48-60 months	15.1	90	99.9	96
5-6 years	18.5	93	112.0	98
7-8 years	22.5	91	122.1	97
9-10 years	25.1	79	129.9	94
11-12 years	30.9	75	139.8	93
13-14 years	40.3	78	150.9	94
15-16 years	48.9	88	157.7	97
17 years	50.3	89	156.7	96
20-44 years	54.1	96	155.9	96

[a]50th percentile National Academy of Science (USA) Standards
[b]Small number in sample

Table 5-8: Percent of Standard[a] Weight-for-Height of Mean Weights by Age Group, Males and Females Area I, 1972 VHS

Age Group	OW÷SW for OH x 100%[b]	
	males	females
0-5 months	104%	112%
6-11 months	109	106
12-17 months	95	99
18-23 months	90	100
24-35 months	96	95
36-48 months	98	102
48-59 months	95	99
5-6 years	97	97
7-8 years	95	98
9-10 years	97	94
11-12 years	98	94
13-14 years	96	94
15-16 years	97	96
17 years	97	103
20-44 years	106	112

[a]National Academy of Science Standards (USA)

[b]OW = observed mean weight for age group

SW = standard weight for observed mean height

OH = observed mean height for age group

From these data, it is impossible to explain with certainty the departure in growth stature. The first explanation is unlikely to be the principal explanation because in most studies in developing countries, children from higher socioeconomic groups who receive optimal nutrition demonstrate growth patterns comparable to international standards. This appears to be true for such groups in Accra (C. Neumann--personal communication). Blacks in the United States have the same growth standards as whites. The second explanation is also unlikely to be the primary cause since birth weights for term infants at the Danfa Health Center appear to be close to normal. Based on the pattern of reduction in weights for heights shown in Table 5-8 and the experience in other West African countries, it is more likely that the third explanation more fully accounts for the pattern seen in this Area. This does not mean that genetic and gestational factors do not play a role in some individual cases; they certainly must. However, it is still likely that they do not play a major role in affecting the mean performance of the group's growth patterns.

An examination of the pattern of growth in head size also shows some falling off in the period 12-35 months with catch up thereafter (see Table 5-9). By five years, however, catch up is still not complete and although mean head size was 97-98% of international standards, as many as 30% of males and 36% of females in Area I still fall below the third percentile of these standards.

Table 5-9 Mean Head Circumference-for-Age as Percent of Standard[a], Males and Females, Area I, VHS, 1972

Age Group	Males		Females	
	mean(cm)	mean÷std x 100%	mean(cm)	mean÷std x 100%
0-5 months[b]	38.1	96	39.1	101
6-11 months	44.5	98	42.9	96
12-17 months	46.2	95	45.2	96
18-23 months	46.1	94	45.4	96
24-35 months	47.7	96	47.8	99
36-47 months	49.0	97	48.0	98
48-59 months	49.8	98	48.6	97

[a]50th percentile National Academy of Sciences (USA) standards.

[b]Small number in sample.

This mild to moderate malnutrition may be important for two reasons.

- Diminished nutritional status seems to reduce immunologic competence and results in more severe infections. Case fatality rates of such diseases as measles and whooping cough are increased. Even if death does not ensue, nutritional status may deteriorate still further during the course of infection because of anorexia, vomiting, diarrhea and increased metabolic demands. This can set up a vicious cycle.
- It appears that final growth attainment may be below genetic potential in some children. This may compromise both their intellectual and motor performance.

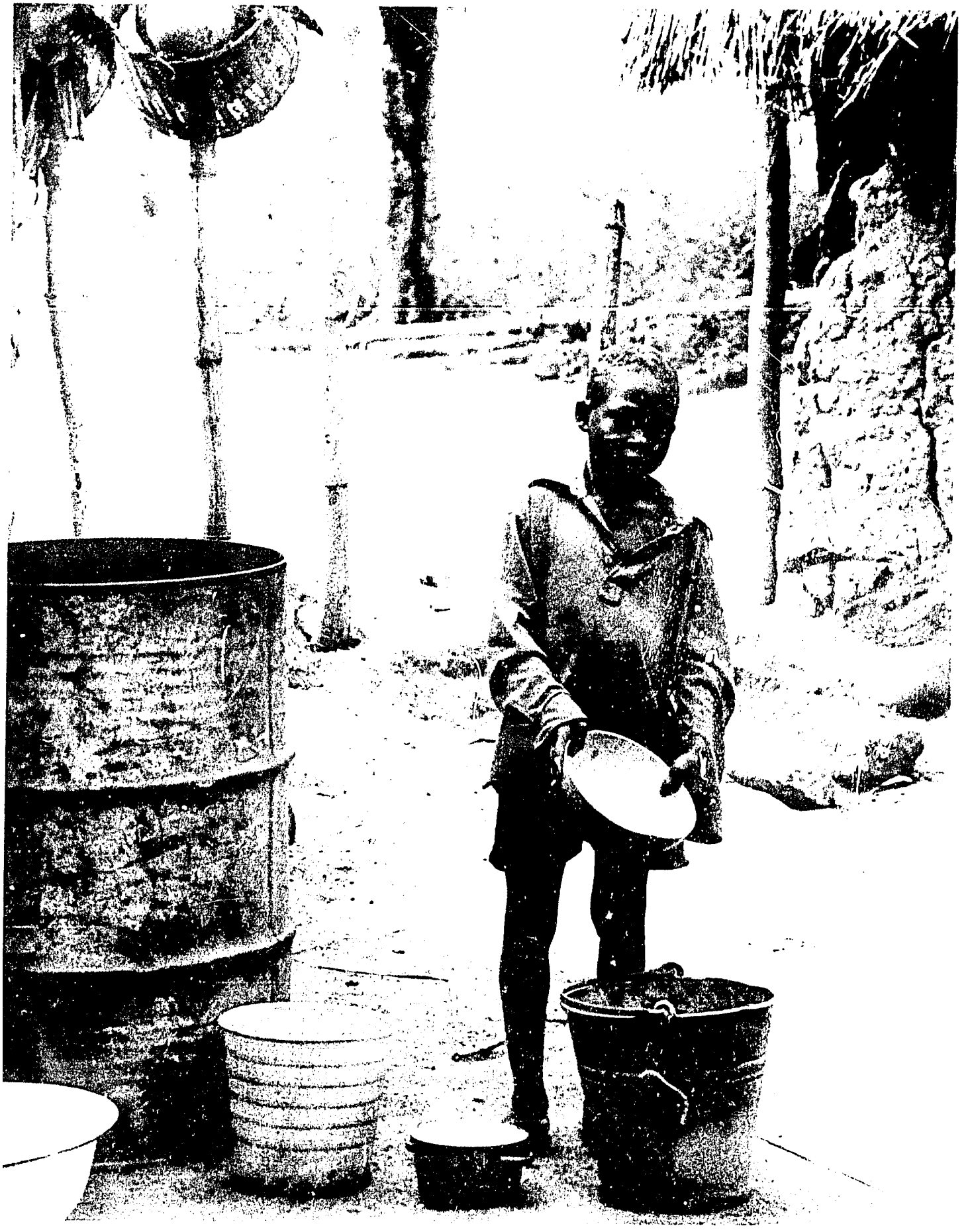
The identification of heights and weights lower than international standards during adolescence (11-17 years) is very important. These reductions are due in part to delayed onset of puberty compared to international reference groups, and this delay may itself be related to a smaller lean body mass at the start of this period. Nevertheless, mean weights for mean heights also fall to a relatively low level during this period suggesting that nutritional intake may be sub-optimal during this time. Historically, nutrition programs have concentrated on the preschool age groups. It may be that nutrition in adolescence is in need of much more attention than it has received in the past.

5.7.4 Overview of Infectious Disease

The infectious diseases of most concern, with regard to mothers and children in Ghana are malaria, measles, pertussis, gastroenteritis, respiratory infection, helminths, poliomyelitis, tuberculosis, schistosomiasis, guinea worm, tetanus and skin infections. Each is discussed in the following subsections.

5.7.5 Malaria

In Ghana, 8% of all deaths are attributed to malaria, or about 16,000 deaths per year (2). It also accounts for 30% of outpatient visits and 9% of hospital admissions.



Malaria has long been recognized as a problem in the Accra plains. The vectors, Anopheles gambiae and Anopheles funestus are present all year, but with augmentation of their numbers and increased malaria transmission during the rainy seasons. The Village Health Survey and the special malaria surveys provided epidemiological data on malaria prevalence. The special malaria surveys conducted at various seasonal points from 1973 to 1975 showed that in Area II, where no malaria control program was instituted, the mean enlarged spleen rate (2-9 years) was 46% with a seasonal range of 33% to 58%. The Village Health Survey first showed, and the special surveys later confirmed, that malaria was an important problem, not only in the preschool children, but also in the school-age children. The mean parasite rate in the under-one age group was 24%, in the 1-4 age group 45%, and in the 5-9 year age group 44%. The mean parasite density (per mm^3 blood) over a three-year period in Area II was 145 in the 0-5 age group and 95 in the 6-10 year age group. The lower density in the 6-10 age group suggests that, despite the similar parasite rates in the two age groups, the 6-10 year age group has a higher degree of immunity. In 88% of cases the infections were single infections of P. falciparum, the most dangerous form. In the other cases there were either single or mixed infections of P. malariae or P. ovale with or without P. falciparum (3).

By strict WHO definition, malaria in the Accra plains (where most of the research areas are located) would be called mesoendemic since the spleen rate in the 2-9 year age group was not consistently over 50%. However, the age specific spleen rates, parasite rates and lack of marked seasonal change present an entire epidemiological picture more consistent with hyperendemic malaria. This is supported by spleen rates over 45% in five of seven monthly observations, a low spleen rate in adults, parasite rates in the 1-4 age group over 30% at all times of the year, and sometimes inconsistent seasonal changes. Stable malaria is characterized by a high density of the vector, a vector with frequent man-biting habit and a temperature favorable to a rapid sporogenic cycle. In this area malaria manifests many of the characteristics usually associated with stable malaria, that is, hyperendemicity, A. gambiae vector, P. falciparum predominating type, and a high degree of immunity in adults. For these reasons it is difficult to control the disease in the Accra plains.

Malaria was the single most frequent diagnosis made at the Danfa Rural Health Center and its satellites (Area I) in 1972, accounting for 31% of all patient visits. However, 1972 was a relatively "light" year for malaria at the Health Center satellites, the mean malaria diagnoses for the five years 1972-1976 was 43%. Thirteen percent of all infant visits were diagnosed as having malaria, 50% of 3-4 year olds, 59% of 5-14 year olds, and 33% of those over 14. The monthly distribution of visits tended to follow the pattern of the rainy season, with 33% of malaria cases coming in the months of May, June and July, which corresponds with the wet period in this part of Ghana.

5.7.6 Measles

In Ghana, 5% of all deaths are attributed to measles but in fact it may contribute to more deaths since measles frequently precedes kwashiorkor (2).

During the first Village Health Survey, 44% of mothers in Area I said that their children under five had had measles in the past, but this may not be a reliable estimate since other viral exanthems are often confused with measles. Baseline serological studies conducted as part of the VHS showed that by age five, 87% of children had positive measles antibody titers, indicating either natural infection or vaccination.

The measles/smallpox eradication program which had been operating prior to 1972 may have greatly reduced the usual high incidence of measles. In 1972 the Danfa Health Center and satellites reported only 101 new cases, about 40% of the expected number. These cases accounted for only 1.3% of all diagnoses in children under five, but measles still was ranked as a priority disease to hold under control.

5.7.7 Pertussis (Whooping Cough)

Accurate data about pertussis is difficult to obtain in most African countries, including Ghana, but David Morley's studies in Nigeria suggest that it is a problem of the same order of magnitude as measles (4).

VHS serological studies showed that 27% of children 0-5 years had positve pertussis antibodies. However, the reliability of serological studies as an indicator of pertussis immunity is questioned. Still, since only 8% of mothers reported that their children had DPT immunization, it may indicate that as many as 19% had the illness. Only 24 new pertussis cases were reported at the Danfa clinics in 1972. This low reporting could mean that

pertussis was in an inter-epidemic period at that time, or else that the disease was not being accurately diagnosed by Health Center staff.

5.7.8 Gastroenteritis (Diarrhea)

The primary indicator of acute gastrointestinal infection is diarrhea. Despite often impotable water sources and a significant amount of mild to moderate malnutrition, severe diarrhea with dehydration (and severe malnutrition) in children were diagnosed infrequently. The reasons for this are not clear.

At the Health Center diarrhea constituted 21% of the complaints/diagnoses registered for 0-4 year olds, with a peak clearly occurring in the 6-24 month age group. In the Village Health Survey, diarrhea was found in 7% of children under five, in 3% of those 5-14, and in 2% of those 15 or older. In a subsample of under-fives, only 2% of specimens contained Salmonella or Shigella, a considerably lower level than had been expected based on other studies done in the region (5). Enteroviruses were isolated from 28% of the sample, including polioviruses types I and II, Coxsackie A and B, and several types of Echovirus but these may not have been etiologic. As in other countries it is likely that enteropathogenic E. coli or rotaviruses are responsible for a large majority of cases.

5.7.9 Respiratory Infection

Respiratory complaints and diagnoses were second only to malaria in frequency at the Health Center. Upper repiratory infection (URI) was the most common respiratory complaint accounting for 11% of all visits to Danfa clinics in 1972. Bronchitis and other lower respiratory disease accounted for another 3% of all visits. Children 0-4 years had an even higher rate of visits (17%) due to respiratory disease.

5.7.10 Helminths (Worms)

The primary helminth problems in the Danfa district are Ascaris and Necator. Infections are acquired early and persist, probably intermittently. Stool samples examined at the baseline Village Health Survey in Area I showed positive rates for Ascaris (roundworm) in Area I of 33% for children under five, 51% for age 5-14, and 42% for people 15 and above. Corresponding positive rates for Necator (hookworm) were 22%, 43% and 38%. By

contrast, other intestinal parasites were found with much lower frequency: Strongyloides 4% overall, Trichuris 1% overall, and Giardia, Taenia, and E. histolytica not at all. We could find no significant association between hookworm infections and anemia in this population, suggesting that most of the hookworm loads are light.

A diagnosis of worms was the third most frequent diagnosis at the Health Center and satellites in 1972, nearly 8% overall. Fewer than 1% of infants were diagnosed as having worms, whereas 11% of children 1-4 (i.e., crawler/toddlers) were so diagnosed, as were 13% of 5-14 year olds, but only 4% of those 15 and older. The considerable difference between the levels seen by examination of stools versus diagnoses made by the Health Center staff is probably due to the large number of asymptomatic carriers, as well as a certain amount of acceptance of mild worm infection as a relatively unimportant self-limiting problem.

5.7.11 Poliomyelitis

Serological studies during the first VHS showed that the poliovirus was endemic; 65% of children had antibodies to all three types by five years of age, and only 7% were triple negative.

Children were examined for lameness in the Danfa Project district to assess the impact of endemic poliomyelitis and to test a widely held hypothesis that paralytic poliomyelitis is relatively rare in such areas (less than one per 1000 children affected). The observed prevalence of lameness attributable to poliomyelitis was seven per 1000 school-aged children, and the annual incidence was estimated to be at least 28 per 100,000 population (6). Although no evidence for an epidemic was found, these rates were comparable with those in the USA and Europe during the years of severe epidemics and indicated that a high price was being paid in the Danfa district for the natural acquisition of immunity. As a result, immunization against poliomyelitis was given high priority. A teacher questionnaire was also tested for use in postal surveys as a rapid means of estimating the prevalence of lameness attributable to poliomyelitis in countries with a reasonable network of primary schools. Such a survey was carried out by Project staff on a sample of schools throughout Ghana and similar results were found (7).

This study suggests that mean annual incidence rates in tropical endemic countries have always been as great, if not greater, than those experienced by

temperate countries during epidemic periods in the twentieth century and that the total number of cases of paralytic poliomyelitis occurring in the world each year has been reduced by only 25% since the advent of polio vaccine. Partly as a result of this study poliomyelitis immunization has been given renewed emphasis in Ghana and many other developing countries.

5.7.12 Tuberculosis

A tuberculin skin test was included in the Village Health Survey. (Persons showing a BCG scar were excluded.) Conversion to a positive reaction rose with age: only 3% of children under five were positive, but 15% of 5-14 year olds and 42% of those older than 14 were positive. Interestingly, however, the Health Center staff made only four diagnoses of tuberculosis in the entire year, although it may well be that some cases in which a diagnosis of "cough" was made were actually tuberculosis. The Health Center staff, working with limited training and equipment (no stethoscope and no acid-fast stain capability), may find tuberculosis to be a very difficult diagnosis in all but its latest stages.

In any case, the skin test results indicate that tuberculosis is only a moderate problem (compared to some areas of the world where as many as 90% of children have positive tuberculin reactions by age five) and that the greatest danger of infection comes at adolescence.

5.7.13 Schistosomiasis

Though an important problem in other parts of Ghana, schistosomiasis is not significantly prevalent in Area I of the Danfa Project district. Examination of 93 urine specimens from persons between ages six and 40 produced only three positive for S. haematobium. At the Health Center, very few diagnoses of schistosomiasis were made, only 0.2%. However, although very little of the disease is found in Area I, in an adjacent area (Area II) urinary specimens were collected and showed a 9% positive rate, and another (Area III about 20 miles west of Area I) has a positive rate of 15%. Nevertheless, schistosomiasis never became a problem of high priority in the Danfa Project district.

5.7.14 Guinea Worm

Guinea worm is highly prevalent in the more northerly parts of Ghana, but much less so in southern Ghana including Area I of the Danfa Project district. In the Village Health Survey, of 957 people examined only one had a guinea worm diagnosis. The Health Center recorded 33 visits involving 22 people with guinea worm in 1972.

However, an outbreak in Area II in 1973 led to a special epidemiologic survey of 159 villages in Areas I, II and III. Most of the problem was confined to Area II, where attack rates of as high as 80% were found in some villages (among males 25-44 years old). The recent occurrence for the first time in many of these villages suggested that the disease was spreading. The study was particularly important because of its economic implications. The average work loss in untreated adults was more than five weeks. Because guinea worm disease is seasonal, coinciding with peak agricultural activities, and few alternative labor sources are available for the incapacitated farmer, a marked reduction in agricultural output occurred (8).

5.7.15 Tetanus

Tetanus accounts for 3% of all deaths in Ghana (2); about half are neonatal cases. Only one case was diagnosed at the Danfa Health Center in 1972.

5.7.16 Skin Infections

Severe skin infections were primarily pyoderma and tropical ulcer. Pyoderma was the more common and showed a pronounced age-related distribution. The first Village Health Survey found 22% of children under 15 in Area I suffering from one or more pyodermal foci, but only 6% of those who were older. It is believed that young children are more prone to dermal injury and subsequent infection. Among the older age group, farmers and laborers were more likely to have pyoderma than teachers and traders. Tropical ulcer was seen in 5% of those examined in the Village Health Survey, concentrating mainly in people over five years of age and especially in the 5-14 age group: 8%.

The 1975 Village Health Survey included a special study of pyoderma (9). It was diagnosed in 19.4% of villagers examined. Peak pyoderma rates occurred in the 5-9 old age group, and was more prevalent among males and

unskilled laborers and farmers than among those engaged in more sedentary occupations. Non-bullous impetigo was most common (72% of lesions) and, in contrast to other studies, non-group A-streptococci predominated in these lesions (82% of streptococcal lesions were Group G, 18% Group C).

5.7.17 Previous Immunizations

For a number of years prior to the start of the Project the Regional Medical Field Unit had carried out BCG, measles and smallpox vaccinations as part of the West African campaign to eradicate smallpox. In the first Village Health Survey mothers of children under five were asked about prior immunizations in these children. In Area I, 44% reported prior smallpox vaccination (60% actually had a smallpox vaccination scar), 23% reported prior measles vaccination, 8% prior pertussis vaccination and only 7% prior BCG vaccination against tuberculosis (although 10% had BCG scars). Prior measles vaccination might have been actually higher as it was usually given with smallpox vaccination. Eleven percent of children 5-14 had BCG scars; 90% of persons over five had smallpox scars.

These results showed that smallpox immunization levels were diminishing but this was of questionable significance since the disease appeared to have been eradicated from West Africa at that time. Measles, pertussis and BCG immunization levels were far too low.

5.7.18 Chronic Disabilities and Other Health Problems

Chronic disabilities and chronic health problems included hernia, hypertension, leprosy, anemia, loss of visual activity, hearing loss, amputation and smoking habits.

(a) Hernia: The Village Health Survey found that 34% of children under one in Area I had umbilical hernias, as did 19% in the 5-14 group. In the group over 14, umbilical hernias were present in only 8% of cases. This is a self-limiting condition that decreases with age and does not usually require surgery. However, indirect inguinal hernias were present in 7% of males over 20, a problem that creates great surgical demand in Africa.

(b) Hypertension: Of the 16-55 year old adults in the Project district screened for hypertension, only 2.5% had diastolic pressures equal to, or greater, than 95 mm Hg.

(c) Leprosy: The prevalence of leprosy in the Project district was about two per 1000 in the Village Health Survey. This is lower than some other countries in Africa where rates of 10 to 20 per 1000 have been observed (even higher in certain highly endemic pockets).

(d) Anemia: Only 1.7% of pregnant women seen at the Danfa Health Center from 1970-1973 had a hemoglobin below 7.1 gm %. The first Village Health Survey also showed that severe anemia was uncommon in the Project district. However, one-fourth of children 0-4 years and one-tenth of children 5-9 years had a hemoglobin of 7-10 gm %.

(e) Visual Acuity

Eighty-four percent of those under 45 had normal vision, but 51% of persons 45 and older were suffering from moderate to severe loss of acuity.

(f) Hearing Loss

Significant reduction in hearing was evident in fewer than 1% of persons 15-44 years, but in 8% of those 45 or older.

(g) Amputations

Only two of 961 people examined had lost an arm or a leg.

(h) Smoking Habits

Seven percent of adult males were pipe users and 41% reported smoking cigarettes in the first VHS. Only 16% of the adult male population smoked ten or more cigarettes per day. Smoking by women is virtually non-existent.

5.7.19 Functional Impairment Due to Illness

As part of the early efforts to assess morbidity in the Danfa district, the baseline longitudinal survey included a section on illnesses and related sequelae in the two weeks previous to the interview. Respondents were asked to describe symptoms and to indicate during how many of the preceding 14 days they had been forced to restrict their activities either entirely or in part. Twenty-four percent of persons surveyed said that they had been ill at some time in the previous two weeks, and of these, 39% said that they had suffered some restriction in activity. Thus, of the total sample, 9% said

that they had had to restrict their activities due to illness in the preceding 14-day period; to a slight, but statistically significant, degree women reported more days of restriction than men. Seven percent of the school children had lost at least one day from school due to illness and the average loss for all school children was 0.2 days in the two-week period. Ten percent of the people who were economically active had lost at least one day of work due to illness; the average loss of productive time per member of the working population in the Project district was 0.6 days in the two-week period, or roughly 5% of a six-day work week.

5.7.20 Mortality Rates at Baseline

Important mortality rates are shown in Table 5-10, and additional rates are shown in Appendix 2, "Demography."

Table 5-10: Baseline Observed Mortality Rates in Four Research Areas of the Danfa Project District, First Vital Events Registration Period, 1971-72.

	Area I	Area II	Area III	Area IV
Infant Mortality Rate[a]	54	79	99	59
Preschool Mortality Rate[b]	16	17	23	16
Childhood Mortality Rate[c]	25	31	41	24
Crude Death Rate[d]	12	14	15	10

[a]Per 1000 mid-year population under age one (used instead of live births because of high in-migration)
[b]Per 1000 population 1-4 years
[c]Per 1000 population 0-4 years
[d]Per 1000 population

Although mortality rates in Area III were not very different from 1970 National Census estimates, the rates of the other three areas were lower than expected. Area I had the most effective registration assistants but there may still have been significant underreporting of deaths in all four areas.

Attempts were made to obtain data about causes of death both from death certificates and a special death recording form. The data proved to be unreliable, however, because the great majority of deaths occur in the village

and not in the presence of a trained health care worker who could determine the cause of death. The information supplied by a relative some time later when the death was registered was generally rather vague and impossible to attribute to a reasonably specific cause.

5.8 FACTORS AFFECTING HEALTH STATUS

There are a number of factors that affect health status in the Danfa district, both positively and negatively.

5.8.1 Sociocultural Factors

Well being is enhanced in the Danfa Project district by clan ties and customs that tend to provide stable role models for the growing child and much personal security from childhood through old age. There is a strong tradition of community support for village self-help activities as evidenced by the volunteer labor supplied to build the Danfa Health Center and other village sanitation projects. In the first Health Practices Survey 37% of households in Area I reported that at least one member was involved in a cooperative community activity, but fewer than 20% so reported in Areas II and III.

Perhaps related to several decades of health education work in the Greater Accra Region, the knowledge of proper nutrition seems relatively high in the Danfa district. Prolonged breastfeeding is the rule; the average woman breastfeeds her infant for 16 months. This promotes strong maternal-infant bonding and provides emotional security to the infant, as well as ideal nutrition and protection from many diseases for the first six months of life. The addition of weaning foods, usually maize porridge, commonly starts between three and five months of age; in Area I, 76% had begun before nine months of age. Between six and 19 months of age a high protein food such as legumes, fish or meat usually is added. However, in about 40% of cases women in early Project surveys reported that they waited until after 12 months to begin these protein foods. This suggested that at least 40% of children were receiving an inadequate weaning diet.

Perceptions of the causation of a particular disease entity plays a dominant role in the way people attempt to cope with it. The child health practices segment of the longitudinal survey explored the knowledge, attitudes, and practices of mothers responsible for young children with regard to some important childhood problems. At times, the people in the Danfa

district seemed surprisingly sophisticated. For example, when asked what causes worms in a child, 56% in Area I associated worms directly with the child either eating "dirty" food or playing in the dirt or some form of poor hygiene. Seventeen percent associated worms with eating too much of a specific kind of food and only 2% associated worms with some supernatural causation.

When asked about the cause of fever in a child, 18% associated fever with mosquito bites. Thirty-six percent thought fever came from overheating or playing too long in the sun. Again, only 2% thought fever was the product of supernatural forces. Only 1-2% of the mothers said they would take the child to a traditional healer in preference to a hospital or clinic (i.e., a scientific medicine establishment). By contrast, 9% of the mothers in Area I believed convulsions to arise from a supernatural causation and, in the case of convulsions, 20% said they would take the child to a traditional healer. We recognize that many people use both traditional and modern healing systems simultaneously (including, at times, the Danfa Health Center staff), but it is significant that the mothers openly averred that, for this problem which was viewed as supernatural in etiology, they would opt for traditional methods.

In another, if minor, example of how local custom interacts with health, 90% of mothers said they do not bathe a child with measles. Local belief is that doing so causes the agent (whatever it may be) to move from the outside of the body and penetrate the inside, with dangerous effects. (For other results of the maternal and child practices KAP see Appendix 3.)

When a malaria prophylaxis campaign was undertaken for 0-10 year olds in the district, a survey was done both to determine participation rates and to find out why there were some nonparticipants. One of the discoveries was that mothers who gave modern explanations for the cause of childhood fever had greater rates of entry into the program and greater continuation rates than mothers with more traditional beliefs (10). This appears to be a demonstration of the linkage between understanding and effective action.

Finally, the effect of level of education as a determinant of health status is unclear. It did not affect the rate at which mothers brought their children to be immunized, nor their participation in a malaria prophylaxis campaign, but it did correlate with attitudes toward family planning.

5.8.2 Environmental Factors

One of the most significant environmental factors is the combination of climate and geography which is conducive to the support of the Anopholes gambiae and funestus species of mosquito. A. gambiae is the most effective and dangerous vector of falciparum malaria known in the world. It is very difficult to control and is the major factor underlying the high endemicity of malaria in West Africa.

The first Health Practices Survey (1973) established baseline levels for several key variables related to environmental sanitation. The main findings were related to refuse and human waste disposal and water supplies.

REFUSE

Seventy-three percent of the population of the Danfa district lived in villages in which refuse was not adequately managed. In these villages, refuse and brush were either dumped more or less indiscriminately in multiple locations or, if generally placed in one or two locations, tnese were simply allowed to pile up and serve as breeding grounds for rodents and insects. In villages where refuse was adequately handled, it was usually burned at intervals frequent enough to reduce it in volume and destroy it as a refuge for pests.

HUMAN WASTE

A large majority of the population over age six did defecate under reasonably sanitary conditions, usually by use of maintained pit latrines. However, the survey showed that the discipline of young children with regard to elimination was extremely lax; nearly 90% of children under six of households interviewed defecate nearby the house in areas likely to be used by other (barefooted) children. Even the fairly high numbers of pit latrines present in the Project district left considerable room for improvement, since most were not covered and served as incubators for flies and other insects. Moreover, some were relatively enclosed for privacy and worse, were "modernized" with tin roofs. The combination left them hot and malodorous and encouraged many people to bypass them in favor of the open bush. For both adults and children, personal hygiene following defecation was very poor: soap was not a commodity readily available in many village households, and even water was scarce during the dry season.

WATER SUPPLY

Another important envrionmental factor is water supply. The Project district overlies hard pre-Cambrian rock that contains very few aquifers. As a result, shallow wells are impossible to construct and there are very few locations where even deep drilled wells are feasible. There are very few natural springs to feed gravity flow systems. As a result, many villages rely on streams and especially pond water which is the least desirable source, as it is stagnant, often used for both bathing and drinking, and is frequently contaminated.

A key component of the government's rural development program is the construction of a piped water system. Area I of the Danfa district, lying between Accra and one of the main sources of water for the city, had the advantage of having a large aqueduct pass through it. Thus, 58% of the people in Area I lived in villages receiving pipe-borne water from off-shoots of the main pipe. While the supply could be erratic, most of the time these people were able to obtain a reasonable supply of sanitary water.

The other 42% augmented their supply during the rainy season by collecting rain water in containers. For better-off households which had sheet-tin roofs collection of run-off was fairly simple. For the majority of households, however, their thatched roofs provided less opportunity and thereby a smaller supply. During the dry season, water was carried by the women and children from ponds which, in some cases, were several miles distant. Under these circumstances, the household's water supply for any purpose other than drinking or cooking was quite meager. As the dry season progressed, many of the sources became brackish. Also few of the ponds had a pier, so that people scooping water had to wade in and place the pond at risk in the transmission of guinea worm. Since firewood was expensive, boiling of water was not a common custom.

5.8.3 System Factors

The single system factor which we have found to have the greatest impact on health (operating through delivery of health services) is distance between the patient's residence and the health service facility. Early studies of attendance patterns at the Danfa Health Center showed that 70% of visits were made by persons who lived within three miles of the Health Center. The availability of transport was a factor, in that patients tended to travel

further if they lived in villages served by public transportation (the famous mammy-lorries of West Africa) than if they lived in villages in which transportation was not available.

Even more striking was the difference in distance traveled when only preventive services were considered. Before 1972 all the children who attended well-baby clinics with acceptable regularity lived in villages less than one mile from the Health Center. This effect was demonstrated again in the first mass-immunization campaign in 1974, in which 89% of children living in the village in which the immunization team was working were immunized, compared to 72% of children living up to a mile away, and 67% of children living two miles away. Not one out of 40 children known to be living three or more miles from the vaccination site were brought for immunization, even though the same information about the program was given parents in these villages as in the others.

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6. HEALTH CARE DELIVERY

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6. HEALTH CARE DELIVERY

6.1 OBJECTIVES OF HEALTH CARE DELIVERY

The major goal of the Danfa health care program has not changed during the life of the Project, namely: "To undertake research into the most useful and efficient means of utilizing available manpower and other resources in the operation of Health Post-centered comprehensive rural health services" (USAID Project Paper 5-16-70, p. 2). The original health care objectives (p. 16) were:

"(a) To establish a fully functioning rural family health center with:

- Comprehensive service including preventive and curative services, services given both in the Health Center and in the community, immunization, environmental sanitation, nutrition, health education, care of all family members, referral of serious cases to major hospitals.
- Emphasis on maternal and child health.
- A modest nutrition program.
- A staffing pattern utilizing primarily the services of paramedical workers presently available and being trained in Ghana.
- A scope of staffing and services intermediate between current government health posts and primary health centers.
- A service area population of 15,000.

(b) To establish a records system in the Center which is functionally linked to community health studies and to the national demographic survey.

(c) To test several hypotheses concerning the association of health services and family planning by means of a quasi-experimental research design.

(d) To establish a health education program emphasizing MCH and family planning.

(e) To organize an ongoing operations research program to evaluate the organization and functioning of the Health Center and associated community program."

By 1975 most of these objectives had been reached, although the research design to test hypotheses concerning the association of health services and family planning was largely abandoned because the Government of Ghana decided to integrate all family planning services with MCH services, and because of statistical and demographic limitations. This freed the Project to engage in more flexible innovations of health care delivery, and in 1976 a new Project paper was prepared with revised objectives and activities.

The Ghana Medical School has a permanent commitment to the Danfa Health Center and its surrounding district, and the preparation of the second Project Paper enabled the formulation of long-term, but specific objectives. Not all were to be completed by the termination of the USAID-UCLA contract in 1979, but targets were set so that there would be substantial progress in many of the areas of endeavor.

The primary health service objective, according to the revised Project Paper of 1976, is the demonstration of several cost-effective health care system models that include family planning as an integrated component suitable to the Ghanaian context. The subobjectives related to family planning will be dealt with in Section 7, "Fertility," and Section 8, "Family Planning."

The major subobjectives, or outputs of the health care program and their related activities, are:

(a) To develop systems for increased accessibility of health services by:

- Continuing evolution and evaluation of the satellite clinic concept.
- Continuing development and evaluation of community-based and mass approaches to the delivery of preventive health services.
- Experimenting with and evaluating extended services utilizing volunteers and traditional health workers.

(b) To develop methods of increased community participation in the health care system by:

- Experimenting with community education programs which include the design, implementation and evaluation of various approaches to community health care.
- Involving the community in the planning and implementation phases of health care programs.
- Identifying and involving other members of the traditional health system, apart from TBAs.

(c) To increase the effectiveness of human, physical and financial resources by:

- Analyzing costs to ensure that services do not exceed available resources and comparing the cost effectiveness of alternative approaches.
- Carrying out functional analyses of services, subsystems and components.
- Standardizing and simplifying patient management procedures, including drug regimens.
- Improving utilization of health personnel by means of task analysis, development of job descriptions, simplified operational manuals and in-service training.

(d) To develop systems that improve quality of care by:

- Establishing feasible minimum standards of preventive and curative care for major health problems.
- Establishing improved management methods (including functional job descriptions and operational manuals).

(e) To develop systems that improve environmental sanitation by:

- Exploring means for increasing the quality and quantity of rural water supplies.
- Demonstrating improved methods of village refuse and excreta disposal.
- Demonstrating self-help methods of vector control feasible for rural villages.

(f) To develop coordinated research and applied programs with systematic flow and feedback of information by:

- Maintaining formal links with the Ministry of Health at all levels.
- Conducting workshops with specialized personnel of operating agencies.

6.2 OVERVIEW OF PRIMARY HEALTH CARE PROGRAMS IN THE COMMUNITY, CLINICS AND SCHOOLS

A major tenet of the Danfa Project has been that "diseases that are due to an inadequate social and cultural environment can be controlled or eradicated only through improvement in the total living conditions of the people affected (1)." Although the Project could not improve all the conditions affecting healthful living, it did propose to implement a comprehensive health care program which would also include an emphasis on agriculture and water supply, subjects not embraced in a typical health program. This health program is comprehensive, both in the broad range of services provided and in its coverage of the Project district population.

The original strategy for the provision of curative and preventive comprehensive health services was twofold: first, establishing a service program primarily based at the Health Center but with home visiting carried out by community health nurses and village self-help sanitation projects supervised by a sanitarian; second, implementing a health education program based largely in the villages and using Health Education Assistants (HEAs). As time progressed it became clear that a program based at a Health Center or relying primarily on health professionals to provide services would not reach a large percentage of the population with many of the essential services.

Thus, the health care program was modified to bring the services closer to the villages where the people resided, first through satellite clinics and later through village-based programs of malaria prophylaxis, immunization and primary care using volunteer Village Health Workers. Multiplication and extension of health professional skills were achieved by training village volunteers to provide many of the services needed in their own communities.

6.2.1 Maternal Health Care Program

Maternal mortality is one of the most important health problems in West Africa. Child mortality, of course, is also a problem of great magnitude. However, because the death of a mother results in far more serious consequences for a family, mothers' deaths are of greater concern.

The major maternal health problems are infertility, maternal depletion from overwork and too frequent pregnancies, and, most importantly, maternal mortality from obstetric complications of hemorrhage, infection and toxemia.

The objectives of the maternal health care program are:

(a) To reduce maternal mortality by 30%.
(b) To reduce maternal morbidity.
(c) To increase birth intervals and reduce fertility.

The activities to achieve these objectives are a part of the overall health care program. The two most important efforts of the maternal health program are to improve obstetrical services and to make family planning information and services accessible to the entire population.

Obstetrical care is rendered by three groups: traditional birth attendants (TBAs), the Danfa Health Center staff, and the obstetrical staffs of Mampong and Korle Bu Hospitals.

(a) Training Traditional Birth Attendants: In Areas I and III most of the traditional birth attendants have been registered and trained in improved obstetrical methods, maternal health and family planning. Regular follow-up and supervision of those trained is being carried out.

(b) Health Center and Satellite Care: All mothers are encouraged to have one early prenatal visit in the first trimester to the Health Center or satellite clinic, and subsequent prenatal visits each month to a trained TBA or to a Danfa clinic. All high risk women are to be followed and delivered at the Health Center. Standards of Performance are clearly set forth in the MCH Manual of Procedures (2) developed early in the Project's history. Regular in-service training courses are held for the MCH team to assure competency.

(c) Obstetrical Care at Mampong and Korle Bu Hospitals: More complicated cases can be referred to the district or regional hospitals with transport provided by the Health Center ambulance when needed.

6.2.2 Child Health Care Program

The child health care program was developed using a matrix that charted disease problems according to prevalence, severity and susceptibility of the problem to attack. Death certificates from the Project district were examined in an attempt to determine cause of death. Results of medical student surveys in the area were considered, as were the causes of death reported at Korle Bu and for the nation as a whole.

Based on these analyses the following objectives were defined:

(a) To reduce the infant mortality rate by 30%.
(b) To reduce the preschool mortality rate by 50%.
(c) To reduce infant and preschool morbidity rates due to:

Malnutrition	Pertussis (whooping cough)
Malaria	Helminthiases (worms)
Measles	Accidents
Diarrhea	Poliomyelitis
Tuberculosis	

Again, the various activities to achieve these objectives are integrated into the overall health care program described below. The child health program especially focuses on the major causes of childhood mortality as follows:

(a) Neonatal: Reliance is placed particularly upon the traditional midwives to ensure that infants delivered under their care receive sanitary cord care to prevent tetanus. In addition, these midwives receive instruction in simple techniques in the resuscitation of the newborn. This program has the potential of decreasing the infant mortality rate by 6% (rate estimated from national statistics showing 3% of deaths in 0-5 age group caused by tetanus.)

(b) Malnutrition: Baseline studies confirmed that first and second degree protein-calorie malnutrition (mild to moderate) is common as indicated by weight-for-age and height-for-age measurements of children in the area (see Subsection 5.7.3). Because these conditions increase the likelihood of death from diarrhea, measles, or respiratory infections, a major emphasis of the child health program is preventive nutrition. A successful nutrition program could reduce infant deaths by 10% and preschool deaths by 20%.

(c) Malaria: Malaria is a major "killer disease" in this area. A program of malaria prophylaxis with pyrimethamine (Daraprim) 25 mg. per month, supplemented with chloroquine therapy for fevers, is being carried out. A distribution system was organized through the young child clinics or with the aid of volunteers in each village.

This program has the potential of reducing infant deaths by 5% and preschool deaths by 10%.

(d) Measles: Measles immunization is provided for children over 12 months of age. This can eliminate about 5% of infant deaths and 10% of preschool deaths.

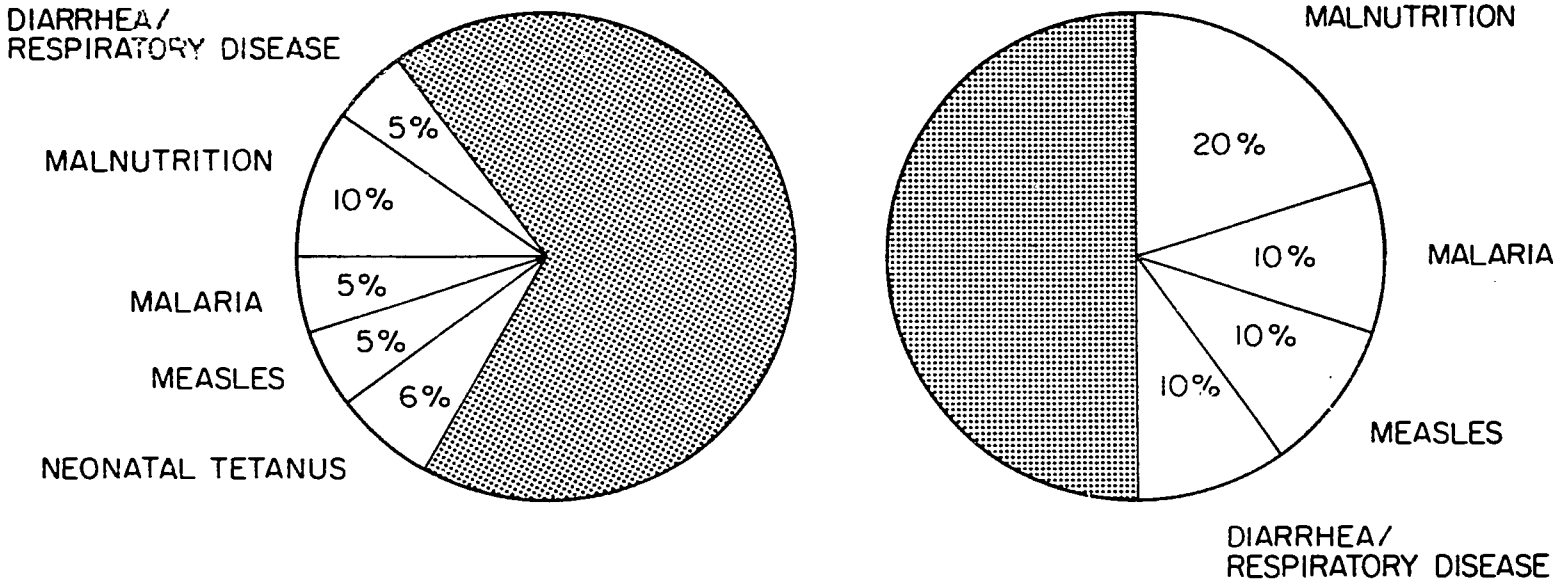
(e) Diarrhea: Improved sanitation (such as piped water) can reduce the prevalence of this condition. Improved nutrition should further reduce the severity in many cases. In addition, two other important modes of attack are used:

- Education for home nursing - mothers are taught how to feed and hydrate an infant with diarrhea.
- Treatment - children with clinically significant diarrhea can be treated with fluids and antibiotics (when indicated) at the Health Center or satellites, or referred for intravenous rehydration.

(f) Respiratory disease: Severe viral pneumonia is usually as common as bacterial pneumonia in causing death among children in developing countries. Still, a certain number of deaths due to bacterial pneumonia could be prevented by the use of sulfadimidine and penicillin for children seen at the clinics with severe cough and fever. Improved nutrition is also

Figure 6-1

DANFA CHILD HEALTH CARE PROGRAM
POTENTIAL FOR REDUCTION OF INFANT (IMR)
AND PRESCHOOL (PS MR) MORTALITY RATES



IMR = 54/1000[a]

PS MR = 16/1000

a = MID-YEAR 1972
SHADED AREA RESPRESENTS RESIDUAL MORTALITY

likely to reduce mortality due to respiratory infection. Respiratory deaths associated with pertussis or measles can be prevented through immunization.

Prevention of many deaths due to diarrhea and respiratory disease should result in a reduction in the infant mortality rate by, at least, another 5% and in the preschool mortality rate by another 10%.

6.2.3 Summary

Thus, with the above programs there is the potential of reducing the infant mortality rate by 30% and the preschool mortality rate by 50%. This should reduce the mortality rate in the under-fives group by about 40% (see Figure 6-1).

6.3 HEALTH CENTER-BASED SERVICES

After the Ghana Medical School identified the Danfa district as a suitable location to develop a teaching, research and service program, the chiefs and people of the district indicated that they had a strong desire for a health center. In fact, the government had been planning to build a health center in the area. Although this had not been the first priority of the Medical School's assessment, it was mutually agreed that a health center would make a suitable rallying point from which other community activities could be organized. The Danfa village was selected as the site and the Center constructed, partially through communal labor.

6.3.1 Objectives of Health Center-based Services

The objectives of the Health Center program are:

(a) To provide primary medical care aimed at the major causes of morbidity and mortality, especially in mothers and children.
(b) To orient the staff to become more involved in meeting community health needs.
(c) To support the community in organizing communal efforts aimed at improving the environment.
(d) To keep accurate records of morbidity in the Project district.

6.3.2 Danfa Health Center Staff and Services

At the present time the following services are provided at the Health Center itself:

(a) Maternal Health Care:
- Prenatal clinics
- Labor and delivery
- Postpartum clinics
- Family planning services
- Acute care, including referral where indicated

(b) Child Care:
- Acute care, including referral where indicated
- Under-five clinics, including malaria prophylaxis (if not given in the village) and immunizations (series 1A)

(c) Adult Health Care:
- Acute care including referral where indicated

(d) Laboratory Services:
- Hemoglobin determinations, urinalysis, stool exams

(e) Nutrition Education and Agricultural Extension:
- Demonstration garden at the Health Center, and maternal and child nutrition education, especially in conjunction with weighing programs.

(f) In-Patient Care for Minor Medical Problems:

The Health Center staff fluctuates in size, but basically consists of:

1	Health Center Superintendent	1	Record Clerk
2	Staff Midwives	1	Laboratory Assistant
2	Community Health nurses	1	Enrolled Nurse
1	Health Inspector	2	Drivers
1	Dispensing Assistant	2	Cleaners
2	Midwifery Assistants (volunteers)		

6.3.3 Health Center-based Service Development

Soon after services began, the University of Ghana Medical School (UGMS) UCLA Project team undertook a number of activities to improve the Health Center's efficiency and effectiveness. These activities focused on the following:

(a) Records and Information System: This system was designed to meet the service and research needs of the Project. Each patient seen at the Health Center obtained an I.D. number either assigned in the village during a census or at the Health Center. For each visit an encounter card is completed which provides information about the patient (age, sex, village, etc.) and his illness (diagnosis, services rendered). By periodically tabulating these data, the program managers can generate information concerning services rendered, morbidity statistics and population coverage.

Initially it was felt that the maintenance of a family folder at the Health Center for each household would result in more comprehensive and informed care for each family member. Such a system was instituted but it was found that, in practice, the staff rarely had time to consult the health records of other family members. In addition, a substantial amount of time was required to wait in line at the record clerk's station and for the folder to be located and transmitted to the appropriate health worker. The hard covered folders were used more as writing boards. As a result the Health Center began to use a firm, cardboard weight card (known as a "Road to Health Card" or "Morley Card") for children under five. Information about growth and development, preventive services received and acute illnesses could be noted briefly on the card. Most importantly, the card is retained by the mother and is available to a health worker wherever the mother travels.

The card is also more suitable for usually busy West African health centers where large numbers of patients must be seen in a short period of time. The child's entire health history can be ascertained at a glance. Development of patient-retained records for other family members is also planned by the Department of Community Health (DCH).

(b) Job Descriptions: Soon after the Health Center began operations, the usual Ministry of Health duties were modified to assure attainment of Project objectives, and detailed job descriptions for each member of the staff were developed (see Table 6-7).

(c) Functional Analyses: In 1971, a functional analysis of Health Center operations was carried out and a number of changes made to increase efficiency, including:

- Daily MCH clinics - Previously, maternal and child clinics were operated only one day a week and maternal clinics were offered on a different day than the child welfare clinics. As a result of the functional analysis, recommendations were made to operate maternal and child clinics each day so that the mother could come at her convenience.
- Combined MCH clinics - The maternal and child clinics were held in the same room so that the mother need not wait twice if both she and her children needed care. Moreover, the midwives were trained to care for children as well as treat mothers at the clinics. Previously the midwives had been underutilized because of the small number of Health Center deliveries. Subsequently, they were able to aid with the heavy child clinic load.
- Pre-packaging of drugs - The analysis showed that patients spent a long time waiting for prescriptions to be filled and for the dispenser to count out pills or pour out mixtures. The recommendation was made that commonly used drugs be packaged in small standard treatment units so that they could be dispensed quickly. Dispensary waiting time became markedly shorter.

(d) MCH Manual: A manual was prepared which detailed the standards for preventive maternal and child care and included treatment regimens for common conditions.

(e) Formulary: Cost studies showed that a wide range of sometimes very expensive drugs were being used, often inappropriately, or could be replaced with a less expensive preparation. Therefore, a committee was formed to review the drugs needed and to prepare a formulary. As a result, the number of drugs at the Health Center was reduced from over 200 to 76. In addition, the committee gave recommendations for reduced lengths of treatment where indicated, for example, one dose treatment of malaria in partially immune persons.

(f) In-service Training Programs: Regular in-service training courses covered new duties and skills, re-emphasized objectives and oriented new staff members.

(g) Under-five's Clinics: The traditional child welfare clinic was restructured to follow more closely the organizational pattern developed by David Morley in Nigeria. Emphasis was placed on close, monthly weight surveillance (especially children 6-36 months), nutrition education, immunization and malaria prophylaxis.

6.4 SATELLITE CLINICS

In 1972, a study of a sample of those served at the Health Center showed that the Danfa Health Center was drawing 70% of its patients from within a three mile radius of the Health Center; a circle that encompassed only 23% of the area's target population. It was decided, therefore, to start weekly satellite clinics in each of three villages selected on the basis of distance from the Health Center, accessibility to surrounding villages and willingness of the community to provide and help maintain the clinic premises and to provide one or two volunteer assistants at each clinic session. The Health Center staff was divided into two rotating teams. One team, made up of the Health Center Superintendent, a community health nurse, a midwife and a midwifery assistant, provides services at the satellite clinics. The remaining Danfa Health Center staff provides daily services at the Health Center. The two teams alternate roles every week, with the exception of the Health Center Superintendent who permanently heads the mobile team three days a week. Preventive and curative health services, similar to those listed above for the Health Center, are provided.

6.5 OVERVIEW OF COMMUNITY-BASED PROGRAMS

The progressive involvement of the community in the provision of services can be divided into three phases. Phase I included four programs:

- Health Education
- Nutrition
- Sanitation
- Training of Traditional Birth Attendants

Activities in health education, nutrition and sanitation were closely coordinated and integrated. Nevertheless, each can be described as a separate program entity for purposes of this report.

Phase II was marked by the introduction of two new community-based programs:

. Malaria Prophylaxis
. Expanded Immunization

Phase III in the development of community-based programs is the Village Health Worker (VHW) program. The components of each of these three phases of the community-based programs are described in the following subsections.

6.6 PHASE I: HEALTH EDUCATION

The health education component was one of the major Project strategies aimed at improving the total living conditions of the people. The Department of Community Health was interested in determining the impact of health education alone on health behavior and health status, as well as its impact when integrated with Health Center-based services. As a result, two different models of health education were implemented: an integrated district model in Area I and an independent regional model in Area II.

Because the conventional Health Center staff would be heavily committed to other aspects of the health care program, the Project decided to experiment with a new community health worker, to be called a Health Education Assistant. The Health Education Assistants (HEAs) were selected from existing unipurpose workers primarily within both the health and family planning agencies in the country. This group consisted of community health nurses, Nutrition Technical Officers (both seconded from the Ministry of Health) and family planning field workers (seconded from the Planned Parenthood Association of Ghana). In addition, two individuals were recruited from the research section of the Danfa Project and provided training which was reasonably equivalent to that of the health inspection assistants. All HEAs received training in maternal and child health, sanitation, nutrition, family planning, and health education methods and materials. Six of the eight HEAs are women.

6.6.1 Objectives of Health Education

The objectives of health education in the Danfa Project were to:

(a) Provide comprehensive health education coverage for all villages in Project Areas I and II.

(b) Create and maintain effective lines of communication between the staff of health facilities in the areas and the villagers.

(c) Motivate villagers to rely on preventive measures in the improvement of health and community welfare.

(d) Employ a multidisciplinary approach (nutrition, maternal and child health, sanitation, and family planning) in the solution of rural health problems.

(e) Provide continuity of health care, through a system of patient referral and follow-up, to and from health facilities.

6.6.2 Health Education in the Integrated District Model - Area I

For purposes of better coverage of the area with health education services, Area I has been divided into five sub-areas. Four of the sub-areas are covered by four Health Education Assistants (later reduced to three), while the fifth sub-area has been the responsibility of other Danfa Health Center personnel. A District Public Health Nurse, who reports directly to the District Medical Officer, supervises the educational input. This arrangement was made to ensure that all health education activities in the area are channelled through individual health workers assigned the educational responsibility for specific communities.

The health education program under this model consists of the educational inputs provided at the Danfa Rural Health Center, the various satellite clinics, the family planning clinics as well as inputs independently provided in the communities. Thus, this model combines the widely accepted policy of, "all health workers as health educators " with the approach that utilizes specially trained personnel with health education as their primary focus. Educational efforts in all the mentioned settings are meant to reinforce one another.

A variety of alternative approaches to geographic distribution of HEAs have been tried. A major consideration in assigning health workers to villages has been to minimize transportation demands. Thus, the Health Center staff are responsible for the 13 communities within a four to five mile radius of the Health Center, which contains a population of approximately 4,000. Health education related activities in the communities are, as far as is practicable, carried out in the late afternoons and on weekends.

As already implied, the four Health Education Assistants are integrated administratively into the organizational framework of the Health Center and are within the jurisdiction of the District Medical Officer. Each of the four HEAs is assigned a cluster of villages ranging from five to 15 and divided so as to provide geographic coverage of all villages in the area. Base villages, in which the HEAs reside, are selected which have easy access to local transportation, adequate housing, a central location in relation to the other villages, and a significant population. The HEA plans most of the field activities, usually in consultation with the supervisor. The HEA is not isolated, for the supervisor (a public health nurse) visits once a week and the HEA is in regular contact with other members of the Project team, particularly the staff of the Health Center.

6.6.3 Health Education in the Independent Regional Model - Area II

The health education program in Area II consists of the health education provided at the Amasaman Health Post (run by the local authority), at the family planning clinics, and independently in the communities.

The independent community-based health education is provided by four Health Education Assistants (later reduced to three), who are each assigned a cluster of villages. They carry out field activities in ways similar to their counterparts in Area I. The major difference between the two models is in the nature of the relationship of the health education program to other health services. In the independent model, the HEAs operate independently but collaborate with other frontline workers in their service areas. The supervisor plays the role of a "district health educator" and is answerable directly to the health education specialist, who plays the role of a "regional health educator."

The health education program reinforces the Project's family planning input in Area II, and is linked closely with other health and related services operating in the area. It must be noted, that the Project's only inputs in this area are family planning and health education. The HEAs, therefore, operate in situations where some of the new ideas introduced into the community cannot be implemented for lack of supporting services, such as comprehensive health coverage.

6.6.4 Field Activities in Areas I and II

The activities and performance standards related to each of the five primary health education objectives listed in Subsection 6.6.1 are:

(a) Comprehensive coverage of population in all villages in Areas I and II. Health education workers (Health Center staff or HEAs) are expected to make contact at least once a month with each of the communities (of more than 50 inhabitants) to which they are assigned. The health education worker completes a work plan which should indicate scheduled visits to each of her communities. The worker maintains a daily record of communities visited, the educational topic considered, the group contacted, the specific health education method used, the number of participants and the time spent in the activity. Quarterly analysis is carried out to determine the extent to which monthly contact is actually made in each community.

(b) Creation of lines of communication between Health Center staff and villagers. This objective focuses on providing coordination between the village population and the existing health facilities. Because Area I has more extensive health services available than Area II, comparison in this effort can only be made within an area and not between areas. Changes in the utilization rates of health services that are related to specific health education efforts are one method of evaluating the "link" between health personnel and villagers. Monthly summaries of health facility utilization are available for Area I. This is not yet the case in Area II. The Project

also determines the proportion of target groups that take advantage of specific health services provided periodically in the community (the percentage of children under five participating in a malaria prophylaxis program, immunization campaign, or village weighing sessions and associated child welfare education programs).

(c) Concentration on the use of preventive measures to improve health. Once measurable objectives have been set at the community, sub-area, and area level, the activities of the community, the efforts of the health education worker and the total effect of the health education program can be evaluated by measuring the difference between the reported change in preventive health behavior (protecting drinking water, using child welfare clinics, etc.) which took place at the time of the re-survey, and the change desired or anticipated at the outset.

(d) Use of multidisciplinary approach in attacking rural health problems. The Health Center staff and HEAs are expected to provide educational motivation in the four fields of family planning, maternal and child health, nutrition and environmental hygiene. From the above records, a quarterly listing of time spent in each community on each of these topics is prepared. A standard of one hour per month per topic per village is set as the minimum at which a given worker can be considered to be providing a multi-purpose health education input.

(e) Provision of health care through an established system of referrals and follow-ups. The purpose of this is to motivate individuals such as pregnant women, those needing family planning assistance, and parents of severely malnourished children to seek appropriate health care. Assessment is made of the proportion of referrals written which are completed providing an index of referral efficiency. Evaluation is also made of the number of follow-up requests written by Health Center staff in Area I, the health team in Area II and the family planning team in both Areas I and II, and the number effectively handled by the health education worker.

Educational activities by the Health Center staff, as well as the HEAs are carried out on three levels:

- Health education in the community.
- Health education in clinical settings.
- Health education in schools.

Table 6-1 shows the types of activities carried out by the HEAs. The HEAs utilize a community development approach to education by working through community leaders, community groups, and households which have been designated as being high risk for specific health problems. The four HEAs in Area II cover all of these 63 communities. In Area I, the four HEAs cover 48 of 61 villages; the rest are the responsibility of the Danfa Health Center Staff. They provide their own lodging and travel to villages for which they have responsibility by foot, bicycle, local "mammy-wagons" or, when available, a Project vehicle.

6.7 PHASE I: NUTRITION

All members of the health team are involved in activities of the nutrition program which has as its objectives:

(a) To prevent malnutrition, especially in mothers and children.
(b) To identify persons at risk of developing malnutrition.
(c) To identify persons with any degree of malnutrition.
(d) To rehabilitate those found to be malnourished.

Attainment of these objectives requires the integrated efforts of all health workers as well as cooperation with the agricultural extension service and community development workers. The activities carried out in relation to each objective are described below.

6.7.1 Prevention

One of the most important activities is to ensure the adequate production of nutritious foods. In 1972 a farmers group was formed whose first activity was to organize a food exhibition during which the farmers demonstrated the various crops raised in the area. It was then

Table 6-1: Activities of Health Education Assistants by Setting

Setting	Activity
Community	Developing men's and women's groups; community health committees; surveying and planning, organizing communal labor groups for latrine construction, improving water supplies, refuse disposal, general village maintenance; school health, participation in anti-malarial, deworming, immunization campaigns.
Group	Education discussions in family planning, maternal and child health, sanitation, nutrition; weighing sessions for under-fives.
Household	Home visits to discuss all topic areas; follow-up request visit; referral visiting.
Health Post/Satellite Clinic	Participation in under-fives and prenatal programs; discussions in all topic areas; individual patient counseling.
Family Planning Clinic	Individual counseling; group education.
Special Health Events	Notifying village leaders and communities of activity; motivating attendance; assisting in registration services.

agreed that crops should be diversified to include a number of crops that would improve nutrition if made available (tomatoes, pulses, garden eggs, amarantus and Indian spinach); that production should ensure the availability of food throughout the year; that every farmer should be introduced to improved farming techniques (improved seeds, fertilizers, insecticides); and that a demonstration farm be set up at the Health Center. The demonstration farm and other area-wide activities associated with these objectives became a project of the Extension Division of the Faculty of Agriculture of the University of Ghana. Visits have been made to farmers at their farms and regular meetings have been held with farmers at the Health Center. Farmers have been supplied with improved seeds and easy access to fertilizers.

Education in preventive nutrition during pregnancy and childhood is a priority activity of the Health Education Assistants, the midwives and the community health nurses. Important topics include the value of prolonged breastfeeding, the potential risks of bottled milk formulas, ideal weaning foods (including mixtures of cereals and legumes), feeding during illness, the importance of immunization in preventing diseases, such as measles and whooping cough, which can have a devastating nutritional impact, proper diet during pregnancy and lactation, and the value of child spacing to ensure prolonged lactation and the nutritional recuperation of the mother. Mothers are counseled on proper nutrition during each under-fives clinic visit and nutrition demonstrations are given regularly. Women's groups were formed in nine of the larger villages; one of their major activities was demonstrating the preparation of nutritious foods.

6.7.2 Identification of Persons at High Risk of Developing Malnutrition

The Health Education Assistant and members of the Danfa Health Center's MCH staff were instructed to be alert to identify:

(a) Infants whose mothers are unable to breastfeed sufficiently.
(b) Infants whose mothers have died.
(c) Infants whose mothers conceive again before the child's first birthday.
(d) Infants who are completely weaned before 12 months.
(e) Infants of families of very low socioeconomic status.

(f) Infants or children who contract measles or whooping cough.

(g) Infants who contract severe diarrhea.

Mothers or caretakers of these children are provided with more intensive education and supplemental foods if they are necessary.

6.7.3 Identification of Persons with Malnutrition

Mothers are encouraged to bring their children for weighing each month. This can be done at the Health Center, at one of the satellite clinics, or during village-based weighing or arm-measuring sessions conducted by an HEA or Village Health Worker. Weights are recorded on a patient-retained weight card of the Morley type. Besides those children who show gross and obvious malnutrition such as kwashiorkor or marasmus, children are identified as being malnurished who:

- Have weights below the bottom line (representing the third percentile of international standards) of the normal growth pattern unless a special reason is known to explain the small size.
- Fail to gain weight during subsequent clinic visits.

6.7.4 Rehabilitation of Those Found to be Malnourished

Mild to moderate cases are given intensive nutrition advice and supplemental foods where indicated. Follow-up home visiting is carried out in most cases and more frequent return visits are scheduled. Severe cases can be referred to the Princess Marie Louise Nutrition Rehabilitation Hospital in Accra.

6.8 PHASE I: ENVIRONMENTAL SANITATION

The objectives of the environmental sanitation program in Area I are to educate villagers about the need for:

(a) Potable water, and to assist each village to obtain a potable water supply by the most feasible means.

(b) Sanitary excreta disposal, to assist in making accessible at least a pit latrine to all village inhabitants, and to help ensure appropriate use of these facilities.
(c) Appropriate refuse disposal sites, to assist in making these accessible, and to help insure their continued and proper use.
(d) Protection against disease vectors such as flies, mosquitoes, snails and cyclops, and to assist in promoting measures to control these vectors.
(e) Improved house construction for more healthful living.

The general strategy for accomplishing these changes is, first of all, to develop a close working relationship between the sanitarian and the village leaders. Measures are taken to stimulate the formation of Village Development Committees (VDCs) in those villages lacking them and to encourage a health interest in all VDCs. Village needs are assessed as a cooperative effort of the VDC and the sanitarian, and a schedule of self-help project targets is developed.

6.8.1 Water Supplies

Some of the most difficult obstacles to improving water supplies at low cost in a rural African setting are present in Area I. Except for a thin layer of top soil, the area lies on hard pre-Cambrian rock that contains few aquifers. As a result there are few opportunities for hand dug or machine drilled wells. There are no rivers and few streams or springs which would allow the easy development of gravity fed systems. Although many homes that have corrugated metal roofing do collect small supplies of rain water, these receptacles provide only a small percent of the family's needs and rain is very scarce during the long dry season from December to April. This explains the heavy reliance on ponds as the primary water source.

Activities aimed at improving water quality were centered in three areas: first, improvement of pond sources by hand- or machine-dredging to deepen the ponds and improvement of pond access points to eliminate wading and contamination. Second, prolonged storage in covered earthen containers which reduces bacterial counts. Third, the development of cooperative self-help projects to connect villages to the piped water

supply of the Greater Accra Region. Although expensive and difficult, this is the most desirable long-term solution in this area. Initial costs of the connection are partially defrayed through labor contributed for ditch digging and pipe laying. Once connected, each household must contribute regularly to maintain standpipe supplies.

6.8.2 Improved Excreta Disposal

The principal emphasis has been the self-help construction of large communal pit latrines at several convenient points in each village. These projects are organized and supervised by the Village Development Committees. Separate facilities are constructed for men and women. Demonstration latrines have been constructed at the Health Center to illustrate the ideal facility. In some locations septic tank latrines have been constructed by the Tema District Council. The importance of avoiding contamination of ponds or streams with either feces or urine is emphasized.

6.8.3 Refuse Disposal

The Village Development Committee designates several authorized refuse disposal sites in each village and the women's groups are responsible for their maintenance.

6.8.4 Vector Control

Cutting brush near dwellings and covering water containers is encouraged. However, the effect of these measures on the man-biting frequency of A. gambiae, the principal vector of malaria in the area, is doubtful. Such measures may have some effect on the prevalence of Aedes aegypti, the vector of yellow fever, but this disease is not usually a problem in this area in any event.

No measures were taken to control snails in the stagnant ponds used as water sources. Guinea worm was not a major problem in Area I but was in Area II. Consultations were held with the Department of Aquatic Biology of the University of Ghana to explore measures for reducing cyclops, the vector of guinea worm, in ponds in Area II.

6.8.5 Housing

The sanitarian provides Village Development Committees with information concerning methods of improving house construction. Important measures include: tin roofing and conduits for rain water collection, cementing for floors, covered containers for food and water storage, adequate lighting and ventilation, raised bedding, private latrines and/or urinals.

In addition, cooperative housing societies have been formed in three villages with 250 members. Small homes of modern construction have been built by the Department of Rural Development using self-help labor to defray costs.

6.9 PHASE I: TRAINING OF TRADITIONAL BIRTH ATTENDANTS

Maternal mortality has been identified as a serious problem in Ghana and in the Danfa district. One approach to reducing this problem would be to provide all women with modern prenatal and obstetrical services delivered by trained professional midwives or physicians in maternity centers or hospitals. This is difficult to do in most African countries for two important reasons. First, it is very expensive. Training midwives and doctors and providing salaries, housing and other amenities for them is becoming increasingly difficult. Costs of constructing health centers and hospitals and their recurrent expenditures are also very burdensome. Second, even where such facilities are available, women may have difficulty reaching them at the time of delivery, especially in rural areas where transportation is either completely unavailable or infrequent at best.

Another approach to solving the problem has been to train traditional birth attendants (TBAs), who already perform about 75% of deliveries in Ghana. This solution has several advantages:

- It is less expensive than training government midwives. One does not have to wait many decades to find enough personnel or money to provide improved services.
- It is less dependent on transportation, since the pregnant woman usually lives in or near the same village as the TBA.

- It allows childbirth to take place in a more natural setting. Rather than being confined to bed in a hospital separated from her infant and running the risk of cross infection, the woman can deliver in her own home, surrounded by her family. Bonding of the mother to the infant may also be enhanced in such a setting.
- Finally, after training, the TBA is a resident agent for health education in the village. He or she can help to improve nutrition, promote the use of antenatal care, and encourage family planning practices in the village.

6.9.1 Goals and Objectives of Traditional Birth Attendant Training

The goal of TBA training is, first, to reduce maternal mortality and morbidity; and second, to reduce infant mortality and morbidity. These goals can be broken down more specifically into several objectives:

(a) To reduce maternal deaths (or illness) from the three major causes during pregnancy:
- Hemorrhage (including ruptured uterus from obstructed labor)
- Infection (including both puerperal fever and septic abortion)
- Toxemia of pregnancy

(b) To reduce the risk of death by encouraging adequate maternal nutrition which enables the stronger, better nourished women to withstand both the expected and unexpected difficulties of repeated pregnancies.

(c) To reduce long-term maternal disability from urinary or rectal fistulas resulting from perineal or vaginal tears during delivery.

(d) To reduce the risk of death by reducing the number of pregnancies to which a woman is exposed (encouraging the use of modern family planning methods and prolonged breastfeeding).

(e) To reduce infant mortality and morbidity due to neonatal tetanus, asphyxia, infection, diarrhea and malnutrition.

A complete description of the Danfa TBA programs is in the Project publication, A Program Manual for Traditional Birth Attendents: Organization, Training and Evaluation (3)

6.9.2 Administration of TBA Training

Under the supervision of the District Medical Officer, the public health nurse in the district coordinates the TBA training program. Her responsibilities include the supervision of TBA identification and registration efforts, the selection of an appropriate training program for the TBAs, and the design of course content, continuing education, and follow-up.

6.9.3 Identification and Registration of TBAs

This was an important first step in recruiting TBAs for training and for planning an appropriate training program.

The village chiefs, elders and members of the Village Committee were approached first, by appointment, to gain permission for the registration and to explain the kinds of information to be obtained from the TBAs, the reason for registering them, the purpose of the proposed TBA training program, and the program's anticipated benefits for the community. Once permission was granted by village officials and names of TBAs supplied, the registrar located the TBAs to again explain the reason for the registration and the purpose of the training program. Village school teachers assisted in this effort.

Two hundred sixty-three TBAs and 26 assistants were registered in the Danfa Project's three study areas in 1972. The ratio of TBAs per population was about 1:137. Almost half of the practitioners were males. Six percent were literate. The mean age of the TBAs was 62; average number of years in practice, 23. TBAs averaged about seven deliveries per year and only a small number (6%) performed 20 or more deliveries per year. However, the initial registration confirmed that the TBAs are a major souce of health care for women in this rural area of Ghana.

In 1973, a detailed survey was administered to a sample of the TBAs registered. The survey elicited information about the TBAs knowledge and practices, and their attitudes toward family planning. Detailed

results are published elsewhere (4). TBAs generally gave correct or neutral advice to their patients. Although many delayed in referring women for complications, most recognized the benefits of early referral of serious problems. Most were supportive of family planning and 68% were interested in improving their midwifery skills.

6.9.4 Training Course

Based on information obtained in the questionnaire survey, a pilot training program was begun in Area I. Villages in the area were clustered into four groups to achieve efficient use of transportation and training personnel. Training began in the first cluster in June, 1973; the remaining clusters completed training in March, 1975. Of the 68 TBAs registered in this study area, 57 completed training, three additional TBAs joined the training program later.

It was clear from the survey questionnaire that these elderly, largely illiterate TBAs had limited capacity for assimilating modern midwifery practices; therefore, limited objectives were set for the course:

(a) Motivate and train TBAs to monitor women during the prenatal period.
(b) Motivate and train TBAs to recognize and refer high-risk women or those with serious complications of pregnancy or delivery.
(c) Train TBAs to perform safer deliveries.
(d) Train TBAs in the proper care of the cord.
(e) Enlist the aid of TBAs in promoting improved maternal and child health practices and family planning in their villages.

The course was organized and coordinated by a senior nurse-midwife and two public health nurses. Two physicians affiliated with the Danfa Project served as advisors. The initial course for each cluster consisted of eight three-hour sessions held every two weeks. Teaching methods included lectures, demonstrations and role playing. While TBAs were not paid for attending, they were provided with a midwifery kit at the conclusion of the training program (5).

6.9.5 Supervision

The follow-up process is a crucial component of the training program. If regular follow-up does not occur after training, the TBAs' interest diminishes and the program suffers as a result.

There are several objectives of the monitoring process:

(a) To maintain the TBAs' interest and involvement in the program and to reassure them that the government system has a continuing interest in the quality of their work.
(b) To ensure that referral channels remain open.
(c) To give technical advice and reiterate lessons.
(d) To evaluate the TBA and the program.
(e) To replenish supplies (if program directors decide to provide that service).
(f) To remind TBAs of periodic refresher classes and motivate them to attend.

Both the district public health nurse and the Health Center midwife have been used to conduct the supervisory visits and perform the following task:

- Maintain friendly rapport with the TBA.
- Discuss any problems the TBA has experienced in her practice or with referrals.
- Discuss any complications or deaths that have occurred since the last visit.
- Collect and record data on TBA activities since the previous visit.
- Periodically evaluate the quality of TBA work by observing the TBA during prenatal, postpartum and family planning visits.
- Replenish supplies (if this service is provided).
- Educate the TBA where deficiencies seem to exist.
- Inform the TBA of program activities, such as refresher courses.

Supervisory visits are augmented by periodic refresher classes held by the public health nurse or nurse midwife at a convenient location. To date, about eight or nine review classes have been held per year and attendance has been very good. At these sessions problems are discussed and important lessons reiterated. These classes are scheduled to continue indefinitely.

6.9.6 Evaluation

In 1977, each TBA was graded or rated by the supervisor based on performance in the refresher course and data obtained during supervisory visits according to eight criteria:

Attentiveness in training	Referral for family planning
Retention of knowledge	Provision of prenatal care
Cooperation	Use of cord packs
Referral of problems	Keeping up notebook

TBAs were rated on a scale of one to four for each criterion with high scores representing excellent performance.

Beginning in 1974, the Project's Vital Events Registrars began to administer a special birth questionnaire to all households having a live birth. Information was obtained concerning place of delivery, person performing the delivery, instrument used to sever the cord, cord dressing, prenatal or postpartum care received, maternal or infant problems during or after delivery, and current status of mother and infant (alive or dead). This information was used to aid in evaluating the work and practices of the TBAs.

During training the TBAs were instructed to use special cards when they referred patients. The cards helped to identify which patients coming to the Health Center were referred by TBAs and which TBAs were referring patients.

The Project's evaluation plan for the TBA training program adheres to the five objectives of training presented earlier. In addition, special attention was given to cost studies to determine the financial feasibility of widescale training and utilization of TBAs in Ghana.

The results presented below cover the period of May 1974 to August 1976 for 56 TBAs trained in Area I. Training in each cluster was completed at different times during this period. In all, 1265 trained TBA-months form the bases for the analyses. In this period the program cost was ₵3201 ($2783).

The number of reported deliveries performed by trained TBAs is increasing with the number of months in practice following training. Since May of 1974 their deliveries have increased from 3.38 to 5.67 per trained TBA-year (an increase of 2.20 per year). During registration, TBAs claimed they handled about seven deliveries per year. The discrepency is probably explained by the TBAs' overestimation of their own activity levels during registration. The percentage of all deliveries handled by trained TBAs has also steadily increased as the number of trained TBA-months has increased (1974: 11%; 1976: 29%). Untrained TBAs are handling a decreasing percentage of all TBA-managed deliveries: from 65% in 1974 to 30% in 1976. This, of course, is related to the fact that the number of untrained TBAs has decreased as more TBAs have been trained. According to the questionnaire results there has been a decline in the number of deliveries being handled by the Health Center over this time period (19% in 1974; 10% in 1976). The TBAs also see a greater number of postpartum patients than does the Health Center staff.

About 30% of the TBAs handle the majority of all TBA deliveries (71%). Another 20% handle about 18% of deliveries. Together, then, 50% of the most active TBAs handle almost 90% of the deliveries.

OBJECTIVE 1: PRENATAL MONITORING

Of the TBAs interviewed in the attitude/practice questionnaire administered prior to training, 75% reported that they rendered no prenatal visits. Since training, TBAs in Area I have averaged just over two prenatal visits per delivery. Ninety-one percent of pregnant females were referred by a TBA to the Health Center for at least one prenatal visit, as the TBAs were trained to do.

OBJECTIVE 2: MOTIVATING AND TRAINING TBAs TO RECOGNIZE AND REFER HIGH-RISK WOMEN

Based on the referral cards distributed to TBAs during training, supervisory visits and TBAs self-reports, they now refer about 4% of their patients to the Health Center for delivery and 1.5% of postpartum patients for

treatment of problems or complications. This probably still represents too low a percentage of referrals.

OBJECTIVES 3 and 4: TRAINING TBAs TO PERFORM SAFER DELIVERIES IMPROVED MANAGEMENT OF THE CORD

As mentioned, it is rare to observe TBAs performing actual deliveries, hence intermediate indicators of performance were used to evaluate TBAs knowledge and use of new delivery skills. Part of this evaluation is based on the ratings given the TBAs by the supervisor/instructor according to TBAs performance during training and in the refresher courses, and part is based on mothers' reports, supervisor reports and kit inspections.

Quantitative data are available on the care and treatment of the umbilical cord. Prior to training, most TBAs reported using a new (but unsterilized) razor blade to cut the cord. Others used old blades, knives, scissors and broken glass, often unwashed before use. Since training, there has been a steady increase in the use of sterilized blades which are provided in the TBA kit (from 42% of births in 1974 to 68% in 1976, according to the special birth questionnaire reports).

Herbs and salt were the most common cord dressing prior to training, followed by ground shells, talcum powder, clay and palm kernel oil. Gentian violet is provided in the kit for cord dressing. There has been a steady increase in its use as the number of trained TBA-months has increased. According to mothers' reports, gentian violet was used in one-half of all deliveries attended by a trained TBA.

During the reported time period, there were 426 cord pack replacements (about 4.03 per TBA-year). In 1976 there was a cord pack replacement for almost every delivery--a most encouraging finding. A cord pack contains a sterilized blade, gauze dressing and ligatures.

OBJECTIVE 5: FAMILY PLANNING

Since 1974, the number of women reportedly referred by TBAs for family planning has remained at an average of about one and one-half referrals per trained TBA-year. Since the family planning referral cards are frequently not being used, it is not possible to determine the individual TBAs who refer the women for family planning. If these reports are accurate, TBA referrals in 1976 accounted for about 34% of all female acceptors in Area I. However, this

is probably an overstatement of the TBAs' influence on family planning referral rates.

6.10 PHASE II: MALARIA PROPHYLAXIS

Malaria meets the criteria of a disease that must be given attention in any MCH program in West Africa. It is prevalent, serious, and susceptible to attack. Eighty-seven percent of people in Africa are exposed to malaria, most in areas without any control measures. Malaria is probably the number one killer in Africa since it is estimated to cause 600,000 deaths annually in children under five. This is 10-20% of all deaths in this age group. Even more impressive are data from experimental control areas where 50% reductions in crude and infant death rates have been observed after control measures were instituted (6). In Ghana, 8% of all deaths are attributed to malaria or about 16,000 per year. It also accounts for 30% of outpatient visits and 9% of hospital admissions.

Major eradication efforts are not considered feasible in most of Africa at this time because the vector, the parasite and the ecology of the disease present technological problems that are insurmountable by the available scientific and administrative resources. Rather, control measures are recommended. Those available include vector control in urban and some selected rural areas, treatment of acute cases, and chemoprophylaxis in children and pregnant women.

The baseline Danfa Village Health Survey showed that falciparum malaria was meso- to hyperendemic with high spleen rates persisting through the first ten years of life. Mean parasite rates during the year in the 0-10 age group were 41%; the seasonal range was 24-63%.

The Danfa Project provided a good opportunity to study the effects of chemoprophylaxis as a control measure in rural Ghana. Malaria chemoprophylaxis is defined as the administration of suppressive drugs to a population at regular intervals not exceeding one month. Pyrimethamine, trade-named Daraprim, was used as the suppressant rather than chloroquine for several reasons.

- Pyrimethamine is tasteless--a major advantage in assuring that small children will take the medication without fuss.

- It has a lower toxicity than chloroquine if an overdose is accidentally taken.
- Pyrimethamine had been used by David Morley and his approach was being widely applied in many under-fives clinics in Africa. Further evaluation of the effectiveness of this drug in monthly prophylaxis was desirable.

One 25 milligram tablet is given each month to children under six years and two tablets to school children six to ten years. Infants under three months receive one-half tablet. School children are included because Project surveys showed high parasite rates persisting until age ten. The tablet is given monthly rather than weekly to reduce parasite density in the blood and prevent severe attacks. It is hypothesized that in this way the development of naturally acquired immunity to malaria will not be suppressed. To further reduce the likelihood of severe attacks the mother is given a chloroquine tablet to use only in the event the child develops fever during the month.

The crucial task is to reach at least 80% of the children. Initially, children under age five who lived in villages within one mile of the Health Center or its satellite clinics came to an under-fives clinic to receive their tablet. In other villages, volunteers were recruited and trained to organize monthly tablet distributions. In schools, the head teachers usually accepted responsibility for distribution. An important policy was that the tablet had to be swallowed in the presence of the volunteer distributor. During the first year of the program 56% of children under age five received tablets each month in the volunteer villages but only 35% in the Health Center villages. For this reason a completely volunteer system was used subsequently. The Health Center sanitarian supervised the field program as one of his many responsibilities.

Data on numbers of children participating each month were obtained from monthly volunteer reports to the sanitarian and from a special questionnaire survey carried out in 1973. In the first five months of the program 87% of the households with children under five participated at least once, and half participated three or more times. During the first five years of the program from 1973 to 1977, 113,000 tablets were distributed resulting in a mean monthly coverage of 38% of children under five years and 83% of school children six to ten years.

The impact of the study was assessed by periodic malaria surveys during the first two years in Area I, the treatment area, and for comparison in Area II where no control program was carried out. Results are shown in Table 6-2. At the baseline parasitemia rates were actually higher in preschool children in Area I than in Area II but spleen rates were lower. Both parasite and spleen rates of Area I school children were lower at the baseline than those of school children in Area II. Lower spleen rates were also seen in Area I during the first Village Health Survey. The lower rates in Area I at the baseline might possibly have been due to greater accessibility of treatment for acute malaria at the Danfa Health Center or its satellites. In any case, because both parasite and spleen rates in the two age groups were not the same in both Areas I and II at the start, the value of Area II as a control area was compromised. After the start of the program the mean annual parasite rate in the under-five age group was 30% in Area I compared to 41% in Area II. More importantly, parasite density was 60 parasites per cubic millimeter of blood in Area I compared to 109 in Area II. Similar differences were found in the school population. Because of the differences observed at the baseline, we cannot say for certain that the differences in rates between the two areas from 1973-75 are due primarily to the chemoprophylaxis program. Health Center and home treatment by mothers may also be important factors in Area I.

Based on special blood surveys of a small group of participants and non-participants at the Danfa Health Center and on a mathematical analysis of differences in parasitemia rates in Areas I and II, it is estimated that the risk of parasitemia is reduced by as much as 78% in the month after the tablet is taken.

The question arises whether such a program inhibits the acquisition of natural immunity to malaria and jeopardizes the child in later life when he stops taking the medication regularly. This question has not yet been adequately answered and certainly further research is needed. Based on present evidence, it seems likely that intermittent monthly prophylaxis does not significantly delay immunity and that the benefits of fewer serious attacks in the vulnerable preschool period justifies any temporarily reduced levels of immunity.

A major objection to the use of pyrimethamine in mass chemoprophylaxis is the development of resistance. After the first five program months no

pyrimethamine resistance was found, but after two years 38% of parasitemias were found to be resistant in Area I. It should be stressed that most of these resistances were mild, with marked reduction of parasite densities after the drug was administered. Only 7% were fully resistant. Resistance to pyrimethamine usually disappears rapidly in an area after the drug is withdrawn as the pyrimethamine-resistant parasite seems to be at a natural disadvantage in the usual ecological state.

Table 6-2: Malaria Indices--Areas I and II, 1973-1975

	Baseline (6/73)[a]		Mean values 1973-75[b]	
Age 0-5 years	Area I	Area II	Area I	Area II
Spleen rate	16%	43%	14%	41%
Parasite rate	40%	30%	30%	41%
Parasite Density[c]	NOT EXAMINED		60	109
Age 6-10 years[d]				
Spleen rate	22%	46%	23%	35%
Parasite rate	34%	41%	28%	40%
Parasite Density[a]	NOT EXAMINED		42	67

[a]Start of rainy season.
[b]Various seasons after the baseline in 6/73.
[c]Geometric mean parasite density per mm^3.
[d]School children only.

Some prefer to use chloroquine as the prophylactic. It is a more potent agent and little resistance has been observed in Africa. It is a bitter pill though, and less readily swallowed in crushed form by small children. The more acceptable syrup is too expensive and bulky to be used in mass programs. Chloroquine is also more toxic in overdose. One worries about the emergence of resistance in Africa if chloroquine were widely used in chemoprophylaxis. However, the drug is already used in such huge quantities

that chemoprophylaxis should not greatly increase this risk and we feel that either pyrimethamine or chloroquine is suitable for prophylaxis.

In summary, results of this program indicate that volunteers can be very effective in distributing malaria prophylaxis tablets at the village level, with better coverage than through the Health Center. The per capita cost is modest--$0.11 per year in 1976--and if carried out nationally the cost per death averted would be only $138. Chemoprophylaxis is one of the most important preventive health measures that can be applied in Africa. With a 78% reduction in the risk of parasitemia in each protected child and a 50% reduction in parasite density in the population, it is possible that half the deaths due to malaria in Africa could be prevented--a saving of 300,000 lives annually. Few health measures can be more cost-effective in saving lives than vigorous immunization and malaria-control programs.

6.11 PHASE II: EXPANDED IMMUNIZATION PROGRAM

BACKGROUND

In developed countries childhood communicable diseases have largely been controlled by immunization. In Ghana, less than 10% are protected. Most countries have used a health center-based approach to immunization. However, a number of problems have resulted in very low levels of immunization, even in urban areas where services were accessible. These problems include: poor accessibility to information and services, inadequate supplies and distribution of vaccines, poor refrigeration, poor health worker motivation, and overly strict policies regarding immunization during intercurrent illness. On the other hand, the West African measles-smallpox eradication program and several trials in Nigeria, Uganda and a number of Francophone African countries, showed that very high levels of immunization could be obtained by a mass village-based approach. In 1971, a Pan American Health Organization-sponsored conference on the application of vaccines against diseases of man recommended such an approach to control childhood communicable diseases in developing countries (7).

Program development was guided by a requirement that the immunization scheme should be cost-effective and replicable nationwide. Therefore, a combined health center and mass village-based approach was chosen. The priorities for prevention were measles, whooping cough, tetanus, tuberculosis

and poliomyelitis. Measles is one of the top three killers of children in Africa and causes many late deaths due to malnutrition as well. Morley showed that whooping cough may be nearly as serious a problem as measles. Tetanus causes 3.5% of deaths under age five and tuberculosis starts to become a major problem in adolescence. Finally, studies carried out by Project staff in Danfa and throughout Ghana showed that the prevalence of lameness due to poliomyelitis is seven per 1000 children, a higher rate than existed in the United States during the worst epidemic years.

6.11.1 Immunization Schedule and Coverage

An annual cycle seemed most feasible for replication nationwide and a regimen recommended at the PAHO conference was chosen. Children receive one BCG, DPT and oral polio vaccination in the first year of life, and one DPT, oral polio, measles and smallpox vaccination in the second year of life. In addition children under one are supposed to receive another DPT-polio vaccination at the Health Center. Thus, all children should receive at least two doses of DPT-polio by age two and many would receive three. If they have never received it, children aged 14 and 15 are given BCG and a tetanus-typhoid vaccination. Two tetanus boosters at this age should result in adequate antibody levels to prevent neonatal tetanus in infants born subsequently to these girls. In such a scheme a health center need stock only two vaccines: DPT and polio.

Figure 6-2 is a sample of the Danfa Project Immunization Record.

Figure 6-2: Danfa Project Immunization Record

DANFA PROJECT: GHANA

IMMUNIZATION RECORD

NAME_____

Date of Birth_____

SERIES I	date_____	
BCG (Marker)		
DPT		
POLIO		(AGE 0-12 MOS.)
SERIES IA	date_____	
DPT	POLIO	
SERIES 2	date_____	
SMALLPOX (Marker)		
DPT		
POLIO		
MEASLES		(AGE 12-23 MOS.)
SERIES 3	date_____	
BCG (Marker)		
TETANUS		
TYPHOID		(AGE 14 & 15 YRS.)

Health education is crucial to the success of the program. Village volunteers are recruited to aid in this effort. After a day's seminar, volunteers return to their villages to tell their people of the coming program, the diseases to be prevented, the age groups to be vaccinated, the benefits to the child, and the expected side effects. They periodically remind them of the coming date, aid in selecting a vaccination site and, on the day of the program, help organize lines of flow and tally numbers vaccinated.

There are 61 villages in Area I. Initially, 18 collection points were identified for vaccination so that no one would have to walk more than one mile to be vaccinated. Whenever possible, vaccines are given by PED-O-JET guns which greatly speed the vaccination process. However, PED-O-JETS are expensive and there are frequent breakdowns which can disrupt schedules. Employing the services of the mobile Medical Field Unit of the Greater Accra Region, Project staff are now able to vaccinate all of the target group in Area I in three days. The vaccinations in a given locale usually are carried out in the school building in about an hour's time. Some of the Health Center staff accompany the vaccination teams to supervise and to aid in patient control, education and polio vaccine administration.

Coverage of target populations was assessed by running tallies of children vaccinated and by a special questionnaire survey in 1974. Results are shown in Table 6-3. During the three programs carried out in Area I from 1974 to 1976, 51% of the children under age two were vaccinated. In 1977, 36% were vaccinated in Area II and 18% in Area III. This is less than the 80% target recommended as necessary to develop enough herd immunity to prevent epidemics of whooping cough. A special questionnaire survey in 1974 showed, however, that 75% of children under two who were in the village on the day of the 1974 program were vaccinated. Lower rates of coverage had also been noted in southern Ghana during the measles-smallpox campaign and there seems to be less interest here than in the north. Many people are unwilling to walk even one mile for this preventive measure. Thus, health education must be long term, sustained and intensive.

Table 6-3: Percent of Children Immunized -- Area I

Age	1974 Tally	1974 Survey	1975 Tally	1976 Tally
Under 12 Mos.	51	73	47	45
12-23 Mos.	66	--	43	54
TOTAL	59		45	49

Many antigens were given simultaneously to these children. For example, during the first program, children 12 to 24 months received 12 antigens. As had been the case in northern Nigeria where a similar schedule was tested in 1973, no higher incidence of febrile reactions was found than one would expect with three or four antigens.

Most of these childhood diseases are epidemic in appearance. Therefore, it is not possible to assess the impact of the program on morbidity from Danfa Health Center records in the three years since starting the program. For example, there was a measles epidemic just prior to the first program. One would expect a reduced incidence in the next two years, even without the program. In fact, such a reduction did occur but this cannot be attributed to the program. A longer period of observation is needed.

6.11.2 Immunization Program Costs

The costs of the program were estimated to be $1.90 per child vaccinated in 1975 or about $0.08 per capita for 50% coverage and $0.10 for 80% coverage. If carried out nationally it is estimated that, with 80% coverage, 24% of deaths under age five would be prevented. This would mean about 24,000 lives saved at a cost of one million dollars per year, or $42 per death averted.

6.11.3 Strategy to Maximize Coverage

There is some controversy as to whether one should encourage a mass village-based approach to vaccination in preference to a health center-based approach. The Project staff think that, at the present time, a combined approach will be necessary in most of rural Africa to overcome the existing constraints of the health center approach. As soon as health centers

Waiting to be immunized

demonstrate that they can adequately immunize 50 or 75% of the children, one could then eliminate the mass village-based approach. What may be more interesting is to explore ways of combining and integrating village-based primary care, village-based immunization and health center clinics, and of maximizing coverage in the most cost-effective manner. At present, WHO is participating with the Ministry of Health in a trial program to explore ways of simplifying the approach to immunization while expanding coverage. If resources permitted, villages should probably be visited twice a year. This would increase coverage and accelerate the age of immunization, thus reducing the risk of contracting the disease.

In summary, one can expand immunization coverage by:

- Improving the technology of vaccine storage and administration.
- Combining a village-based approach with Health Center immunizations.
- Involving the community in health education.
- Having a short vaccination period on an annual cycle which solves some of the logistic problems.
- Simultaneously administering a number of vaccines to each child.
- Allowing liberal policies regarding immunization during mild intercurrent illnesses.

6.12 PHASE III: THE VILLAGE HEALTH WORKER PROGRAM

It is difficult in Ghana and many other West African countries to reach the rural population with clinic-based health services. Capital budgets to construct facilities and recurrent budgets to pay for staff or supplies are limited. Transportation systems are usually inadequate and health personnel often are reluctant to work in remote areas.

Village volunteers had previously assisted in the Project's mass immunization, malaria chemoprophylaxis and self-help sanitation programs. Other Project village-based activities trained traditional birth attendants to deliver maternal care and health education volunteers to monitor the growth of children and provide nutrition education. The Village Health Worker (VHW) program was designed to consolidate many of these activities in one or more multipurpose village workers.

6.12.1 Community Involvement

Once it was determined that an expansion of the village-based program was needed, a one-day workshop was organized to explore the ways of involving the communities in such an effort. Representatives from 15 villages, staff from the Health Center, Danfa Project staff, members of the Department of Social Welfare and staff of the Regional Administrative Office participated. They examined the history of community-based programs implemented to date by the Ministry of Health, the Medical School and the Danfa Project. The workshop endorsed the concept of using volunteer Village Health Workers, and developed guidelines covering the scope of Village Health Worker activities, the importance of determining the felt needs of the community, the selection of the trainees, the type of training, the supervision of the program and remuneration of the Village Health Workers.

6.12.2 Selection of Villages

For the pilot training program, three villages were selected which had functioning village development committees, and which were easily accessible to the Health Center staff so that frequent supervision of the first VHWs would be facilitated. After eight Village Health Workers in the three original villages were satisfactorily trained, six other villages were selected based on interest of the village, the population size (over 300 persons) and the existence of a suitable social infrastructure such as a functioning village development committee or an interested chief. Two or more trainees were selected from the larger villages.

6.12.3 Selection of Village Health Workers

After several consultations with the local village development committees and based on the recommendations of the workshop, a number of guidelines for selection of VHWs was established. Criteria stipulated that a trainee should be:

- A volunteer
- Resident and employed in the village with no plans of moving
- Literate
- Between 20-50 years of age
- Acceptable to the community

There was no sex preference. Volunteers were screened by the local village development committee which considered the candidate's acceptability to the village community. A member of the training team then interviewed the candidate and discussed the nature of the program. Once selected by the village development committee, a candidate was normally accepted into the training program.

Fifteen of the VHWs in the nine villages were men and five were women. Ninety percent of the Village Health Workers in the program were farmers with ages ranging from 20-56 years (mean: 32 years). They had a mean of ten years of schooling.

6.12.4 Selecting and Instructing the Trainers

In the selection of suitable trainers for the Village Health Worker, health personnel were considered who were easily available in most parts of the country (especially underserved rural areas) and who had considerable experience in community organization and development. Proficiency in the local language was also essential. The trainers for our program were the public health nurse, the sanitarian, and the Health Center Superintendent.

6.12.5 Training the Village Health Worker

A training manual for the VHW was developed based on a manual produced by WHO (8). The Danfa manual (9) was prepared by a team of physicians, nurses and educators in consultation with the trainers. Those preparing the manual took into consideration the recommendation of the workshop and the village development committees, the culture and felt-needs of the community, the educational level of both trainers and trainees, disease prevalence and the characteristics of the health system.

Three principal areas were covered by the training program: curative care, preventive care, and the organization and administration of a primary health care program. Lectures, demonstrations, discussions, role-playing and practice examinations performed on actual patients were used as teaching methods. The curative aspect of the program consisted of a brief study of the causes of selected symptoms and signs, history taking, simple patient examinations and the management of problems according to standard protocols. The volunteers studied fever, convulsions, headaches, "waist pains," wounds, cuts, burns, bites, intestinal worms, diarrhea and dehydration, coughs and

colds, and malnutrition. (The addition of intestinal worms and "waist pains" was at the insistence of the village representatives.) A simple and inexpensive drug list was compiled which included chloroquine syrup and tablets, aspirin tablets, kaolin mixture, cough mixture, antihelminthics and penicillin tablets.

About two-thirds of training time was allocated for lessons in prevention of disease. Discussion topics included health education, nutrition and growth surveillance, community organization, excreta and waste disposal, the maintenance of water sources, family planning, distribution of anti-malaria tablets to children under 12 years, mobilization of mothers and children in immunization programs, and the management of villagers with chronic diseases such as tuberculosis, leprosy and epilepsy. Family planning lessons covered the motivation of clients, the distribution of contraceptives to new clients, and the referral of clients who have complications or who require long-acting progesterone preparations or the IUD.

The administrative part of the course included a simple overview of the organization of health delivery in the country, record keeping, referral and supervision. Field visits were made to relevant health institutions and to community health project sites in the area.

The course lasted 11 weeks for a total of 110 hours of instruction, and was divided into two phases with a three-month interval between phases so that VHWs could more easily assimilate the lessons already presented. Training was conducted at the Health Center, which was the most convenient site for training. After the training program, the VHWs were expected to work with the Health Center Superintendent at the Health Center or satellite clinics at least once a week for three months before they were finally given a certificate of satisfactory completion of training.

6.12.6 Supervision of Village Health Workers

Supervision of the VHWs is provided by the trainers, village-based Health Education Assistants and the village development committee. The village development committee is responsible for the attitude of the VHWs towards the work and for the financial support of the program. The supervisors, who visit the VHWs monthly, are responsible for overseeing record keeping, drug usage, and quality of patient care. They replenish drug supplies and provide technical support. The VHWs attend clinics either at the Health Center or

satellite clinics at least one a month for continuing education in clinical medicine and to screen patients for the Health Center staff. They may also bring some of their own cases to the Health Center for discussion with the Center's staff.

6.12.7 Records

The VHW keeps a notebook in which he records the name of the patient, the house number, age, presenting problem and treatment. The patients do not have an outpatient record, except for children under five years whose mothers are issued a growth chart. For research purposes, a more detailed record is kept of family planning acceptors. Health Center referral cards are given to patients with serious medical problems and to family planning acceptors with complications.

6.12.8 Evaluation

The supervisor checks the notebooks of the VHWs once a month and records on a special evaluation form the number of patient encounters, quantities of drugs used (including contraceptives), conditions treated, number of referrals and types of community activities organized for the period.

6.12.9 Financial Supports

Workshop participants (see Section 6.12.1) recommended that financial support for the program be obtained from patients who would pay a nominal fee towards curative services. The amount of the fee was to be decided by the individual village communities. Most of the village development committees agreed on a charge of about 0.20 cedis ($0.17) per visit for a child and 0.40 cedis ($0.35) per visit per adult. Monies realized from patient charges are paid to the committee. It was also recommended that the official health agency should help support the program by subsidizing drugs used by the VHW. The Health Center has been supplying all the drug needs of the VHWs.

6.12.10 Results

In the first 15 months of the program these volunteers delivered a significant amount of primary health care as shown in Table 6-4. This represents 3.1 service encounters per person in these villages per year--a high rate of utilization.

Table 6-4: Primary Health Care Delivered by VHWs: Danfa Project, January 1977 to March 1978

Activity	No. of Visits or Preventive Services Provided
1. Acute Care	
Cough/cold	822
Diarrhea	467
Wounds/bites	276
Convulsions	29
Burns	50
Worms	271
Malnutrition	111
Waist pains	340
Headache	426
Fever	1584
Miscellaneous	364
Sub-total	4740
2. Malaria prophylaxis	
Age 0-4 years	3147
Age 5-12 years	5671
Sub-total	8818
3. Family Planning	
New acceptors	190
Revisits	267
Sub-total	457
TOTAL	14015

Most village leaders in the Project district have been enthusiastic about using village residents to provide health care services. A strong village development committee facilitates the organization of a VHW program but the most important factors associated with a successful program are the dedication of the VHW's and the quality of their training and supervision. In some villages well motivated VHWs have been able to work sucessfully without substantial support from a village development committee.

The ultimate success of a demonstration project depends on its incorporation into the national health program. Based on the Danfa experience and a similar WHO-sponsored project in Kintampo, Ghana, the Ministry of Health is now examining the feasibility of launching a nation-wide program to make Village Health Workers and TBAs their frontline primary health workers.

6.13 EVALUATION METHODS FOR HEALTH CARE DELIVERY

6.13.1 Introduction

The evaluation of the health care program was carried out on several levels. The first level of evaluation was directly related to the attainment of the specific objectives of the revised 1976 Project paper as outlined in Section 6.1. This level consisted of a number of functional analyses of the health delivery system: its inputs, processes, outputs and their interrelationships. The necessity of the second and third levels of evaluation were implied in many of the Project papers and discussions.

The second level of evaluation is an evaluation of the effects of the health care program as measured by changes in health-related knowledge, attitudes and practices. The third level of evaluation is an assessment of the program's impact on health status.

The third level of evaluation is most problematic. The measurement of the impact of health services on health status is notoriously difficult, especially in the areas of mental or social health. It is difficult to accurately measure changes in a mobile, rural population, especially where there is not complete recording of vital events. This difficulty may also be compounded by small sample size and the intrinsic variability of the survey methods used. Even if changes in health status are detected, it is usually impossible to attribute them solely to health service interventions.

Because of the demographic problems and the socioeconomic differences between the four Project research areas that were identified by early Project work, the priority of measuring impact changes was greatly de-emphasized in the 1976 revised Project paper. Rather, process measurements which had been shown to be associated with status changes elsewhere in the world (such as percent of children immunized) were to be stressed and considered as proxies for status change.

6.13.2 Methods of Evaluation - Level I

The inputs include:

(a) Financial accounts of expenditures for personnel, facilities, vehicles, equipment and supplies.
(b) Drug inventories.
(c) Administrative report cards of worker activities.
(d) Administrative records of staff employment and volunteer service.
(e) Registration of client or patient characteristics.

Two sources were utilized for keeping an account of the types of educational, treatment and preventive health care activities carried out and of the administrative support activities. These processes include:

(a) Administrative records and diaries of activities conducted.
(b) Functional analyses of Health Center, satellite and special program activities.

Service outputs were tabulated by means of:

(a) Patient Encounter Cards: The computer processed information system of the Danfa Project provided a record of each patient encounter at the Health Center or any of the satellite clinics. Information stored included patient's name, identification number, village, age, sex, place of encounter, clinical problem, treatment and status of visit (new or old complaint). This allows tabulations of patient encounters, diagnoses and services provided, as well as cross-tabulation with such important patient characteristics as age, sex,

and geographic location. In addition, data from patient encounter cards can be used as numerators for the estimation of morbidity and health care utilization rates of the population.

(b) Special Surveys: At several times special sample surveys of the population were carried out to determine the number of persons participating in special programs such as the malaria prophylaxis, mass immunization and village child weighing programs. Again, utilization rates could be determined as well as associations with important population variables.

(c) Administrative Records: These were kept by the Health Center midwives, the sanitarian, the Health Education Assistants and the supervisors of the village-based programs. These records included the number of services provided in these programs.

(d) Efficiency Studies: Analyses were performed of the relationships between the inputs of certain activities (especially costs) and their outputs in order to assess and improve the efficiency of the health care delivery system.

6.13.3 Methods of Evaluation - Level II

Although more difficult to achieve than the first level of evaluation, a determination of a health care program's effects on knowledge, attitudes and practices (KAP) is useful because these changes can often be used as a proxy for changes in health status. These methods included:

(a) Longitudinal KAP Survey: At three successive times during the life of the Project a questionnaire was administered to a sample of women in the four Project areas. This provided information about current maternal and child health-related knowledge, attitudes and practices.

(b) Morbidity Survey: There was a baseline and one repeat survey in 1975. Questions dealt with morbidity conditions and associated health care utilization in the two weeks prior to the survey. It provided information about perceived health problems and sources of care in those same households.

(c) Health Practices Survey: This survey was carried out under the direction of the health education group in villages served by the Health Education Assistants or Health Center staff in Areas I and II

A questionnaire was administered to households in these villages and focused on determining current behavior related to specific health education objectives.

(d) Special Surveys: The same special surveys described in Subsection 6.3.1 enabled us to determine of changes in KAP that were related to special problems or programs such as malaria and immunization.

6.13.4 Methods of Evaluation - Level III

A number of indices were used in the attempt to measure changes in health status:

(a) Morbidity Estimates: These were determined from three sources:

- Diagnoses recorded on Health Center and Satellite patient encounter cards (see 6.13.2)

- Diagnoses and conditions reported during the Village Health Surveys. The Village Health Survey was a longitudinal survey of five villages in each of the Project's four research areas carried out three times (in 1973, 1975 and 1977). All members of selected houses were examined and certain laboratory specimens analyzed. This survey provided information about objective health problems existing in the population at the time of the survey and enabled the determination of morbidity rates and associations with important population variables.

- Special epidemiologic surveys such as studies of malaria prevalence carried out in association with the malaria prophylaxis program.

(b) Mortality Estimates: These were established from the demographic analysis of results of the dual system of vital events registration and from an analysis of the longitudinal fertility survey.

6.14 EVALUATION RESULTS OF HEALTH CARE DELIVERY

6.14.1 Danfa Health Service Utilization and Coverage

The earliest studies of the Health Center were done using hand-tallied patient records and simple monthly morbidity reports which were standard for all Ministry of Health facilities. In 1971, a record system based on electronic data processing (EDP) was introduced for research purposes. The new recording system was designed to enable us to study both the patients and the delivery system itself. In addition, a number of special studies were carried out to determine the utilization of special programs such as malaria prophylaxis and mass immunization.

COVERAGE OF THE HEALTH SERVICE SYSTEM

The first examination of patterns of utilization of the Health Center showed that nearly half of its patients came from villages less than one mile distant and that 70% of its patients came from villages within three miles of the Health Center (10). This meant that, by their own definition, less than one-third of the people who lived in Area I viewed the Health Center as accessible to them. Based on subsequent analyses, it was estimated that, at most, only 46% of children under five and only 29% of pregnant women were being seen even once during the year. At the same time, functional analyses of the Health Center led to the conclusions that (a) the time of Health Center staff was underutilized, and (b) the community health nurses could be trained to substitute adequately for the Health Center Superintendent, who until then was the only staff member seeing sick patients. These two studies, taken together, led to the design of the satellite system described in Section 6.4.

In 1971, the first satellite was opened at Abokobi village, some eight miles southwest of Danfa. A second satellite was opened shortly thereafter at Oyibi, also eight miles away but to the northeast. Finally, in 1973 a third satellite was opened at Berekuso, a large village only a few miles from Abokobi, but over very difficult terrain. The data show, in fact, that people were more likely to travel the further distance to Danfa for care than the lesser, but more arduous, distance to Abokobi.

The addition of the satellites saw a rise in the number of cases seen by the system. In the 12 months preceding the opening of the first satellite in mid-1971, the Danfa Rural Health Center recorded 12,379 clinic visits, whereas

for calendar year 1972, with two satellites in operation, the expanded system recorded 21,622 visits. In March 1973 the third and final satellite was opened and visits for 1973 rose to 23,120. These figures reflect only visits from residents of villages within the boundary of what the Project labeled on its maps "research Area I." In actuality, about one-third more visits were made each year by people living outside the area, especially in several fairly large villages to the northeast and accessible by good roads to both the Health Center itself and to the Oyibi satellite.

Besides increasing the numbers of patient encounters with the system, the satellites increased the numbers of individuals who used it. In 1972, with two satellites in operation, 7,834 individuals were represented in the 21,622 visits and in 1973, 8,597 individuals were represented in the 23,120 visits. The main point, however, is that in the villages around the new Berekuso satellite, the proportion of individuals who came to the Health Center or satellite at least once in the year jumped from 48% in 1972 to 69% in 1973. Whether this necessarily results in improved health status is difficult to say, but under the present circumstances in the rural area, overutilization does not seem to be much of a factor.

With the three satellite clinics in place there was a marked improvement in the coverage of the system. Table 6-5 shows that in 1971 before the satellite clinics were opened only 33.9% of the population lived within four miles of clinic services (provided only at the Danfa Health Center). After the opening of the three satellite clinics, 85.3% of the population lived within four miles of at least weekly services.

Table 6-5: Cumulative Distribution of the Danfa District Population by Distance from Residence to Nearest Clinic, Before (1971) and After Start of Satellite Clinics (1973)

Within	Before Satellites (1971-Danfa Health Center Only)	After Satellites Operational (1973-Danfa Health Center and Satellites)
0 mi.	5.3%	26.2%
1 mi.	15.2	45.7
2 mi.	21.4	66.0
3 mi.	26.2	74.7
4 mi.	33.9	85.3

Table 6-6 shows that the utilization and coverage of the child and prenatal clinics nearly doubled after the start of the satellite clinics; 77% of children under five and 53% of pregnant women were being seen at least once each year during the period 1972 to 1977. During this period there was a mean of 2.9 visits per individual attending the clinics (1.5 visits per capita in Area I); 3.5 visits per child under five attending (or 2.7 visits per child under five in the area), and 5.4 visits per pregnancy cared for in the prenatal clinics. The median month of first attendance at the prenatal clinics was four and 35% were seen for the first time during the first trimester.

Table 6-6: Number of Visits, Number of Area I Individuals Seen, and Percent of Target Population Covered in Danfa Clinics for Periods Before and After Start of Satellite Clinics, for Selected Target Population Groups

	Before Start Satellites 12 month period - 1970/71			After Start Satellites Mean Annual for 5 year period 72-77		
Target Population Group	Visits	Individuals[a]	% Population[b]	Visits	Individuals[a]	% Population[b]
Children under 5	4209	895[c]	46	7301	2070	77
Pregnant Women-Prenatal only	838[c]	205[c]	29[d]	1591	445	53[d]
Total Area I Population	12379	3247[c]	29	22176	7758	51

[a]Number of individual Area I residents seen at least once.

[b]Number of individuals divided by population of age group x 100%.

[c]Estimated.

[d]Estimated number of pregnant women seen in 12 month period x 0.67. (ratio expected to deliver in that calendar year) divided by the total number of live births in Area for same 12 month period x 100%

The importance of distance as a determinant of utilization of the health facilities may be seen in Table 6-7.

Table 6-7: Utilization as a Function of Distance to Service Location--1973

Clinic/Distance	Percent Attending	Avg. Visits Per Attendee
Danfa		
0 mi.	81.5	3.7
1 mi.	79.4	3.3
2 mi.	60.4	2.7
3 mi.	40.9	2.3
4 mi.	32.1	1.9
Abokobi		
0 mi.	63.5	2.8
1 mi.	59.6	2.8
2 mi.	48.9	2.6
3 mi.	19.2	2.2
4 mi.	2.2	1.1
Oyibi		
0 mi.	57.5	3.3
1 mi.	54.0	2.2
2 mi.	43.9	2.9
3 mi.	43.7	2.7
Berekuso		
0 mi.	69.6	3.3
1 mi.	59.1	2.3

As the distance from the service center increases, the proportion of the population living at the distance who attended a clinic at least once in the year decreases. Moreover, the frequency with which any attendee comes to the clinic also decreases. From these data, we conclude that the outreach of any one of the clinics for curative services (87-91% of all visits) is approximately four miles. With this outreach, Danfa and its satellites can reach about 85% of the people living in the target area.

Figure 6-3 shows the distribution of visits per person of a given age and sex proportionate to the age/sex distribution of the area. Very young children are brought to the Health Center and satellites at a much higher relative rate than are adults, although by age six or seven their visiting pattern is similar to that of adults. Females tend to use the system at a slightly higher rate than males at all ages. In the fertile years, they are considerably heavier users. When maternal visits are removed from consideration, however, as is shown in this figure, the pattern approximates that of the men. The age/sex utilization pattern was fairly consistent over the years, with one important exception: proportionately, between 1972 and 1976 prenatal maternal visits rose by more than 30%. While we would not claim that health education aimed at encouraging prenatal visits was the sole cause of this improvement, we do believe it played a major role.

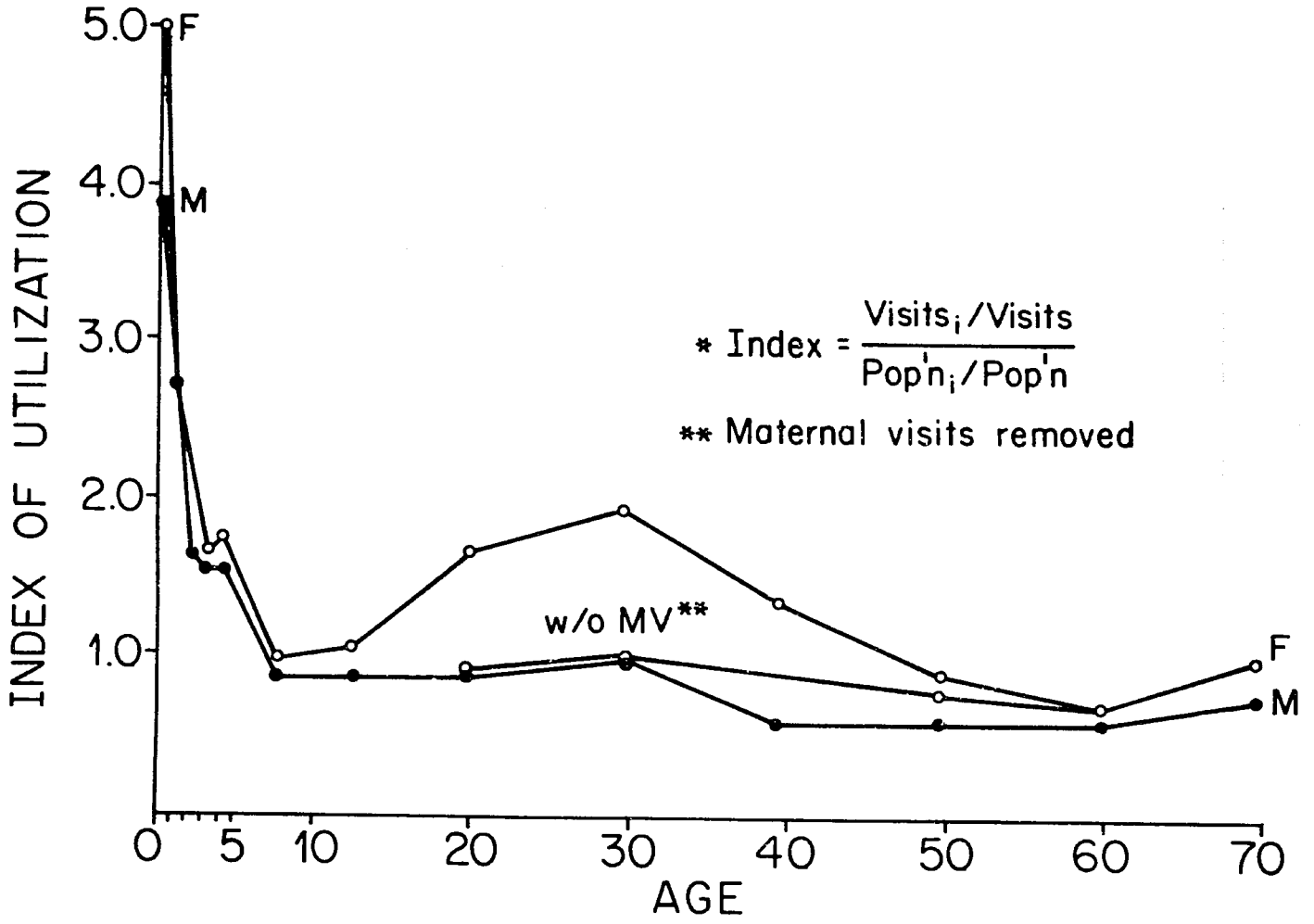
There was a drop in the percent of children under five seen at the Danfa clinics from 1972 to 1977 (see Table 6-8).

Table 6-8: Changes in Utilization of Danfa Clinics by Children and Pregnant Women, 1972 to 1977

	Percent of population group seen at least once				
Category	1972	1973	1974	1975	1976
Children under five	93	89	77	73	61
Pregnant women	48	50	59	57	52

Figure 6-3:

RELATIVE FREQUENCY OF HEALTH CENTER VISITS



We attribute this drop to the increase of village-based services during this period (malaria prophylaxis, immunizations and village child weighing). We think that this resulted in a real decrease in Health Center utilization which is desirable since Health Center-based services are more expensive. Village-based services enable people to manage many of their own health problems and reduces their need to travel long distances to health facilities, losing precious work time. Reduced utilization can also free up staff time to facilitate more participation in community health activities.

At the same time that the satellite clinics were increasing accessibility and coverage with clinic-based services, a number of village-based services increased the utilization and coverage of a number of important preventive measures such as malaria prophylaxis, immunization, pregnancy care and village weighing. Table 6-9 shows the changes in coverage during the life of the Project.

Table 6-9: Mean Percent of Target Populations Receiving Health Health Services, 1970/71 Compared to 1972-76

	1970/71	Mean for 1972-76
Primary care at clinic (all ages)	29	51
Under fives clinics	46	77
Under fives having a weight card	ND[a]	76
Malaria prophylaxis (under 5 years)	0	38
Malaria prophylaxis (6-10 years)	0	83
Immunizations (under 2)	<10	51
Prenatal care at clinic	29	53

[a]No data.

6.14.2 Functional Analysis and Quality of Care

In 1970-1971, functional analyses of the Danfa Rural Health Center were carried out to obtain information concerning staff roles, clinic organization, and drug utilization patterns. A similar study was done in 1976. Key findings were:

STAFF ROLES

The Health Center Superintendent (HCS) is a nurse with at least five years experience who has been given one year additional training (at the Kintampo Health Center Superintendent School) in diagnostics, therapeutics and health administration. He (recent classes have admitted a few females) is the head of the Health Center team enumerated in Subsection 6.3.2. As was routine at all health centers, the HCS at Danfa saw every patient who came for care, with a resultant patient-flow bottleneck at this point. A study of patient complaints led to the conclusion that most MCH complaints could be recognized and treated appropriately by the community health nurses if they were given some in-service training for this purpose. Such a program was organized, the nurses trained, and, working in tandem with the midwife, they operate a daily MCH clinic at the Health Center.

Several benefits have accrued from the new approach. First, the load on the HCS is considerably reduced, giving him more time to spend with each patient he sees; even so, waiting time to see the HCS has decreased somewhat. In addition, it frees more of his time for administrative chores and for program planning, especially for community work. Just as important, using the community health nurses, the midwife and the midwife assistant more intensively means that a well-baby and antenatal clinic can be held every day, in contrast to the previous two times a week. Moreover, this organization is used as a reinforcement for convincing mothers that their own and their babies' health are linked.

Table 6-10 shows the tasks assigned to each of the Health Center staff positions following the staff reorientation exercise.

CLINIC ORGANIZATION

Prior to the changing of the responsibilities of the Health Center staff, the average patient spent nearly four hours in the Health Center. Eighty-nine percent of this time was spent waiting, only 11% actually interacting with a

Table 6-10: Staff Duties at the Danfa Rural Health Center After 1971

Position and number of staff	Background	Patient Care	Community Programs	Other Duties
Health Center Superintendent (1)	Qualified nurse with over five years of nursing experience; One year course in symptomatic diagnosis for Health Center Superintendents.	Examines and treats patients; refers seriously ill patients to a physician or district hospitals. Provides family planning services.	Executes a comprehensive health plan for the area prepared by the Medical Officer. Develops liaison with community leaders.	Supervises health center activities. Organizes weekly staff meetings. Teaches in-service training programs. Orders drugs, supplies and equipment.
Midwife (2)	Midwifery training course.	Manages routine prenatal, delivery and postnatal patients and their newborn babies. Gives patient care and health education in the MCH clinic. Provides family planning services.	Makes home visit to MCH patients.	Gives in-service training to midwifery assistants.
Midwifery Assistant (2)	Middle School Leaving Certificate plus in-service training at the health center.	Assists the midwife in deliveries and in the MCH clinic. Provides family planning services.	Conducts home visits. Participates in health education activities	Maintains the labor and delivery areas.
Community Health Nurse (2)	Middle School; Community Health Nurses Training Course.	Examines and treats patients in the MCH clinic. Gives health education to the MCH group. Provides family planning services.	Assists with the immunization programs makes home visits, participates in school health programs.	Participates in community surveys.

Table 6-10: (Continued)

Position and number of staff	Background	Patient Care	Community Programs	Other Duties
Health Inspector (1)	Secondary School; Health Inspectors Training Course.	Participates in health education activities. Supervises village sanitation projects and the malaria prophylaxis program.	Meets with village health committees. Maintains environmental sanitation and disease control programs in the area, organizes health education activities.	Supervises the sanitation and maintenance of the Health Center. Particpates in village surveys.
Medical Records Clerk (2)	Secondary School; In-service training.	Maintains a daily attendance register. Prepares, retrieves and files patients' medical records.	Participates in health education activities.	Registration of births and deaths in the Health Center.
Dispensary Assistant (1)	Secondary School; Approx. two year course for dispensary assistants.	Dispenses drugs on prescription; prepackages common drugs; stocks dispensary from storeroom, supervises cleansing of drug bottles.		

service provider. A good part of the problem was the original system in which, once the patient's clinical record was pulled from the file, he/she had to wait to see a community health nurse who recorded the chief complaints and their duration, and then took the record to a stack piling up at the HCS's examining room. By the time this was over, the average patient had already spent 112 minutes in the Health Center. He then waited an average of 94 additional minutes before seeing the HCS, who then proceeded to ask many of the same questions the nurse had, plus additional ones, before recording his diagnosis and writing an order for treatment and drugs to be dispensed. Waiting for treatment and drugs added another 86 minutes on the average. All in all, there was good reason to believe that the very long time which a visit to the Health Center occupied acted as a deterrent to some people who should have been seen.

Two major steps were taken. The first was alluded to in the previous section. The community health nurses were trained to recognize and deal with the most common childhood problems and normal or uncomplicated prenatal cases. Those cases which she was unsure of, she referred to the HCS. Also, the pre-screening step performed by the community health nurse before the patient was received by the HCS was eliminated.

The other big change was with regard to drugs. Each time a patient handed a prescription over to the dispensary assistant, he:

(1) Walked back from the dispensary window to the shelves containing the drugs,
(2) Measured and poured the drug into a bottle or paper packet,
(3) Wrote out an instruction label and glued it to the bottle or wrote on the paper packet before filling it,
(4) Stepped back to the window and called out the patient's name,
(5) Waited for the patient to come from the waiting area and collect the item.

The study showed that although the Health Center carried more than 125 different drugs in its stock, a relative handful were used in 60% of the cases. Those were antimalarials, analgesics, vitamins, iron preparations, and antihelminthics. Therefore, it was decided to package these drugs in standard prescription units, pre-label and place within a few steps of the window.

Some, such as antimalarial and analgesic tablets, are also kept on the desk of the service provider, which enable some patients who need only these drugs to bypass the dispensary altogether.

Eventually, once this system became routine, the average patient could pass through the system in one and one-half hours if no laboratory work was needed.

DRUG UTILIZATION

We have already noted that the Health Center stocked more than 125 drugs. Some of those were drugs, such as steroids and chloramphenicol, which the Health Center staff was not trained to use appropriately. As part of the manual on Health Center operations which outlined the duties of each member of the Health Center staff, a formulary of about 70 drugs was created, along with a sketch of appropriate applications. Selection of the drugs is made on the basis of effectiveness relative to the problems being seen, cost, and consistent availablity in Ghana through regular Ministry of Health channels.

6.14.3 Quality of Care: An Outside View

In addition to the Project's own program of assessing the function of the Danfa Health Center and Satellite complex in 1976, the system was evaluated alongside other Ghanaian health care establishments by a group from the Institute of Development Studies of the University of Sussex (11). Quality of care was scored on the basis of history taking, examination and appropriateness of treatment. The Danfa Health Center was judged to provide "good" care (the highest category), as opposed to "fair" or "poor" quality care. (Danfa did not, however, receive a perfect score in this category.)

In addition, the various establishments (which comprised hospital outpatient departments, rural health centers and health posts, dressing stations, and small mission clinics) were judged on the basis of comprehensiveness of the range of services provided. The criteria included curative care available at least three times a week, antenatal care available at least once a week, deliveries performed, special child clinic at least once a week, individual or group health education conducted, family planning services available at least monthly, community outreach, immunization services for at least two diseases, and contact with the local traditional birth attendants. It may be seen that some of the criteria are not very stringent,

and yet, only Danfa and its satellites scored 100%. The nearest other scores were received by the hospital OPD's (55-60%), and, as the Institute of Development Studies report states, "virtually all health center and health posts provide less than half the range of services at Danfa." The report concludes that the Danfa Health Center and its satellites provide "currently the 'best feasible' range of primary care services in Ghana" (11).

6.14.4 Changes in Health Knowledge, Attitudes and Practices

The results of longitudinal surveys of knowledge, attitudes and practices in the same population may be influenced by the learning experience of the prior survey. Thus, the actual attitudes and practices of the population may differ from those reported.

Respondents in the KAP longitudinal survey in all four areas reported fairly positive pregnancy-related practices (see Appendix 3). In Area I, for example, 87% said that they received some prenatal care and the number who sought care in the first trimester increased from 32% in 1972 to 41% in 1977. The percent seeking care for preventive health care reasons was especially high in Area I (72%) compared to 51% in the other three areas. The use of professional nurse midwives or TBAs increased most in Area I with a concomitant reduction in the use of an untrained relative. The trend of home delivery decreased in all areas and now occurs in only 47% of cases in Area I. The Health Practices Survey showed that, by 1977, 99.6% of deliveries in Area I had at least one prenatal visit to a trained health worker and 83% in Area II. In addition, 74% of women in Area I reported that their last delivery was performed by a trained TBA or other health worker compared to only 47% in Area II and 50% in Area III. (See Appendix 6, "Health Practices Survey.") A special birth questionnaire administered by vital events registars beginning in 1974 showed that trained TBAs in Area I were using sterile razor blades to cut the cord in at least 68% of deliveries and were using gentian violet as the cord dressing in at least 50% of cases according to mothers' reports. Reports from the TBAs themselves indicate that they are using the sterile cord packs and gentian violet in nearly all deliveries.

The studies of child health practices indicated a significant increase in understanding about child health problems in all four project areas (see Section A3.4). There was great improvement in understanding the cause of poor growth especially Area I and Area II where over 80% of mothers associated

it with poor nutrition, worms or illness and where there were particularly large increases in the realization of the role of inadequate food intake. About half the respondents in all four areas continued to associate fever with overheating from the sun, but Area I showed the highest awareness of the relationship of fever to mosquitoes (24%). There were varied opinions about the cause of diarrhea but most were plausible such as eating wrong amounts of food, illness, bad food, pain or dirt in the stomach and dirt or germs. In Area I, 66% of mothers associated worms with poor hygiene and 34% associated convulsions with illness or fever, a much larger percent than in the other areas.

Home nursing by mothers also improved in all three areas, but especially in Area I where in 1977, for example, 21% of mothers administered an antipyretic or antimalarial for fever. However, there was much more reliance on antipyretics than antimalarials, perhaps because of more dramatic and rapid action and suggests that more intensive health education is needed to stress the importance of antimalarials for fever. Fifty-one percent of women in Area I also reported that they sponged a child with water for fever. About two thirds of mothers gave some medication for diarrhea, most commonly a herbal mixture. Most give some form of liquids during the diarrhea but do not stress it as an important therapeutic measure. Symptomatic treatment is often given for measles or convulsions and the child is usually brought to clinic. One third of mothers in Area I continue to take a child with convulsions to a traditional healer.

Weaning practices seem generally adequte with 76% beginning a weaning porridge and 46% having started a protein food by eight months of age. Still, about 20% have not started adequate weaning by 12 months of age.

The Health Practices Survey was administered by the Health Education Team to specifically assess changes in targeted health practices (see Appendix 6). Significant changes were observed in Areas I and II. By 1976, 69% of children under six in Area I and 70% of those under six in Area II had birth certificates. In Area I 72% of children aged two to five had Morley-type weighing cards, about the same percent as in 1973; in Area II 85% had cards, twice as many as in the previous survey. About 50% of children in Area I had positive histories of BCG, smallpox, DPT and measles immunization which confirmed evaluations of tallies done during the program.

The Health Practices Survey was also used to assess nutrition and sanitation practices. Although there was no great change in the reported use of nutritious foodstuffs in the diet there was an increase in the number of households actually growing or buying an increased variety of recommended foods. Over 75% of households in all three areas in 1977 reported that adequate latrine facilities were available nearby for use (about the same as in 1973), but the number who reported that children under six were using them increased from under 20% to over 60%.

Finally, the 1977 Health Practices Survey showed that 58% of households in Area I reported that at least one member was engaged in a community development activity, compared to only 37% in 1973.

6.14.5 Impact on Health Status

The ultimate goal of any health program should be the maintenance or improvement in a population's health status. Unfortunately, the measurement of the impact of health services on health status is very difficult for the reasons mentioned in Subsection 6.13.1.

Nevertheless, data related to health status indicators continued to be collected and analyzed. The results which follow are primarily concerned with physical health and a discussion of each result attempts to expose those changes that seem to be related to Project inputs. Although Project activities such as nutrition programs and family planning programs might well have improved mental and social well being, we did not attempt to measure changes in these two areas. The two major categories of health status change examined were morbidity and mortality.

MORBIDITY

There is no single index that can be used to reliably assess the morbidity of an entire community. Although there was a baseline morbidity survey of days of illness and restricted activity, a comparison with conditions found on simultaneously administered health examinations showed such weak correlation that it was not considered useful to expend the resources for a subsequent morbidity survey at the end of the Project.

One might presume that, if preventive health services were effective, Health Center visits would diminish due to a reduced disease burden. In fact, this is rarely the case because people tend to then use the available health

resources for more minor complaints. Annual visits to the Danfa Health Center and its satellite clinics are shown in Table 6-11.

Table 6-11: Visits to Danfa Health Center and Satellites, by Category of Visit, 1972-1976, Area I Residents Only

Year	Category of Visit: Well Child	Prenatal	Acute Care	Total
1972	1,319	1,344	18,943	21,622
1973	1,001	1,337	21,405	23,120
1974	858	1,664	21,371	23,893
1975	749	1,874	20,175	22,798
1976	1,026	1,729	16,014	18,769

The increase of visits in 1973 coincides with the opening of the third satellite clinic at Berekuso. After that acute care visits are relatively stable until 1976 when a decrease of 24% is seen from the mean 1973-75 number. The reason for this decrease is not clear. Although it could be due to lower morbidity, it might also be due to increased utilization of village-based services such as village weighing, malaria prophylaxis or immunization services, to reluctance to spend resources on travel to clinic during increasingly difficult economic circumstances, or other reasons.

It is generally more enlightening to examine more specific morbidity rates, especially those associated with major maternal and child health problems which were the major program priorities.

The important causes of maternal morbidity and mortality are hemorrhage, infection and toxemia. These are acute conditions and as such ordinarily would not be identified in village health surveys. Reports from the TBAs might prove satisfactory. However, it was only after the development of the TBA Training Manual, based on our Area I experience, that we developed what we think will be a feasible way for illiterate TBAs to monitor and record these morbidity problems. As a result we must rely on Health Center records to indicate the frequency of these problems in the female population. Table 6-12 shows the frequency of problems associated with pregnancy seen at the Health Center and its satellites from 1972 to 1976.

Table 6-12: Frequency of Problems Associated with Pregnancy Seen at Danfa Health Center and Satellites, 1972-1976[a]

	1972	1973	1974	1975	1976	Total	Total as % Pregnancies
I. Routine Visits							
Antepartum	1,639	1,534	2,017	2,222	2,051	9,463	--
Labor and delivery[b]	85	65	106	71	81[c]	405	13.5
Postpartum	37	47	56	20	58	218	7.3
Total Visits	1,761	1,643	2,179	2,313	2,190	10,086	--
II. A. Bleeding							
Antepartum	7	11	9	5	9	41	1.4
Intrapartum	1	0	1	0	0	2	0.07
Postpartum	4	3	4	1	3	15	0.5
Subtotal	12	14	14	6	12	58	1.9
B. Infection/Fever							
Antepartum	59	65	86	64	40	314	10.5
Postpartum	0	5	11	4	1	21	0.7
Subtotal	59	70	97	68	41	335	11.2
C. Toxemia[d]	4	5	15	6	2	32	1.1
D. Miscarriage	1	4	7	1	4	17	0.5
E. Therapeutic abortion	1	0	0	0	0	1	0.03
F. Illegal abortion	0	0	8	2	2	12	0.4
G. Prolonged labor	2	3	1	1	0	7	0.2
H. Mastitis	0	27	22	13	0	62	2.1
I. Ruptured uterus	0	0	0	0	1	1	0.03
J. Laceration	0	0	1	3	0	4	0.13
K. Other	0	4	2	1	1	8	0.3
III. Total Problems	79	127	167	101	63	537	17.9
IV. Ratio Prob./Visits x 100%	4.5	7.7	7.7	4.4	2.9	5.3	--
V. Ratio Prob./Pregnancies x 100%[e]	13.2	2.1	27.8	16.8	10.5	17.9	--

[a]Source: Patient Encounter Cards.

[b]Source: Hand-tallied Health Center Records.

[c]Estimated.

[d]Eclampsia and pre-eclampsia

[e]Approximately 90% of women have at least one prenatal visit; therefore, assume patients seen represent approximately 600 pregnancies per year.

There is no significant trend noticed in pregnancy-related complaints and interpretation of the data is not straight-forward. First, there appears to be underreporting of some problems as was stated earlier. More serious cases may by-pass the Health Center and go directly to hospital. Secondly, the Health Center staff may not accurately diagnose or record certain problems. Finally, although the frequency of problems might have diminished, more cases may be seen at the Health Center because TBAs have been trained to identify and refer problems. Because of the many variables affecting these Health Center maternal morbidity reports and the variability from year to year, we cannot measure any significant statistical change in maternal morbidity.

Child Morbidity

The important components of child morbidity are neonatal causes, malaria, malnutrition, measles, whooping cough and other respiratory disease, gastroenteritis, intestinal parasites, otitis, skin infections and poliomyelitis. Changes in morbidity rates due to these causes were monitored by Health Center and satellite records (patient encounter cards), the Village Health Survey and by special studies.

Since most deliveries occur in the village and because the majority of neonatal deaths occur in the first few days, Health Center records are not a good means of monitoring neonatal morbidity. For example, neonatal tetanus is rarely diagnosed at the Health Center. If it occurs, mothers may be so alarmed that they bypass the Health Center with its limited resources, and go directly to a hospital where they know a doctor is available. Therefore, neonatal mortality rates would be more useful.

In many countries where malaria control programs have been carried out, the number of Health Center visits for malaria has decreased (6). Table 6-13 shows the number of Health Center visits for malaria from 1972 to 1976.

There is no evident decrease in visits diagnosed as malaria in the Danfa clinics over the six-year span. Most fevers as well as other varied complaints are diagnosed as malaria at the Health Center. Few diagnoses are based on blood smears to identify parasites, and many childhood febrile syndromes could be labeled erroneously as malaria. As a result, Health Center records overestimate the true incidence of acute malaria.

Table 6-13: Malaria Visits by Age Group at Danfa Health Center and Satellites, 1971-1976

Age Group		1971[a]	1972	1973	1974	1975	1976
Under 5:	No. visits	359	1,986	2,658	2,533	4,614	4,102
	% visits[b]	18.9	21.9	28.3	26.6	47.3	47.5
Age 5-14:	No. visits	329	2,594	4,086	4,099	4,172	3,102
	% visits[b]	21.6	40.9	56.2	57.3	63.5	55.3
All Ages:	No. visits	977	7,402	11,434	11,226	13,600	10,011
	% visits[b]	18.3	31.0	42.6	42.4	53.1	44.5

[a]Incomplete year.

[b]Percent of all visits for that age group.

A more specific measure of malaria frequency was obtained by conducting surveys of malaria parasitemia in Area I before and during the chemoprophylaxis program. These surveys showed that there was a 28% reduction in parasite rates and a 54% reduction in parasite density in the blood of children under six in Area I compared to the control (Area II) and a reduction of 30% in the parasite rate and of 37% of parasite density in the blood of children aged 6-10 (see Table 6-2). However, because of some baseline differences in the two areas we cannot be sure that the subsequent differences were due to the chemoprophylaxis program.

The surveillance of nutritional status and malnutrition depended primarily on the Village Health Survey. Between 1973 and 1975 noticeable improvement occurred in most measurements in the vulnerable age group 6-35 months in Area I (see Table 6-14). However, these data must be interpreted with great caution. The VHS anthropometric data were more variable from year to year than anticipated and improvements of similar magnitude were seen in all four Project research areas, including Areas III and IV where no nutrition program was carried out. Therefore, we are reluctant to say that the health care program in Area I had a definite impact on nutrition. The number of cases of protein-calorie malnutrition seen at the Danfa clinics did not vary much over the five-year period, averaging 59 cases per year. This represents an

Table 6-14: Changes in Anthropometric Measurements in Area I During Three Consecutive Village Health Surveys, Age Group 6-35 Months

Measurement	1972	1975	1977
Height-for-age -- percent below 90% of standard	23	11	0
Arm circumference-for-age -- percent below 80% of standard	37	9	5
Weight-for-age -- percent below 80% of standard	33	19	--[a]
Arm circumference-for-height -- percent below 80% of standard	6	0	5
Weight-for-height -- percent below 80% of standard	0	2	--[a]

[a]Weight values inconsistent with other measurements in 1977 and faulty scale is suspected. Therefore, weight data for 1977 are omitted.

incidence of only 21 cases per 1,000 children under age five per year. Severe protein-calorie malnutrition was rather uncommon in Area I (only about one case seen per week) and much less common than in many other parts of Africa where several severe cases might be seen on each clinic day.

Measles and whooping cough were priority problems to be controlled by the immunization program. Although some kind of village-based surveillance system would have been ideal to monitor incidence of these two diseases, resources did not permit such a difficult undertaking until the village-based primary health care program in 1977. Even now such a system will not be feasible until all villages are covered by such a program. As a result we had to rely on Health Center records to provide an indication of changing disease status (see Table 6-15). The incidence of these two diseases did not change appreciably during the study period but rather remained at the relatively low level of about one-third of that to be expected without an immunization program. Since the incidence rates were low at the baseline, it would be difficult to demonstrate impact of the immunization program by lower rates. There was a concerted nationwide immunization program against measles and

smallpox until 1973-74. Thus, the success of the Danfa immunization program may have been in maintaining this low incidence rate at a time when the nationwide program was diminishing and in a rural area where epidemics of measles might be expected at least every two or three years. In fact, the national reported incidence of measles in Ghana increased by 54% in 1975 following reductions in measles immunizations. There was a moderate increase in 1974 in the Danfa Project district which peaked about six months prior to the start of the mass immunization program. No increase was seen in 1975 and the incidence remained low in 1976 as well.

Interpretation of the morbidity statistics for pertussis are more difficult. The incidence was again relatively low prior to the immunization program despite the fact that there was no effective nationwide program. The reasons may have been (a) underreporting because of poor diagnostic capability of Health Center staff or because patients did not come to the Health Center for treatment, (b) the area may have been in an inter-epidemic period in 1972-74, and/or (c) many children were brought to Accra clinics for immunization. The latter seems unlikely because VHS questionnaires did not elicit histories of high immunization rates with DPT prior to the Danfa program. The most favorable interpretation from the Project's point of view would be that 1972-74 represented low incidence years of an inter-epidemic period and that these rates were kept low by the mass immunization program begun late in 1974.

The incidence of other respiratory diseases seen at the Danfa Health Center did not show any significant changes. This is not surprising since most of these viral diseases in children cannot be prevented at this time.

Visits to Danfa clinics for diarrhea, worms and skin infections also did not show significant change. Although the prevalence of Ascaris and hookworm did drop in children under five in Area I (according to the Village Health Survey), similar changes were seen in the other three research areas and may be related to the laboratory techniques used. In any case, if there was a real drop, it cannot be attributed to the health care program in Area I.

Even though poliomyelitis is a serious problem, the incidence is low enough and its reporting at the Health Center so inadequate that field surveys undertaken after at least five years of program activity would be needed to detect any significant changes. The Department of Community Health will carry out such studies in the future.

Table 6-15: New Cases of Measles and Whooping Cough, Danfa Health Center and Satellites, Age Group Under Five Years, 1972-1976, Area I Residents Only

	1972	1973	1974	1975	1976	Total
Measles						
New cases	101	54	228	115	51	549
Incidence[a]	7.6	3.7	14.8	7.0	3.0	7.2[e]
Expected cases[b]	255	290	316	342	383	1,586
Expected incidence[d]	20	20	20	20	20	20
Pertussis						
New cases	24	68	40	124	74	330
Incidence[a]	1.8	4.7	2.6	7.5	4.3	4.2[e]
Expected cases[c]	159	181	198	214	240	992
Expected incidence[d]	12	12	12	12	12	12

[a]Incidence = cases per 1000 total population in Area I.

[b]Population 0-4 x 0.2 (exposed each year) x 0.8 (develop disease) x 0.7 (seen at Danfa clinic).

[c]Population 0-4 x 0.2 (exposed each year) x 0.5 (develop disease) x 0.7 (seen at Danfa clinic).

[d]Expected incidence = expected cases per 1000 total population in Area I.

[e]Mean incidence for period 1972-1977.

MORTALITY *(See also Section A2.6.3)*

Crude Death Rates (CDR)

Crude death rates were estimated from the registration of vital events and the periodic census surveys. Results are shown in Table 6-16. In Area I, the CDR was observed to fall from 12.4 per 1000 population in 1971-72 to 6.2 in 1976-77. This decrease was significant ($r=-.93$, $p<0.05$) but several points should be made. These observed rates are most likely underestimated. For example, we had expected a crude death rate in 1972-72 of from 15 to 20 per 1000 population. Thus, it is likely that the rates are significantly underestimated for all years, but perhaps especially for 1971 and 1976-77.

Table 6-16: Observed Crude Death Rates by Period and Area (per 1000 population), Survey and Vital Registration

Period	Area I	Area II	Area III	Area IV
1971-72	12.4	13.7	15.0	9.8
1972-73	9.5	13.4	13.1	12.1
1973-74	9.2	15.0	9.7	13.3
1974-75	9.0	13.3	16.9	11.4
1975-76	8.3	12.0	13.1	11.3
1976-77	6.2	9.9	9.1	9.4
STATISTICS				
Constant	83.2	65.9	60.3	28.3
Slope	-1.0	-.7	-.64	-.2
Correlation Coefficient	-.93*	-.76*	-.40	-.27

*P less than .05.

Based on our records it would appear that the greatest underreporting of deaths occurred in 1971-72 which would make the baseline rate proportionately higher than in subsequent years. Therefore, the downtrend in CDR is probably real. Even if the rate for 1976-77 is disregarded the trend line of reduction is still significant ($r=-.87$, $p<0.05$). The percent decrease of CDR from 1971-72 to 1975-76 was 33% (12.4-8.3/12.4). If all rates were underestimated by five per 1000, the decrease would be 24%. The percent reduction from 1971-72 to 1976-77 was 50% (12.4-6.2/12.4). Adjusting again for underreporting of five per 1000 the percent reduction from 1971-72 to 1976-77 would be 36%. Thus, the best estimate of reduction of crude death rate is from 24-50%. There were no significant reductions in Areas III and IV. There was a significant reduction in Area II from 20-28% from 1971-72 to 1976-77, but not from 1971-72 to 1975-76.

Child Mortality

Mortality rates in all children under five were first examined. As shown in Table 6-17, a significant reduction was observed in Area I from 24.7 per 1000 population aged 0-4 in 1971-72, to 18.1 in 1976-77 ($r=-.95$, $p<0.05$). The rates are more variable and no statistically significant trends could be discerned in the other three project areas. The observed reduction in Area I was 27%. We had expected a baseline child mortality rate of approximately 34 per 1000 population (i.e., 10 per 1000 more than actually observed). Adjusting all rates upwards by 10 per 1000 the decrease would be from 34.7 in 1971-72 to 28.1 in 1976-77, or 19%. Thus, the estimated reduction is 19-27%. The child mortality rate is more commonly broken down into infant (under one) and preschool (ages 1-4) mortality rates.

Infant Mortality Rates (IMR)

Table A2-37 shows that the reduction in child mortality rates in Area I does not seem to be due to a reduction in infant mortality rates. Nor was there any significant change observed in the other three research areas. The rate in Area I varied from 57 to 71 per 1000 children under age one during the period 1972-73 to 1976-77. (The mid-year population under one is used as the denominator for IMR because of high in- and out-migration of children under age one.) Deaths in the first week of life are notoriously underreported in Ghana, perhaps partly related to a traditional belief of some ethnic groups that an infant who dies in the first week of life may be a "spirit child," that is, an ancestral spirit who has returned for a short visit, and not a true infant.

Preschool Mortality Rates (PMR)

The child health care programs are primarily targeted at causes of mortality that primarily affect children six months to four years of age. Thus, greater changes might be expected in the PSMR than in the IMR. Table A2-38 shows that the PSMR fell from 16 per 1000 children aged 1-4 years in 1971-72 to 5.3 per 1000 in 1976-77 ($r=-.94$, $p<0.05$), a decrease of 67%.

Table 6-17: Observed Child Mortality Rate by Period and Area (per 1000 children 0-4 years)

Period	Area I	Area II	Area III	Area IV
1971-72	24.7	30.7	40.5	24.0
1972-73	22.6	30.5	36.5	33.1
1973-74	20.3	37.8	21.3	34.9
1974-75	20.4	30.1	41.6	26.4
1975-76	17.6	26.4	29.6	23.4
1976-77	18.1	22.0	19.3	20.2
STATISTICS				
Constant	122.6	164.3	257.9	147.5
Slope	-1.37	-1.81	-3.04	-1.62
Correlation Coefficient	-0.95*	-0.65	-0.59	-0.52

*P less than 0.05.

We had expected a baseline rate of about 20 per 1000. Thus, assuming underreporting of four per 1000, a better estimate of the reduction might be from 20 per 1000 in 1971-72 to 9.3 in 1976-77, a decrease of 54%. Thus, the estimated range in reduction of PSMR in Area I is from 54 to 67%. No significant reductions were observed in the other three resarch areas.

Maternal Mortality Rates (MMR)

In developing countries such as Ghana where many women deliver in their own village and where cause of death is difficult to determine, the rate of pregnancy-related deaths, that is, deaths occurring in women within three months of any pregnancy, probably would reflect more closely the true maternal mortality rate. Unfortunately, the standard government death certificate in Ghana does not request information about recent pregnancy status for women dying between the ages of 15 and 49. Initially, we used the standard Ghanaian government form to record deaths and did not add a special questionnaire about pregnancy status until mid-way through the Project. Early analyses indicated

that a maternal mortality of approximately four deaths per 1000 live births, but with wide confidence intervals. The rate is sufficiently variable in this relatively small population to require many additional years of surveillance to detect statistically significant changes.

6.14.5 Discussion of Program Impact on Health Status

The analysis of program impact on health status illustrates the very difficult problems involved in the collection and interpretation of morbidity and mortality data in a small, mobile rural population in a country such as Ghana. The reductions shown in malaria morbidity and possibly malnutrition are encouraging, as are the maintenance of relatively low incidences of measles and pertussis. If the reductions in death rates are real it indicates that the child health program is improving the health of preschool children especially. Moreover, the reductions in death rates over the five-year period are greater than any simple continuation of the rate of decrease in death rates that the area was probably experiencing prior to 1972.

Because the magnitude of the errors that may have occurred in the collection, recording, and processing of morbidity and mortality events cannot be known, we are reluctant to state that the comprehensive health care program was responsible for changes of the magnitude described above. Nevertheless, the statistically significant changes observed in these rates in Area I where the program operated and the absence of changes in the other three areas suggests that the trends in reduction in Area I may be real and that, despite the marked deterioration in economic conditions during the study period, the program did have a significant impact on health status.

6.15 COST ANALYSIS OF HEALTH CARE DELIVERY

6.15.1 Background and Objectives of Cost Analysis of Health Care Delivery

The purposes of the costing program of the Project were:

- To monitor costs of each of the health service system components so as to assure that they were maintained within reasonable--if unspecified--bounds, both individually and collectively.
- To measure cost-efficiency within the system using process-level denominators.
- To measure cost-effectiveness of the system using outcome-level denominators.

The first full year of costing activity was 1973; the last full year was 1976. Data are presented for the four years, during which time the official value of the cedi was $0.87. In that same period, the "unofficial," open-market value of the cedis declined from about $0.67 in 1973 to about $0.25 by the end of 1976. Nevertheless, since the government used the official rate in its own foreign-exchange dealings with its own citizens and agencies (e.g., the Ministry of Health), all conversions shown in this report use that rate.

During the years of the research phase of the Danfa Project, Ghana suffered a very severe inflation: from 1972 to 1976, 413%, or a compound annual rate of 43%. As a result, costs which are three, four, five or more years old are poor predictors of present or near-future costs. Moreover, in activities where relatively expensive expatriate staff participated extensively, the Danfa Project incurred costs to develop components of the health service program which are not reflective of costs which would prevail for similar programs produced solely by senior Ghanaian personnel. Therefore, in the presentation of costs in this report, emphasis is on recurrent (or operational) costs. While capital outlay and development costs are shown in this section or in Appendix 1 as appropriate, they generally are not mixed with recurrent costs.

The Danfa Project is very much a research undertaking aimed at developing both information and model programs which will help the Ministry of Health in its avowed task of extending effective health services to the rural

population. The Project staff participated in both aspects of the Project, i.e., information development and model program development. The primary interest was on operational program costs as indicators of potential cost to the government of similar programs, and secondarily on development costs. The cost of the various research undertakings, while of possible interest to anyone contemplating similar projects, is of much less interest to planners of operational programs. Research costs should be viewed as one-time investments which have a payoff well into the distant future with an unknown time horizon. Thus, research costs are not shown as costs attributable to any particular operating program. While detailed records were not kept of time inputs by research staff into any one research program, estimates have been made of the time and dollar costs of the various research tasks and are shown in detail in Appendix A1.

As already noted, the health service programs developed by the Project were designed to be replicable in Ghana in terms of level of personnel employed and cost. These guidelines demanded that, for the most part, once planned and underway, programs had to operate with minimum input from senior level health care professionals, in Ghana's case, doctors, nurses and health educators. The Project staff held scrupulously to this principle. Except in rare instances under dire circumstances, the expatriate staff did not render direct service to patients; thus no costs due to expatriate staff are imputed to service programs. By and large, the same was true of senior staff from the Ghana Medical School, with one exception which will be explained. In development and training programs, the senior staff maintained a position of "trainers of trainers" rather than trainers of service providers. Staying on the correct side of the line at times was difficult, but it was a principle to which the staff tried hard to adhere.

At various times, visitors to the Project and the Project staff itself contemplated the appropriateness of adding some cost factor to account for the potential impact of the research staff on some of the service programs, an acknowledging nod in the direction of the well-known Hawthorne effect. How, for instance, might the mere presence of a research team at the Health Center affect the care taken by the Health Center staff with diagnoses, or how might the general awareness of area residents that the Ghana Medical School had a hand in running the Danfa Health Center affect the numbers of people who used it? Answering this question would in itself have been a major research task,

but one of low priority in the context of the Project since the impact, though perhaps real, was likely to have been quite minor compared to other factors which affect the provision of health services. In view of this, there was not sufficient reason to alter our policy of holding research costs entirely separate from operational costs.

6.15.2 Methods of Cost Analysis

PERSONNEL

For costing purposes, Project staff fell into two categories, those who were hired and paid fully by the Ghana Medical School and those who were seconded (detailed) to the Medical School from some other agency to be employed in the Danfa Project. In many cases, staff in the latter group received a "topping up" from the Medical School to equalize pay for similar level staff. Expenditures were extracted monthly from the accounts of the Medical School and recorded on a special form for us. These expenditures included basic salary, social security, and various allowances, such as cost-of-living adjustments, transport, and overnight allowance for remaining away from home duty station. In the case of medical officers, it also includes a payment in lieu of private practice. For staff seconded from other organizations, such as the Ministry of Health and the Planned Parenthood Association of Ghana, data were obtained in each case from the home agency.

Not shown in personnel costs is housing for the Health Center staff. Except for the medical officer, these staff live in quarters on the Health Center grounds, for which a small percentage of salary is deducted. This probably constitutes some degree of housing subsidy which would be the annual depreciation plus maintenance minus the salary deduction.

MATERIAL

The major items of material were drugs and supplies for the Health Center. The system by which drugs and other treatment materials (bandages, cotton, gauze, towels, etc.) are procured and ultimately dispensed to, or on behalf of, the patient is as follows: a requisition is drawn by the Health Center Superintendent, countersigned by the medical officer, and sent to the source of supply, which in the case of the Danfa Rural Health Center is

Central Supply of the Korle Bu Hospital, the teaching hospital of the Ghana Medical School. (For other rural health centers, the source would either be a district or regional hospital or regional medical stores.)

The supplies are provided to the Health Center against a signed receipt and are placed in the Health Center storeroom. The types and quantities received are entered by the Health Center Superintendent into a continuous inventory log. As necessary, items are issued by the Health Center Superintendent to the dispensary or to staff seeing patients, at which time the material is logged out of inventory. Staff may then use materials in patient care, noting treatment in the clinical record, or may request the dispensary assistant to issue drugs to patients by means of written prescription.

There are several places in the system where one could extract types and quantities of materials used by the Danfa Health Center: at Korle Bu Central Supply by means of the retained Danfa Health Center requisition forms or the signed receipts, at the Health Center storeroom by means of the perpetual inventory log, at the dispensary by means of collected prescriptions, or at the patient level by means of the clinical record. The last point would be somewhat unreliable because it would depend on the staff to note always not only the type of drug used, but also the quantity; this would be a procedure different from that used generally by the network of government health centers and one almost certainly prone to error. Quantifying drug use at the dispensary would rely on complete retention of hundreds of prescription slips each week but would miss any drugs issued directly to patient-care staff from the storeroom; it also could not account for materials, such as bandages, which usually are not issued through the dispensary. We could have approached the problem by means of the signed receipts for transfer of materials from Korle Bu Hospital Central Stores to the Health Center. This would have entailed relying on the Korle Bu staff to keep accurate records which, hopefully, they do; nevertheless, the Korle Bu personnel are not under the control of the Danfa Project, and, were problems to arise, corrective measures would have necessitated acting through the Korle Bu administration.

The most direct and accurate approach seemed to be the use of the inventory log at the Health Center itself. One man is responsible for its accuracy--the Health Center Superintendent--and is supposed to reflect all supplies relating to patient care which pass through the Health Center.

Moreover, the accuracy of the log on the incoming side is checked periodically by an inspector from Korle Bu Central Supply who matches this portion of the log against receipts of issues. Assuming the accuracy of the incoming log, it is a simple matter to determine what was issued in a year to the dispensary and staff. Book balances were checked against storeroom shelf contents to ascertain the accuracy of the log on the issues side. This method also accounts for any shrinkage, i.e., materials received at the Health Center which are not used in patient care but which nevertheless are not in stock; such shrinkage must be included in the cost of operating the Health Center.

Each year, using the stores log, a list of drugs and other "medical" supplies used at the Health Center was drawn up. This list was handed over to the Pharmacy Division of the Ministry of Health, which then very kindly went through its records and supplied its most recent cost for each item. The category of "medical" supplies included not only such obvious items as syringes and bandages, but also tinned milk and other nutrition supplements, and such diverse items as cloth for nurses' aprons, prescription pads, and disinfectant.

The Health Center also consumes "nonmedical" supplies. Into this category fall such items as maintenance materials (paint, cement, wood), fuel for the generator, light bulbs, flashlight batteries, and occasional replacement articles of furniture such as simple chairs or tables. Sometimes these were built by the staff carpenter rather than purchased from a shop; either way, we have chosen deliberately to consider these operational, rather than capital, costs. Expenditures for these items were recorded in Ghana Medical School accounting ledgers and extracted monthly onto Danfa Project forms.

Another big supply item was contraceptives dispensed by the family planning team. These were supplied by the Ghana National Family Planning Programme, which received them from USAID. Cost of these items was furnished by the Agency.

The health education teams used minor quantities of materials, costs of which were noted from both Medical School and UCLA records.

TRANSPORTATION

Two categories of vehicles were used in the Project. The first category is those brought to Ghana specifically for the Project. After some early experiments with makes and models, Chevrolet heavy duty vehicles became the

standard. These were maintained as a fleet and allocated to both research and service duties. Examples of service duties are transportation of staff and materials for the Health Center satellites and the family planning team.

Fuel, maintenance and repair costs were paid from UCLA contract funds; insurance was paid by the Medical School. Depreciation was calculated in the early years of the Project on the basis of a 40,000-mile life; but in 1974, as a result of our hiring our own mechanic (who also supervised the driver corps), we found that we could use the vehicles for some 70,000 miles. Depreciation was somewhat theoretical in that we wrote the vehicles off completely in 70,000 miles when, on the average, they were deemed no longer fit for service in the bush. However, when we then turned them over to the Medical School for general use or sale most of the vehicles were still worth a large fraction of their original cost on the open market.

Each year, the actual costs of fuel, maintenance, repairs, insurance and drivers, plus the calculated cost of depreciation, were combined with the actual number of miles driven, based on drivers' logs, to yield a per mile cost for transportation. Based on the number of miles transportation was used for each of the Project's programs and activities, a transportation cost was assigned to each. However, the service functions of the Project were given very high priority in the context of the Project's activities and, therefore, a vehicle was always made available to them. In effect, these activities were not using a single vehicle earmarked for them but were drawing transportation from a pool which maintained spare vehicles. To account for this factor, the actual cost of transportation for each activity was multiplied by 25%. Table 6-18 shows the cost per mile for transportation in the years 1973-1976.

Table 6-18: Transportation Cost Per Mile, Cedis (Dollars)

1973	1974	1975	1976
¢0.184($0.160)	¢0.296($0.257)	¢0.372($0.323)	¢0.472($0.410)

In addition to the part-time use of a research fleet vehicle, the Danfa Health Center had a full-time vehicle assigned to it by the Medical School. The assignment of a full-time vehicle to a rural health center is a standard procedure of the Ministry of Health. This vehicle was used to transport drugs and supplies from Korle Bu Central Supply and patients to hospital, if

necessary, and, since no telephone link connected the Health Center with other elements of the health care system (such as the referral hospital or the regional Ministry of Health offices), for basic communication with these and other agencies with which the Health Center staff had to do business.

In addition, since transportation in the rural area is erratic and inconvenient, this vehicle was often used by, or on behalf of, the staff to run errands of a personal nature, such as the purchase in Accra of tinned foods, wearing apparel, plasticware and the myriad of other items of everyday living available in Accra but not in the country-side markets. Strictly speaking, the use of the vehicle in this way perhaps ought not be attributed to the cost of operating the Health Center; nevertheless, recognizing that this is a widespread, tacitly sanctioned practice at nearly all the rural health centers no attempt was made to delete these costs.

Depreciation of the vehicle presented a considerable problem, as Ministry of Health records were not particularly helpful with regard to its useful life; one of the main confounding factors was the tendency of vehicles to show low mileage relative to years of service due to very long down-times for repair and service (two weeks for a lubrication and oil change was common, as was two to six months for a major repair). Discussions with the Chief Transport Officer of the Ministry of Health led us to select eight years as the depreciation period. Using ₵4000 as original cost (in 1968) and a straight-line approach we obtained a figure of ₵500.

6.15.3 Health Center and Satellite System Costs

Table 6-19 shows the annual operating costs of the Danfa Health Center and its satellites.

It is to be emphasized that the costs shown in Table 6-19 are annual operating costs only, not full costs, which would include capital depreciation and administrative overhead. In this case, there would be several sources of overhead. One of these is an indirect charge for administrative costs of the Central Secretariat of the National Ministry of Health, and also of its jurisdictional subunit, the Greater Accra Region of the Ministry of Health. It would be exceedingly difficult to allocate the costs of these administrative bodies to any one of the myriad of activities they carry on in support of the national and regional health programs. Their responsibilities include planning; manpower recruitment, training, placement and support;

Table 6-19: Operational Costs of the Danfa Health Center and Satellite Systems, Cedis (Dollars)

	1973	1974	1975	1976
Staff	18,886(16,423)	32,503(28,263)	39,709(34,530)	44,555(38,743)
Care Providers	*11,143(9,689)*	*18,449(16,043)*	*20,310(17,661)*	*22,946(19,953)*
Others	*7,743(6,733)*	*14,054(12,221)*	*19,399(16,869)*	*21,609(18,790)*
Drugs and Medical Supplies	12,086(10,510)	32,676(28,414)	34,522(30,019)	40,363(35,098)
Nonmedical Supplies	4,946(4,301)	4,592(3,993)	5,119(4,451)	5,459(4,747)
Transport	2,658(2,311)	4,669(4,060)	5,973(5,194)	7,117(6,189)
TOTAL	38,576(33,545)	74,440(64,730)	85,323(74,194)	97,494(84,777)

supply procurement and distribution; capital construction; competing for national fiscal resources with other ministries; and the necessary interaction with other national agencies and international organizations.

Since the Health Center is administered in part by the Department of Community Health of the Ghana Medical School, some very small part of its administrative overhead could rightly be reattributed to the Health Center. Also, Korle Bu Hospital (located adjacent to the Medical School) is the primary source of medical supplies for the Health Center, and would contribute minor indirect costs.

Without these backup services there is no doubt that the Danfa Health Center would soon cease to function. Nevertheless, other than to recognize that these costs exist, it is beyond the scope of the Danfa Project to work up cost data for these agencies. A rough estimate, however, might be obtained from the Ministry of Health budget estimates for 1975-76, which allocated 51% of its operating budget to various accounting heads which appear to be administrative in nature. The imponderable question would be what fraction of Ministry of Health costs to attribute to the Danfa Rural Health Center.

With regard to depreciation, in the section on transportation we noted that the vehicles have been treated in effect as consumables. The major item for depreciation is the Health Center and its furnishings. The actual cost of constructing the Danfa Rural Health Center is not known, although a figure of ₵117,000 was given at the dedication ceremony in 1969. This is most likely an underestimate for the Health Center building and its seven staff and student

residence cement bungalows. For example, an unknown amount of voluntary labor was donated by residents of nearby villages and the value of this labor (as imputed opportunity cost) would have to have been counted as a cost, which is unlikely because cost analysis was not being considered when the Health Center was being built. In any event, documentation concerning construction is very skimpy. However, even if ₵125,000 is taken as the best estimate of the cost of the Health Center, there still is a conceptual problem of specifying a realistic depreciation schedule. Observing the Health Center from the vantage point of ten years following its opening, a minimum guess of the life expectancy of the structure is 25 years. Thirty to 50 years seems more likely. Since the cost figures which follow in the ensuing discussion will be based on annual operational costs, the reader who believes that the annual figure should include depreciation costs might add perhaps ₵4,000 a year for this purpose.

Two other potential costs are recognized: the use of volunteers and the free use of physical facilities. At each satellite clinic session, one or two teenagers from the village help the clinic team with such minor chores as carrying messages and delivering records. Their cost value could be approximated by the hourly wage of a laborer. To a degree, the volunteers do enable the clinic staff to operate more efficiently and this probably means that the staff is able to return to base somewhat earlier than they otherwise might. Since the system is not saturated with patients, however, it does not mean that the staff either sees more patients in a day or is able to devote more time to each patient they do see. The value of this labor is probably less than ₵1 per day.

In selecting locations for each of the three satellite clinics, one selection criterion was that a village be willing to provide a site which could be used once a week. These are provided cost-free either by the village, if a communal building, or by some individual. The value of these facilities could be obtained by imputing potential rental income, if any. So far as we could tell, under the conditions prevailing the rental potential is very small.

It may be seen in Table 6-19 that the annual cost of operating the Health Center and satellite system rose very considerably in the three-year period between 1973 and 1976, 153%. However, in the same period, the national consumer price index rose 140%. Table 6-20 shows the proportion of each year's costs attributed to each cost category.

Table 6-20: Proportion of Annual Cost by Category, Danfa Health Center

	1973	1974	1975	1976
Staff	49%	44%	47%	46%
Care Providers	(29)	(25)	(24)	(24)
Others	(20)	(19)	(23)	(22)
Drugs and Medical Supplies	31	44	40	41
Nonmedical Supplies	13	6	6	6
Transport	7	6	7	7
TOTAL	100%	100%	100%	100%

In the staff category, providers of care are the Health Center Superintendent, nurses, midwives, sanitarian, dispensary assistant and medical officer. In the case of the Danfa Health Center, the medical officer is a member of the faculty of the Department of Community Health of the Ghana Medical School rather than a physician based at the district hospital. The medical officer is estimated to spend 15% of his time at the Health Center or on Health Center business and so 15% of his full annual cost has been allocated to the Health Center. On the basis of observation of other rural health centers in Ghana, 15% time would be a considerably higher input than most would receive from their respective medical officers. The staff category "others" comprises clerks, drivers, craftsmen, and laborers who are assigned to the Health Center full time. The rise in the absolute costs of personnel (Table 6-19) are due in small measure to a slight increase in the number of non-care providing staff attached to the Health Center, but much more to the government's efforts to maintain the standard of living for government employees in the face of serious national inflation by raising wages. For example, between 1973 and 1976, the salary of the Health Center Superintendent rose by 121%, that of the community health nurses by 82%, that of the clerk by 191% and those of some of the laborers and craftsmen by 180%.

It will be recalled that the oil crisis of 1973 and the subsequent jump in oil prices resulted in a drastic rise in the cost of many manufactured goods and the cost of shipping. Since Ghana imports nearly all her drug needs (some packaging is done domestically), a comparison of prices paid by the Ministry of Health for drugs in 1971 and 1975 shows some fairly large increases. For

example, chloroquine phosphate (heavily used in this malaria-endemic region) cost 65% more (in constant terms against the dollar), aspirin 81% more, penicillin 70% more, Mintezol (a widely used antihelminthic) 76% more, and multivitamin tablets 41% more.

The Danfa Health Center and its satellites were intended to serve primarily research Area I. As we have already noted, we calculate that through the years approximately 85% of the people in Area I considered the system geographically accessible and used it. Of course, the boundary line drawn by the Project staff on a map did not represent a fence around the area and we know that residents of Area I sometimes went outside for care; we do not know how often this occurred. On the other hand, because village of residence was among the data recorded for each patient visit, we do know that annually approximately 20% of visits were made by people from outside Area I. Most of these visits were made by people living in several large villages whose population, according to the 1970 census, came to about 5,000.

Table 6-21 shows various unit costs for operating the Danfa Health Center/satellites system. The per patient visit costs shown include visits made by persons residing in villages outside of Area I. Costs per Area I resident were determined by reducing the total annual operating cost by the proportion of drug costs which could be attributed to non-residents visiting the Health Center/satellites; it was assumed that this cost factor was proportionately variable while all other costs were essentially fixed. The same operating cost was used in obtaining cost per "accessible" person in Area I, taken as 85% of the Area I population (see Section 5.6). The final set of costs shown use the total cost again.

COMPARATIVE OPERATING COSTS

Each year, the Health Center and satellites contributed approximately 75% of the operating costs of the model comprehensive health care program provided by the Project in Area I. It is reasonable then to ask how Danfa's costs compare to other rural health centers which are operated by the Ministry of Health. Unfortunately, no comparable accounting records are maintained for individual health centers. However, several other cost studies have been performed, and while none involved detailed record-keeping on the level of Danfa, some comparison can be made to provide a feel for costs within the Ministry system.

Table 6-21: Operational Costs of the Danfa Rural Health Center and Satellites Per Unit Noted, Cedis (Dollars)

	1973	1974	1975	1976
Per Patient Visit	1.30(1.13)	2.52(2.19)	2.98(2.59)	3.84(3.34)
Per Person in Area I	2.49(2.17)	4.42(3.85)	4.75(4.13)	5.05(4.39)
Per Accessible Person in Area I (85%)	2.93(2.55)	5.20(4.52)	5.59(4.86)	5.94(5.17)
Per Accessible Person in Area I, Augmented[a]	2.22(1.93)	4.11(3.57)	4.50(3.91)	4.96(4.31)

[a]85% of Area I population
+5,000 resident in villages outside of Area I who used the Health Center and satellites on a regular basis.

In 1972, a retrospective study was done of 1971 operating costs at the Danfa Health Center and its then two satellites, and of several other health centers within a 50 mile radius of Danfa. Because data had to be extracted and extrapolated from rather incomplete records, costs were probably underestimated by about 10-20%. Moreover, only the cost categories of staff and medical supplies could be reasonably approximated. In 1971, the cost per patient visit at Danfa was ₵0.63, and the cost for drugs and medical supplies was ₵0.85 per visit. At the same time, three other health centers showed staff costs of ₵0.31, ₵0.28 and ₵0.26, and drug/supply costs of ₵0.22, ₵0.24 and ₵0.13 for each patient visit. (In 1971, ₵1 = US$0.98.)

Why was the Danfa Rural Health Center more expensive to operate (at least in these two important categories) in 1971 than the other rural health centers? In the category of staff costs, the answer is fairly straightforward. Under Ministry of Health procedures, staffing patterns at all the rural health centers are generally similar, patient load apparently affecting this factor only to a minor degree. With personnel costs nearly fixed, the number of annual patient visits becomes the key determinant of differences in this ratio from one health center to the next. While Danfa had a patient load of 24,078 visits and a staff of 19 in 1971, the others had, respectively, 60,732 visits and a staff of 20, 46,292 visits and a staff of 17, and 91,220 visits and a staff of 28. We have already demonstrated the

importance of population proximity in determining utilization of rural health services. In 1971 the several villages within a mile radius of the Danfa Health Center and its satellites had a population of less than 3,000, while two of the other "rural" health centers actually were adjacent to towns of 22,000 and 17,000; the other health center is in a more rural environment and we have no definitive explanation as to why it would generate nearly twice as many visits as Danfa. One obvious possibility is a different pattern of morbidity, but this is speculative.

Consumption of drugs and medical supplies, on the other hand, should vary approximately with patient load if one may assume that morbidity patterns are reasonably similar. Clearly, comparing the Danfa Health Center with the other three, it did not. However, the latter were also not particularly consistent: the Health Center with 91,000 visits showed an average cost of little more than half the others. This may indicate that economies of scale may be important in this cost category, too, though it is not clear from the data at hand why this should be so. One possibility might be that "shrinkage" of inventory is tied to staff size; this point will come up again.

Aside from our early cost studies, the only other rural health center cost studies available for comparison with Danfa are some done by the Institute for Development Studies (University of Sussex) group in two regions in Ghana in 1975/76 (11). These analyses also had to be done retrospectively and may, therefore, suffer some relative incompleteness which, if biased in any direction, would tend to underestimate costs. Moreover, in the Institute for Development Studies (IDS) report, cost items are aggregated somewhat differently than in the Danfa accounting system, so the comparability is not exact. Nevertheless, it is useful to make such comparisons, even if they are a little rough.

In 1975/76, the five rural health centers examined by IDS had per patient visit costs ranging from ₵2.17 to ₵4.32, with an average of ₵3.05. Danfa's cost per patient visit, it will be recalled, was ₵2.98 in 1975 and ₵3.84 in 1976. Thus, operational costs at Danfa appear to be in line with those at the only other rural health centers available for comparison. This is particularly significant when the Institute for Development Studies' assessment of Danfa's favorable position on comparative quality and comprehensiveness of care is recalled (Section 6.14).

POTENTIAL SAVINGS ON OPERATIONAL COSTS

Staff

In the previous section we noted that the relatively fixed cost of personnel at the Health Center meant that an important component of the cost of a patient visit (about 45%; see again Table 6-10) was determined primarily by the patient load. In their study, the IDS group make the same comment, but go no further. However, on the basis of six years of observing the operations of the Danfa Rural Health Center, we believe that the large number of support staff who do not deal directly with patients could be cut substantially with negligible effect on the scope or quality of care. These people comprise craftsmen, such as carpenters, painters, and engine attendants (who operate the diesel generator four hours per day when that machine is in a good state of repair) plus unskilled laborers who perform such tasks as cutting grass and carrying away trash. In a typical year, this classification of staff provides more than half of the person-months at the Health Center, and about 20% of the total operating cost. A reduction by half would save about 10% of the total operating cost of the Health Center.

Drugs

In recent years, drugs and medical supplies have accounted for approximately 40% of total operating costs; thus, savings in this category also represent a significant proportion of all costs. The greatest expenditure for a single class of drugs is for antimalarials. In 1974, antimalarials represented 27% of drug costs and 12% of all costs. On the face of it, one would expect the cost of antimalarials to be a major item in an area with endemic malaria. However, the absolute numbers were too astounding to be acceptable: for 11,226 patient visits recorded as malaria, the Health Center recorded a flow of 410,000 tablets of chloroquine, 760 liters of chloroquine syrup, 7,000 ml of injectible chloroquine and 36,000 tablets of pyrimethamine. It seemed quite obvious that a good portion of these items were being diverted from the Health Center into private channels (purveyors of modern drugs are common in Ghana). In mid-1975, this situation was discussed with the Health Center staff by the chairman of the Department of Community Health, with salutary effect. For the year 1975, even though 21% more cases of malaria were recorded at the Health Center, the use of chloroquine tablets dropped by 41%, syrup by 9% and injectibles by 21%. In 1976, recorded malaria

cases dropped by 26%, while use of chloroquine tablets dropped by 33%, syrup by 13% and injectible chloroquine by 75%. For the year, the total flow of antimalarials appeared to be, if generous, at least not totally ridiculous. Thus, we may already have effected what saving is possible in this area.

Analgesics account for 15-20% of all drug expenditures each year, and once again, before it was made known to the Health Center staff that the use of drugs was being studied carefully, usage was exorbitant: in 1974, for 29,595 visits (of which 7,592 were by children under five), the Health Center "used" 205,000 adult doses of aspirin, 68,000 adult doses of acetominophen or APC, 12,000 doses of phenobarbitone and 44,000 doses of codeine, plus assorted injectibles such as pethidine. However, by 1976 quantities seemed much more reasonable for the level of visits being made. The flow of aspirin was down 46%, codeine 89%.

A similar story was to be found in two other major classes of drugs, antibiotics and vitamin preparations, which together accounted for another 25-30% of drug costs. Usage rates fell into line once the Health Center staff was made aware that records were being kept and checked. The lesson seems clear. Control of drugs and medications by means of appropriate record keeping and examination of records and follow-through will yield returns in the form of cost-reductions. It is estimated that if proportionate use of antimalarials and analgesics had continued at 1974 rates, operating the Danfa Health Center and satellites would have cost an additional ₵4,986, or ₵0.20 per visit, a 5% increase in total cost.

TRAINING COSTS FOR STAFF AT THE DANFA HEALTH CENTER

As noted, the costs shown in Table 6-19 are operational costs and do not include any costs which must be amortized over time, e.g., construction costs for the Health Center. Another cost which is real but which is conceptually difficult to amortize over some definite period of time is that of special training programs set up for the Health Center staff. Over the approximately eight years covered by this report (i.e., 1970-77), this cost is estimated to be ₵52,000, of which ₵39,100 is attributed to UCLA staff, ₵9,800 to Ghana Medical School staff, ₵2,100 to transport and ₵1,000 to miscellaneous materials. This does not consider the teaching/training function of the cognizant medical officer assigned by the Department of Community Health. That cost is included in the annual operating cost of the Health Center under

the category of personnel, which includes the medical officer's time at the Health Center.

Two points should be borne in mind concerning these training programs. First, their impact has no definite end-point since the material covered was designed not only to affect those staff present at a given training session, but in theory to be passed on to new staff indefinitely as they filter into the Danfa roster to replace persons leaving for other assignments within the Ministry of Health or other agencies. The second point is that had the programs been designed and carried out by Ghanaian senior staff only, that is to say, if Ghanaian staff had had the time to do what the UCLA staff had time to do, the training program actual cost would have dropped from ₵52,000 to ₵17,800. (The Ghanaians were faculty members of the Medical School with multiple program responsibilities and not Ministry of Health employees with sole responsibilities for training.) For this reason, attempting to include the cost of training programs involving expatriate staff in the annual operating costs as a basis for planning should be done carefully and thoughtfully.

6.15.4 Health Education Program Costs

The health education team, it will be recalled, consisted of eight Health Education Assistants deployed equally over Areas I and II, plus two full-time supervisors initially. In 1974, it was determined that the level of supervision could be reduced to one supervisor working only two-thirds time.

Table 6-22 shows annual operating costs for the health education component of the Project. Since the health education effort was split equally between Areas I and II, costs are assumed also to be equally divided. Thus, the annual per capita operating cost in Area I is ₵0.57 for 1973, ₵0.60 for 1974,

Table 6-22: Annual Operating Costs for Health Education, Cedis (Dollars)

	1973	1974	1975	1976
Staff	11,772(10,237)	14,035(12,204)	17,519(15,232)	18,783(16,333)
Transport	4,287(3.728)	3,410(2,965)	4,285(3,726)	5,437(4,728)
Materials/ Miscellaneous	600(522)	1,100(957)	1,100(957)	1,000(870)
TOTAL	16,659(14,487)	18,545(16,126)	22,902(19,915)	25,220(21,931)

₵0.70 for 1975 and ₵0.73 for 1976. In Area II, the per capita annual costs were ₵0.72, ₵0.69, ₵0.81 and ₵0.81.

HEALTH EDUCATION TEAM TRAINING COSTS

The initial training program and occasional in-service training sessions for the Danfa health education team cost ₵86,500, of which ₵67,100 is attributed to UCLA staff, ₵12,600 to Ghanaian senior staff, ₵3,800 to transport and ₵3,000 to materials. Once again, if the training activities of the UCLA expatriate staff had been performed entirely by Ghanaian senior staff, the total cost of training the health education team would have been reduced to ₵27,800. Additionally, the costs were high due to the fact that the training period lasted 14 months. This was to allow the baseline surveys to be completed prior to the team's assignment to the field. A revision of training indicated that a maximum of six months was required.

6.15.5 Family Planning Program Costs

The family planning program was organized to serve Areas I, II and III. Table 6-23 shows the operational costs of the family planning program in all three areas.

Table 6-23: Operational Costs of Family Planning Program, Cedis (Dollars)

	1973	1974	1975	1976
Staff	4,517(3,928)	6,923(6,020)	8,865(7,709)	8,683(7,550)
Transportation	4,541(3,949)	6,677(5,806)	9,672(8,410)	12,272(10,671)
Attributable from Health Education	2,749(2,390)	3,216(2,797)	4,580(3,983)	5,044(4,386)
Attributable from Danfa Health Center Operations	---	---	---	2,380(2,070)
Attributable from Amasaman Health Post Operations	---	---	749(651)	857(745)
Miscellaneous	300(261)	500(435)	600(522)	600(522)
Contraceptives	1,961(1,705)	7,363(6,403)	8,495(7,387)	5,509(4,790)
TOTAL	14,068(12,233)	24,679(21,461)	32,961(28,662)	35,345(30,734)

Since the family planning team covered the three areas equally in terms of time, in allocating family planning costs by area, cost items relating to the team are assumed to be equally divided. Other items, however, varied from area to area. For example, the Health Education Assistants were active only in Areas I and II; therefore, the percentage of time each year the Health Education Assistants devoted to family planning education and promotion (as recorded on their administrative report records) was allocated to family planning costs only in those two areas. Beginning in 1976, the staff of the Danfa Health Center added family planning services to its regular activities. (Prior to that, constraints deriving from the Project's original research design required that only the family planning team deliver those services.) A portion of the Health Center's operating costs (not counting drugs and medical supplies) was allocated to family planning in Area I based on the administrative records of the Health Center. In 1975, the Amasaman Health Post in Area I, staffed by two Mennonite nurses, began to offer family planning services as part of the Project's program for health services in that area; an estimate of attributable costs has been made and added to the cost of family planning in Area II.

The number and kinds of contraceptives dispensed varied from area to area with the number of acceptors, continuation rates and contraceptive preferences displayed in each area. This cost is accounted for separately in each area. The cost of contraceptives shown for 1973 is an underestimate based on an early recordkeeping system for dispensed contraceptives which proved inadequate. The decline in costs of contraceptives between 1975 and 1976 relfects a very strong movement on the part of acceptors away from the use of foam (which is very expensive at ₵1.74 per can), mainly to increased use of oral contraceptives.

Data on cost effectiveness in the family planning program are presented in Section 8. However, since family planning was part of the comprehensive health care package provided by the Project in Area I, we are particularly interested in the annual per capita operating cost for that area. These were calculated by segregating total program costs into separate costs for each of the three research areas by the procedures described above. Per capita cost of family planning in Area I was ₵0.34 in 1973, ₵0.53 in 1974, ₵0.64 in 1975 and ₵0.81 in 1976, but a percentage of this cost has already been calculated in determining per capita health education costs.

FAMILY PLANNING TEAM TRAINING COSTS

The initial, and subsequent in-service, training costs for the three-person family planning team were ₵61,100, of which ₵50,300 was attributable to UCLA staff, ₵6,300 to Ghanaian senior staff, ₵2,500 to transportation and ₵2,000 to materials. If the training programs had been carried out entirely by Ghanaian staff, the cost would have been ₵17,100.

6.15.6 Cost of Area I Comprehensive Health Care Program

While the Health Center/satellites, health education and family planning programs constituted the major share of the comprehensive health services package in Area I (at least in terms of cost), several other important components were also provided. These were the antimalaria, immunization and traditional birth attendant programs. Table 6-24 summarizes the annual operating cost of the entire package in Area I; Table 6-25 shows the package component costs on a per capita basis.

The comprehensive health care program of Area I includes:

- Acute curative services provided through the Health Center.
- Preventive services, including the anti-malaria and immunization programs in the villages.
- Maternal and well-baby services at the Health Center and satellites, and in the villages through the Health Education Assistants and the trained traditional birth attendants.
- Family planning services by means of the special mobile team and, by 1976, at the Health Center and satellites.
- A wide range of promotive services on the part of the Health Center Sanitarian and the Health Education Assistants.

Such a package, while sufficiently comprehensive to earn the label "the best feasible range of primary services in Ghana" is not inexpensive (see Subsection 6.14.3).

In addition to the annual operating costs shown in Table 6-24, one must also be aware of the non-recurrent costs of training these service providers to fulfill their roles in this integrated health care scheme. Table 6-26 outlines the costs of the four major training programs, showing both actual

Table 6-24: Area I Comprehensive Health Services Program, Annual Operating Costs, Cedis (Dollars)

	1973	1974	1975	1976
Danfa Health Center/ Satellites	38,576(33,545)	74,440(64,730)	85,323(74,194)	97,494(84,777)
Health Education	8,330(7,243)	9,272(8,063)	11,451(9,957)	12,610(10,965)
Family Planning	3,649(3,173)	6,702(5,828)	8,322(7,237)	8,952(7,784)
Plus Family Planning Education[a]	*1,374(1,195)*[a]	*1,608(1,398)*[a]	*2,290(1,991)*[a]	*2,522(2,193)*[a]
Plus F.P. by Danfa H.C. Staff[a]	---	---	---	*2,380(2,070)*[a]
Antimalaria Program	528(459)	1,593(1,385)	1,914(1,664)	2,242(1,950)
Immunization Program	---	3,346(2,910)	1,482(1,289)[b]	1,729(1,503)[b]
TBA Program	344(299)	882(767)	1,075(935)	1,244(1,082)
TOTAL	51,427(44,719)	96,235(83,683)	109,567(95,276)	124,271(108,061)

[a]Not counted in family planning total to avoid double counting.
[b]Costs are lower than in 1974 because adults were excluded from mass immunization program after 1974.

Table 6-25: Area I Comprehensive Health Services Program, Per Capita Operating Costs, Cedis (Dollars)

	1973	1974	1975	1976
Danfa Health Center/ Satellites	2.66(2.31)	4.83(4.20)	5.19(4.52)	5.65(4.92)
Health Education	0.57(0.50)	0.60(0.52)	0.70(0.61)	0.73(0.64)
Family Planning	0.25(0.22)	0.43(0.38)	0.51(0.44)	0.52(0.45)
Plus Family Planning Education[a]	*0.09(0.08)*[a]	*0.10(0.09)*[a]	*0.14(0.12)*[a]	*0.15(0.13)*[a]
Plus F.P. by Danfa H.C. Staff[a]	---	---	---	*0.14(0.12)*[a]
Antimalaria Program	0.04(0.03)	0.10(0.09)	0.12(0.10)	0.13(0.11)
Immunization Program	---	0.22(0.19)	0.09(0.08)	0.10(0.09)
TBA Program	0.02(0.02)	0.06(0.05)	0.07(0.06)	0.07(0.06)
TOTAL	3.54(3.08)	6.24(5.43)	6.68(5.81)	7.20(6.27)

[a]Not counted in family planning in order to avoid double counting.

Table 6-26: Service Program Training Costs, Cedis (Dollars)

	Actual (Including UCLA)	Potential (Ghanaian only)
Danfa Health Center staff	52,000(45,217)	17,800(15,478)
Health Education Assistants	86,500(75,217)	27,800(24,174)
Family Planning Team	61,100(53,130)	17,100(14,870)
Traditional Birth Attendants	10,100(8,783)	5,200(4,522)
TOTAL	209,700(182,347)	67,900(59,044)

costs reflecting the involvement of the UCLA expatriate staff in these programs and theoretical costs which would have obtained if the UCLA staff tasks had been undertaken by Ghanaian senior staff. Not included is the cost of the original school based "professional" training for the staff, for example, of the nurses, the health center superintendent, or the family planning field workers seconded as Health Education Assistants.

These training costs may be viewed as program "start-up" costs, investments which are required, as is capital construction (recall the estimated ₵125,000 cost of the Danfa Rural Health Center), in order to get the service program underway. They are real and substantial, nearly equalling the four year annual operating costs of the system. The important lesson for a planner is not the old cedi values or amortization period attached to these items, but rather the nature of the tasks and the resources which would be required to duplicate them. And, the more important question is how affordable is the Danfa comprehensive health service package in the light of recent and near future Ghanaian budgetary constraints.

6.15.7 Affordability of the Area I Comprehensive Health Care Program

As pointed out in the Institute for Development Studies group report, no other system of service comparable to Danfa presently exists in Ghana. One approach to evaluating affordability of the Danfa package, however, would be to examine how much the nation presently spends on health care, particularly in rural areas. No urban/rural breakdown of expenditures is available, but we have two sets of data from which to make rough estimates, one for a pair of essentially rural districts of the country, the other for the nation as a whole.

From the Annual (health) Estimates for 1976/1977 (i.e., the national budget), we are able to isolate budgeted funds for recurrent costs in the provision of health care (12). In order to obtain maximuxm comparability with our own data, we exclude budget items which are strictly administrative or which provide funds for services which are not included in the Danfa package, such as laboratories and mental health services. The 1975/1976 and 1976/1977 recurrent estimates are averaged so as to be comparable to our 1976 data. Also omitted from the national cost is the entire cost of Korle Bu Hospital, the teaching hospital of the Ghana Medical School, which absorbs 8% of the entire national operating health budget. The relevant items in the budget are those labeled Medical Care, Maternal and Child Health Services, Environmental Health Services, Epidemiological Division, Nutrition Services, Stores (i.e., drugs and supplies) and grants to voluntary agencies such as religious mission hospitals. For the two years these budgetary items averaged 60.29 million cedis.

Providing some estimate of the appropriate denominator is very difficult. The simplest approach would be to use the entire national population, which is estimated to have been about 9.93 million in 1976 (8.56 million in 1970 compounding at 2-1/2% per annum). Without question, however, the modern health care system does not serve everyone in the country. The Five-Year Development Plan, 1975/1976 - 1979/1980, in fact, states flatly that "the modern health services appear to reach not more than a third of the total population." If this is indeed the case, then the recurrent, or operating cost would be ₵18.21 per person. On the other hand, if we were to assume that all of the urban population is served, this would come to almost one-third of the population by itself. The question then becomes one of determining what proportion of the rural population is served. In 1975, using the 1970 census, a random sample of ten of the then 51 rural health centers revealed that an average of 19,000 people lived within four miles of each health center. Another estimate of the population served by each rural health center was made by means of the number of visits generated by five rural health centers and posts; this yielded an estimate of about 30,000 people. If 25,000 is taken as a reasonable estimate, then the 51 rural health centers would have been serving about 1,275,000 people. There were also in service about 100 rural health posts which were spotted in more remote areas. If we were to assume--very generously--that each of these would

serve a population of about 12,000, then we would have a total served rural population of perhaps 2.5 million people. Added to the entire urban population, our maximum estimate of the population which is actually served by the modern health care system would be no more than five to six million. The latter figure would yield a per capita expenditure of ₵10.05. We believe this to be the absolute minimum, with the actual figure somewhere between this and the ₵18.21 cited above.

There is considerable inequity in the geographic distribution of government health funds in Ghana. Although no analysis has been done with regard to urban/rural split, Ofosu-Amaah (13) has shown that certain regions receive nearly twice the per capita expenditure as others, with the more urban regions doing better than those which are much more rural in character. The IDS group examined costs in two districts which are fairly rural; in one case (Birim), 76% of the population lived in towns smaller than 5,000 (the Census Bureau definition of an "urban" setting), and in the other (Jasikan), 94% lived in towns smaller than 5,000. In the Birim district, per capita expenditure on health care by the government came to ₵7.54, and in the Jasikan district ₵6.42.

In direct comparison to per capita recurrent cost estimates of ₵10.00, ₵7.54 and ₵6.42, the per capita operating cost ₵7.20 for the Danfa Area I comprehensive package appears to be in an appropriate range. One other factor must be considered, however, before a final judgment can be reached. Besides geographic inequity, another skewing of resource allocation exists in Ghana, namely the disproportionate absorption of operating funds by hospitals and polyclinics. Again, the problem has not been studied to the point of actually yielding data on this urban/rural dichotomy, but the Five-Year Development Plan (quoted earlier) also comments that "the pattern of resource allocation has tended to favor the upper end of the institutional hierarchy...." In the IDS study of health expenditures in the Jasikan and Birim districts, hospitals accounted for 52% and 62%, respectively, although as district hospitals they were also providing intermediate level care for the rural population of the districts by referral from the rural health centers.

Thus, the cost of the Danfa comprehensive package is probably greater than the amount the government presently spends in the rural area, but nevertheless is in a feasible range if the Ministry is able to attain its avowed goal of greater equity in the distribution of fiscal resources. Admittedly, this kind

of equity can be arrived at only slowly, given existing capital investments in hospitals which must remain functional, but the government is making a start in this direction by putting a moratorium on further capital investment in upper level facilities and concentrating instead on health centers and health posts for the rural area. This policy is enunciated in the Five-Year Development Plan of 1975/1976.

6.15.8 Cost-Effectiveness

In previous sections we have dealt with measures of cost-efficiency such as the cost of providing service to each patient who visited the Health Center or the cost of providing the Area I commprehensive package per person resident in the area and deriving benefit from the system. If one makes the assumption that the mere provision of such service is tantamount to improvement of health status, then cost-efficiency could also be interpreted as cost-effectiveness as well. Sometimes, in the absence of true outcome indicators, there is little else to be done, and, moreover, for some process activities the correlation between process and outcome is so high that the former is quite an acceptable proxy for the latter. An example would be the production of high-level herd immunity against measles by means of an immunization program. In this case where it has been demonstrated that a particular campaign protocol yields high titers in a very large proportion of the target population, it may not be vital to evaluate the program by means of an elaborate measles case-recording effort.

Methods employed for the estimation of mortality levels are described in Appendix 2, "Demography." Crude death rate and preschool mortality rate are of particular interest to us, since the decline of these rates in Area I and not in the other areas may reflect, in part, outcomes of the comprehensive health care activities in that area.

The observed crude death rate data for Area I fit almost equally well (and with a high degree of accuracy) either a linear or an exponential model which shows a significant reduction in mortality rate in the period 1972 to 1977. Using the calculated model $y = (3.54 \times 10^4)e^{-0.11x}$, we obtain predicted crude death rates shown in Table 6-27. If, by means of graphical analysis, we then calculate the number of deaths which would have taken place had the 1972 rate continued, we find that the difference ("deaths averted") comes to 294 for the years 1973-1976.

Table 6-27: Crude Death Rates for Area I, Observed and Calculated

	Observed	Calculated[a]
1972	12.4	11.8
1973	9.5	10.5
1974	9.2	9.4
1975	9.0	8.4
1976	8.3	7.5
1977	6.2	6.8

[a]Based on model $y = (3.54 \times 10^4)e^{-0.11x}$, $r^2 = 0.86$.

Under no circumstance could, or would, the Danfa Project take the full credit for reduced mortality rates, but without doubt, the curative, preventive, and promotive services of the comprehensive health care package did play some role. It is not possible to determine precisely how many averted deaths can be attributed directly to the Danfa Project. In the years 1973-1976, the total package of operating costs for Area I was ₵381,500 ($331,739). If it were possible to attribute all the deaths averted in those four years to Danfa programs, then the cost per death averted would have been ₵1,298($1,128). If it had taken every pesewa (penny) of those costs to avoid 10% of those deaths, the cost per life saved would have been ₵12,980($11,280).

A similar analysis was done for preschool mortality (ages one to four). In this case, the exponential model produced from the observed data is $y = (2.95 \times 10^8)e^{-0.234x}$, $r^2 = 0.94$. Taking the 1972 preschool mortality rate as a base, the predicted number of deaths averted in this group for the years 1973-1976 is 102 (8 for 1973, 21 for 1974, 31 for 1975 and 42 for 1976). The full program cost of ₵381,500 divided by 102 yields an average cost per preschool death averted of ₵3,740($3,252).

We repeat that there is no way to separate the Danfa contribution to reduced death rates from that of other factors, but there seems little doubt that the program did make a substantial contribution. The cost-effectiveness figures presented here should be viewed as rough guidelines, both as to what a similar program elsewhere in Ghana might accomplish and what it might cost to do it, at least in operational terms. Capital construction and initial training costs, as noted earlier, are not included.

Malaria may be singled out for special attention, since it is far and away the single most frequently reported disease in Ghana and is estimated by the Ministry of Health Planning Unit to have greater impact on the health status of the Ghanaian people than any other infectious disease problem. It is thought to be responsible for between 10% and 15% of deaths of Ghanaian children, and probably a larger percentage if only preschoolers are considered. In the years 1973-1976, the malaria prophylaxis program cost a total of ¢6,277($5,458) to operate. In reaching 50% of the target population in Area I, if it prevented (.50 x .15 x 102 =) eight preschooler deaths, then the average cost per malaria death potentially averted was ¢785($683) in that four-year period.

6.16 CONCLUSIONS AND RECOMMENDATIONS

Despite certain social, economic and health improvements that have probably reduced crude death rates by 25% and childhood mortality by 50% during this century in Ghana, significant health problems still remain. These include high fertility accompanied by frequent pregnancy related complications such as hemorrhage, infection and toxemia. Malaria is uncontrolled and undoubtedly accounts for a high percent of morbidity and mortality, especially in children. Largely preventable infectious diseases such as measles, pertussis and gastroenteritis have relatively high case fatality rates and are aggravated by underlying malnutrition and poor water and sanitary facilities.

At the present time there are about 10,000 hospital beds in Ghana and more than 150 rural health centers and health posts. Yet, perhaps 50% of the population has no access to preventive or curative health care. The existing hospitals and health centers are expensive to maintain. Added to the general problems in all developing countries today of increased oil prices, worldwide inflation and balance of trade deficits, Ghana has experienced periodic political and economic instability and hardship over the past 15 years. This has affected the stability of planning and the morale of the general population and of health workers. Disposable national income has probably diminished. Thus, it has become impossible to maintain existing health care facilities and programs at their former level of funding in constant dollars and it is difficult, therefore, to plan expansions of health care services.

In considering the expansion of primary health care to rural areas such as Danfa health district, it is important to be realistic and to consider only

those service programs that can be implemented under existing national resources. The essential criteria of a feasible rural health care program for Ghana are:

- It must deal with the major causes of morbidity and mortality to the extent feasible with existing technology.
- It must be accessible to a large proportion of the population and result in high participation rates.
- It must be feasible for implementation with existing national resources.
- Its most important objectives must be capable of being evaluated.

It is likely that sufficient funds will not be available in Ghana in the next ten years to build, supply and staff all of the health centers and health posts that the Ministry of Health had previously planned. Even if they were able to do so, the Danfa experience has shown that strictly health center-based care does not deal necessarily with the major causes of morbidity and mortality and that it is often not accessible or utilized by a large percent of the population who live more than a few miles away.

In fact, primarily for reasons of accessibility, the Danfa program evolved into a more village-based primary health care program. We agree with the Health Planning Unit that village-based primary care using Village Health Workers may be the only feasible method at this time of bringing health care to rural areas in Ghana that will have a significant impact on health status. Obviously, this change in the present approach to the provision of health services mainly by reliance on fixed facilities and direct-hire staff must be financed by effecting savings in the present program and by changing present health service personnel roles.

A village-based primary health care program is not easy to implement. It requires careful planning, training and supervision, but above all, a high level of national morale and will to succeed in this venture. It is a tribute to the optimism of rural Ghanaians that, despite the many recent disappointments, most are still eager to cooperate in such an undertaking. However, it is crucial that, once started, the commitment is maintained by the government, the district leaders and health workers because, once born and allowed to die, it will be difficult, if not impossible, to resuscitate again.

Any such village-based primary health care program in Ghana should include most, if not all, of the following components:

- First aid for common injuries and illnesses.
- Health education, especially nutrition, sanitation and family planning.
- Community cooperation efforts in water supply, refuse disposal and nutritional supplements for malnourished children.
- Malaria treatment and chemoprophylaxis.
- Expanded village-based immunization against measles, pertussis, tetanus and tuberculosis.
- Treatment of diarrhea and pneumonia.
- Training of traditional birth attendants.
- The community distribution of contraceptives.
- Surveillance of child growth and development.
- Surveillance of disease incidence especially reportable and important communicable disease, maternal mortality and, if possible, vital events.

Rural health centers will be needed to provide second level care and to support the village-based program. But they must be made more efficient by:

- Reducing the size and cost of health center construction. The Danfa Project has demonstrated that rural health services can be delivered effectively in very simple settings.
- Reducing the size of the staff. Health Center staff rosters are much larger in Ghana than those found in East Africa, for example, and there is little doubt that present staffing patterns include extraneous staff.
- Simplifying patient records. The use of patient-retained records such as those now used for children (Morley type) should be used for all age groups. Not only is this more efficient, but it is more desirable from the patient's and the health worker's point of view. Family folders are not of practical use in the typical busy African outpatient clinic.

- Organizing satellite clinics to help expand secondary level coverage.
- Offering maternal and child health services, including family planning, on a daily basis.
- Pre-packaging commonly used drugs, and if possible, having them dispensed by the health worker seeing the patient.
- Reducing the formulary to include only those drugs that are needed, effective, and least expensive. Other drugs should be available only to the Health Center Superintendent.
- Requiring single drug and, when possible, one dose treatment for all cases amenable to such an approach.
- Monitoring drug use by each health facility to eliminate overtreatment, pilferage and loss due to expiration.

Health programs must address the major causes of mortality and morbidity. Specifically, health programs must include:

- A maternal health program. Women must be provided with safe and accessible prenatal and delivery services, either at health facilities or by training traditional birth attendants.
- A malaria prophylaxis program. One that utilizes village volunteers can be very effective in distributing malaria prophylaxis tablets, as demonstrated in the Danfa Project. There is about a 78% reduction in the risk of parasitemia in the month after taking the tablet.
- An expanded immunization program. Immunization is one of the most cost-effective methods available for reducing mortality and morbidity. Aggressive and innovative methods are needed to bring immunization services to children in villages.

Health education must be an integral component of every program because it is essential to achieving significant participation of the population in health programs. The Danfa Project found that health education did not significantly affect health status measures when it was separate from comprehensive health services. The health education was most effective when it was part of routine program schedules and when immediate action on the part of the population was possible. The Project also found that the health

education component was able to bring about a significant increase in the level of family planning acceptance in Area II and, in conjunction with comprehensive health services, led to an even greater level of acceptance in Area I.

Mechanisms for the integration of health education are:

- Train level two health staff associated with health centers or health posts in community development and health education techniques.
- These health workers identify, train and coordinate the activities of village volunteers.
- Organize comprehensive coverage of rural health districts by assigning responsibility for supervising health programs in specific communities to individual health workers.
- Integrate health education into routine annual and monthly program schedules in primary and preventive health care.
- In order to make health education most effective:
  (a) It must be integrated into comprehensive health care.
  (b) Where this is not possible, educational efforts must be focused on existing community health and development programs.
  (c) Opportunities must be provided for immediate behavior change.

Training must be made more effective and more relevant to program objectives--whether it is the training of government professional health workers or volunteer village health workers. For example, it appears that Health Center Superintendents have not been sufficiently trained or motivated to supervise comunity health activities. Likewise, community health nurses have not been adequately trained to diagnose and treat child diseases which they routinely should be able to do, to avoid overloading the Health Center Superintendent.

In designing any training program, whether prior-to-service or in-service, the tasks that each health worker must perform must be identified. Then each task must be analyzed to determine the knowledge and skills required to perform the task. Training must then become competency-based, that is, each worker is trained to become competent to perform each required skill and is tested to be certain that he or she has the required knowledge and skill before proceeding to learn the next task. Training programs must be adapted

for use with often illiterate and/or elderly village volunteers and should draw on international experience in their design. Experience with HEA training has shown that community development education assists the staff member in understanding the perspective of rural populations. This boosts staff morale and the level of commitment.

The most feasible method of evaluating program performance is to use existing resources. If the program is well organized and morale high, it may be possible for volunteer health workers or the secretary of the Village Development Committee or council of elders to record vital events. Birth and death rates could then be estimated. If not, district results from the national census might be used. Using record books of the type prepared for the Danfa TBA training manual, even illiterate Village Health Workers would be able to tally visits, diagnoses and nutritional status. Supervisors could consolidate such reports to develop utilization rates and morbidity rates for their district.

Comparison of Health Practice Survey interviews completed by HEAs and by trained interviewers showed that the former were as competent as the latter. Surveying should be a routine part of the activities of community health workers. Supplemental village health surveys or household surveys using simple forms capable of being administered by district personnel could gather additional information such as current nutritional status. Retrospective national fertility and contraceptive sample surveys could be used to evaluate the effectiveness of family planning programs.

In summary, any rural health care program must meet the criteria outlined above and at the same time it must be kept as simple as possible so that health workers and patients of all educational levels may participate and so that sudden crises and shortages do not incapacitate it.

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7. FERTILITY (7-1)

7.1 Objectives of Fertility and Related Measurements (7-1)

7.2 Methods of Assessing Fertility and Contraceptive Behavior (7-1)

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7. FERTILITY

7.1 OBJECTIVES OF FERTILITY AND RELATED-MEASUREMENTS

The principal objectives in the investigation of this aspect of the state of the rural population were:

(a) To determine baseline indices of fecundity and fertility as measured by:

The General Pregnancy Rate (GPR)
The General Fertility Rate (GFR)
The Age Specific Fertility Rates (ASFR)
The Total Fertility Rate (TFR)
The Birth Rate (BR)
The Rate of Natural Population Increase (NPI)

(b) To determine the population's baseline knowledge, attitudes and practices concerning fertility and family planning and to investigate associations with other socio-economic variables.

Although fertility indices can be found or estimated for some African countries, there was relatively little information about fertility and contraceptive behavior. This information was needed for the effective planning of family planning programs.

7.2 METHODS OF ASSESSING FERTILITY AND CONTRACEPTIVE BEHAVIOR

A number of surveys were used to provide the needed data, both for the baseline assessment of fertility and contraceptive behavior, and for determining changes that occurred during the life of the Project. These surveys were:

(a) Dual Collection of Vital Events: This was a major effort of the Project and consisted of a vital events registration program and an annual census carried out by Project interviewers. Estimations were calculated for GFR, BR, ASFR, TFR and NPI. (A full description of these demographic methods is provided in Appendix 2.)

(b) Longitudinal Fertility Survey: This was a survey of the pregnancy history of a sample of women in the fertile age group administered to the same cohort of women at three successive times during the Project. It provided another measure of GFR, BR, ASFR and TFR.

(c) Longitudinal Male and Female KAP Surveys: Three successive sample surveys of the same cohort of men and women in the Fertility Survey provided information about their contraceptive knowledge, attitudes and practices.

(d) Family Planning Acceptor Follow-up Surveys: These studies were carried out midway and at the end of the formal research project period. They provided additional detailed information about the fertility and family planning practices of a large sample of male and female acceptors and of a group of age-matched controls.

7.3 FERTILITY RATES IN THE DANFA DISTRICT

Baseline fertility and vital rates estimated from the dual collection of vital events are shown in Table 7-1. The observed Crude Birth Rate (CBR), 45, was somewhat lower than expected considering the high TFR (7.6) and the 1970 national rate (49 per 1000). However, when the birth rate is standardized to the national Ghanaian population it becomes 56, a very high rate. There was a high rate of natural population increase (3.2% annually) and high fertility rates (GFR=222 live births per 1000 women 15-49 years; TFR=7.6). Infertility rates were quite low with only 2% primary infertility (unable to conceive by age 45) and 4% secondary infertility (able to conceive at least once but unable to produce a live birth by age 45). It is noteworthy that 50% of the population were under 15 years.

The baseline mortality rates were lower than expected and significantly lower than national estimates. Crude Death Rate (CDR) was estimated to be 13 per 1000 population and Infant Mortality Rate (IMR) to be 66 per 1000 population under one year. These low rates suggest that a substantial portion of deaths were unrecorded in the first registration period.

Table 7-1: Baseline Fertility and Demographic Rates: Danfa Project District, 1972, by Research Area

	AREA I	AREA II	AREA III	AREA IV	ALL AREAS
Population[a]	12440	10654	14242	14186	51522
Crude Birth Rate (CBR)[b]	43	45	51	38	45
Standardized Crude Birth Rate (SCBR)[c]	59	59	59	49	56
Crude Death Rate (CDR)[b]	12	14	15	10	13
Rate Natural Increase (%)[b]	3.1	3.1	3.6	2.8	3.2
Population Aged 0-4 yrs.[a]	2029	1955	2863	2500	9347
Population under 5-14 yrs.[a]	4770	2941	4062	4401	16174
% Population under 15 yrs.	55	46	49	49	50
Population women 15-49[a]	2354	2161	3030	2827	10372
Total Fertility Rate (TFR)[b]	7.9	7.8	8.1	6.5	7.6
General Fertility Rate (GFR)[b]	226	235	241	191	222
Age Specific Fertility Rates[b] (births per 1000 women)					
Age Group					
15-19	109	124	143	82	114
20-24	330	387	279	236	300
25-29	341	332	336	310	329
30-34	359	292	361	300	328
35-39	239	197	227	236	227
40-44	139	171	145	92	135
45-49	74	64	132	40	79
Infant Mortality Rate[d]	54	79	99	59	66
Maternal Mortality Rate[e]	5-10	5-10	5-10	5-10	5-10

[a]Midyear populations, 1971-72; for first two registration years, 1971 and 1972.
[b]Observed rate from dual system of vital events registration for first registration period 1971-72 (per 1000 population).
[c]Based on calculating CBR from observed age specific fertility rates and standard Ghana population.
[d]Mid-year under one population used as denominator because of high migration rates (per 1000).
[e]Estimated (per 1000 live births).

7.4 BASELINE FAMILY PLANNING KNOWLEDGE, ATTITUDES AND PRACTICES (KAP) AND ASSOCIATED FACTORS

Ghanaians have traditionally desired large families, as reflected by one of the highest fertility rates in the world. The baseline KAP survey confirmed that, at the time it was carried out, the desired completed family size was still quite large. (1) The mean number of desired children for men was 9.8 and for women 6.6 children. Nevertheless, there were indications of a change in attitude towards control of fertility. Whereas studies conducted in 1965 (2) showed that only 8% of women in the Accra rural area approved of family planning, 72% of the Danfa baseline sample expressed approval. Knowledge about family planning had also increased with 65% of respondents reporting knowledge of the pill. However, use of modern family planning methods was minimal. Only 7% of couples reported ever using a modern method previously. The most common source of information about family planning was reported to be word of mouth from friends and relatives in the village (72%).

Sociocultural patterns are undergoing rapid transition in rural Ghana and, therefore, a number of factors associated with fertility and contraceptive behavior were investigated.

MARITAL PATTERNS

Marriage in the survey area is a fluid relationship with stages of mutual consent and marriage by customary rites. Cohabitation by mutual consent is generally the initial marital state, and is normally followed within a few years by customary rites. Under 2% of marriages were formalized by civil registration or church services (1).

Remarriage rates are high among women during their reproductive years and among men at all ages. Of those ever married, 49% of men and 40% of women had been married two or more times. Almost all Ghanaian women marry at some time. By age 25, over 90% are married, and by age 40, 99%.

Marital instability was found to lower a woman's fertility performance but to increase the final number of children a man produces. Polygamy was also associated with reduced fertility performance in the woman (3).

The mean age at first marriage for women was 18.4 and for men 25.2 years. Increased age at first marriage of women was associated with lower fertility. The survey showed that the percentage of women marrying before age 20 had not been falling in recent years. In fact, early marriage was reported

more frequently in the age group below 30 years than over 30 years. About two-thirds of ever-married women below age 30 were married by age 20. If it is actually occurring, a decrease in the median age at first marriage would be a factor tending to increase fertility rates. Although increased age at first marriage was associated with lower fertility, it was also associated with decreased polygamy and decreased marital instability. This suggests that the full impact of an increase in the age at first marriage on lowering fertility might not be realizable (3).

AGE AND SEX

In the Danfa Project district the age of menarche has been steadily diminishing over the past decades due to better nutritional status of young girls in whom it has been shown that the age of menarche is related to lean body mass. Our baseline KAP survey showed that the average woman reported menarche at 15 years, was married at 18 and had her first pregnancy that same year.

As stated previously, in the 1972 baseline Family Planning-KAP survey, males in the Danfa Project district desired an average of 9.8 children and females an average of 6.6 children. Both males and females in the younger age group wanted fewer children. However, as will be discussed, both age and sex relate to other factors such as education (males, and particularly young males, are better educated throughout Ghana), and marital patterns. There was no sex preference among women but men desired three sons for every two daughters (3).

There was little sex differential in approval of family planning found in our baseline KAP survey with 72% of both males and females reporting approval. While reported knowledge of family planning was extremely high among respondents in the Project's baseline survey, their use of common modern methods was low--only 5% of females and 19% of males had practiced some form of contraception before Project activities were introduced.

EDUCATION AND FERTILITY

Education has long been recognized as a major sociocultural change agent. Educated persons are generally more mobile, with a greatly increased chance of exposure to innovative ideas such as limitation of family size.

Education is highly regarded throughout Ghana; the effort to educate all children has received greatest attention in the south. Not surprisingly, level of education was found to be related to reproductive behavior and attitude in the Project's baseline survey. The more educated the respondent, the more approving was that respondent toward smaller families, confirming Pool's and Caldwell's earlier findings (2,4). However, only after middle school level is attained do respondents exhibit a desire for fewer children and a significantly higher level of approval of family planning (1,3). Since these more highly educated persons may also tend to migrate to urban areas it is difficult to predict whether improved opportunities for rural education will affect future attitudes about family planning.

RELIGION

The Danfa Project's baseline KAP confirmed a relationship between religion and reproductive behavior. Christians who composed 51% of the sample were more supportive of smaller families than Muslims or traditional believers and they also had the highest level of approval of family planning (74%) of the religious groups. Similar findings for urban areas had been noted by Caldwell (5). However, religion and educational levels are believed to be interrelated in Ghana: much of the education in Ghana has been sponsored by the Christian churches, and Christians exhibit higher levels of education than other groups. The Church Council of Ghana has also been actively supporting family planning activities since 1960.

OCCUPATION

While the net effect of husband's occupation on his family size desires has not been found to be significant, the data revealed a significant relationship between occupation of the wife and number of children desired by her. But wife's reproductive norms are lower only when she is engaged in non-farming occupations. Thus, if employment opportunities outside the home are provided to the women, this might bring about a change in their attitude toward large families, which may be instrumental in lowering the actual fertility levels (3).

PARITY AND NUMBER OF LIVING CHILDREN

Baseline and subsequent KAP studies have found a significant relationship between number of living children and additional children desired. The more children a couple has, the less likely they are to want additional children, such that 39% of women with five or six children want no further children. Also, the net effect of infant and child loss was positive and significant on the desired number of children. Female approval of family planning was fairly uniform irrespective of the number of their pregnancies.

ETHNICITY

The Danfa Project population is comprised mainly of Ga, Ewe and Akan tribes. In the 1972 baseline survey, the only ethnic differentials noted were in family planning use by females under age 30. Ewe and non-Ghanaian women in this age group reported only half the use of contraceptives as that reported by Ga and Akan respondents. The Ewe's and non-Ghanaians are more recent arrivals in this area, are chiefly engaged in subsistence farming, and generally hold more traditional attitudes than the Ga and Akan.

OTHER FACTORS

Some women, unfortunately, find that they are unable to have any children. It was found that 2% of women in the Project district suffer from primary infertility; that is, by age 45 they are unable to conceive even once. Another 4% suffer from secondary infertility. They are able to conceive but are unable to produce a live birth by age 45. A high percentage of the infertility results from tubal scarring due to pelvic infections and is impossible to treat currently (6). For many of these women infertility is a life-long curse since the society places such a high regard on a woman's ability to bear children. In traditional Ga culture infertile women were often scorned and ridiculed and, although this is probably diminishing, it still represents a heartbreaking problem for most.

Recent Danfa demographic studies have shown that the average woman has seven or eight live births by the end of her child-bearing years. One or two die in early childhood leaving her with five or six living children. The mean birth interval is about 30 months. Breastfeeding is practiced in almost all cases and lasts for about 16 months if a pregnancy does not supervene, in

which case the woman usually abruptly weans the child. In one Project survey of non-acceptors, it was found that abstinence only lasts five months. An examination of acceptor registration forms containing information about pregnancies occurring before starting family planning showed that the risk of conception after a live delivery is at least 10% by 12 months, 33% by 18 months and 50% by 24 months. The result is a fertility rate among the highest in the world with three of every ten women aged 20-40 delivering a child each year.

7.5 TRADITIONAL CONTRACEPTIVE PRACTICES

In spite of a very pronatalist tradition, there were many situations in which couples have tried to limit their fertility. The most common reason was to ensure an adequate spacing between births. Although women may not have been aware of its anti-fertility effect, breastfeeding has been, and still is, the most important child-spacer in countries such as Ghana because of the anovulatory effect of lactation hormones. Abstinence (after childbearing) was another method and, although it may now have only minimal impact because it occurs early when the anovulatory effect of lactation is strongest, it may have been more important formerly in the Danfa Project district and may still be in other parts of Ghana and West Africa where it is continued for a longer period.

The next most common method of contraception used traditionally has been rhythm. In a recent Project study rhythm was used in 18% of all birth intervals. However, ideas of what constituted the "safe period" of the menstrual cycle varied widely and two-thirds of traditional midwives interviewed gave times for safe periods that fell wholly or partly into what is scientifically considered to be unsafe periods! Despite this, respondents in our survey reported rhythm to be rather effective, with an accidental pregnancy rate of only 8 per 100 woman-years use. This is difficult to explain. Certainly abstinence for any significant period during the menstrual cycle will reduce the risk of pregnancy. Alternately, couples using rhythm may tend to report discontinuance of rhythm in the month prior to conception regardless of whether they were using it in the month of conception or not. Still, it may be worthwhile to investigate in greater detail the nature and impact of rhythm and other traditional methods of fertility control in rural Africa.

Withdrawal is used only rarely but abortion is not uncommon and 4% of Danfa acceptors reported that they sought abortion for pregnancies occurring after the start of contraception. Illegal abortion performed by untrained personnel is a major problem in rural Ghana and is one of the leading causes of death on the Gynecology Wards of Korle Bu Hospital (7).

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HAVOLINE

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8. FAMILY PLANNING

8.1 ORIGINAL OBJECTIVES OF THE FAMILY PLANNING PROGRAM

Before 1970 most family planning activities in Ghana had been directed at urban populations. If the new population goals of the Government of Ghana were to be realized, family planning services had to be brought to the rural areas where 70% of the population lived. In 1970, few family planning programs existed in rural Africa and there was little information or experience to guide rural program planning. Thus, the primary research objective of the Danfa family planning program was to conduct operational research and to test various ways of delivering family planning services in rural Ghana to learn which are most effective.

In addition, controversy existed both within Ghana and in international circles concerning the most cost-effective way to deliver services. Many thought that the most effective program would combine comprehensive health care and family planning services and thus produce a synergistic effect on fertility reduction, partly as a result of increased child survival and partly as a result of increasing contacts with susceptible women. Another group thought that comprehensive health services were difficult and costly to implement and that insistence on their presence would delay implementation of family planning services. They believed that the provision of effective family planning education and services alone would result in acceptable rates. Moreover, they held that, if general health education were included, many of the health benefits of comprehensive health services could also be achieved. A third group thought that sufficient motivation already existed and that couples readily would accept family planning if only effective contraceptive methods were made available. Finally, a fourth group believed that fertility reduction was primarily dependent on socioeconomic improvements. This last group thought that as levels of education and income improved, Ghanaian couples would seek out ways to reduce their fertility without the need for special programs.

Another research objective, then, of the Danfa family planning program was to develop and implement a quasi-experimental research design to help resolve this controversy and to evaluate carefully these four alternate arguments regarding the implementation of national family

planning policy (1,2,3). This was to be done in as rigorous a manner as possible under field conditions. Four research areas in the Danfa Project district were identified, each one to receive services corresponding to the four alternate arguments presented above. (See Table 8-1).

Table 8-1: Health Services Provided in Four Project Areas--Danfa Project, Ghana, 1972-75

	SERVICES PROVIDED			
Area	Comprehensive Health Care Program	Health Education Program	Family Planning Program	Standard Ministry of Health Services
I	YES	YES	YES	YES[a]
II	NO	YES	YES	YES
III	NO	NO	YES	YES
IV	NO	NO	NO	YES

[a]Equivalent.

8.2 ASSUMPTIONS AND HYPOTHESES

The basic assumptions and hypotheses underlying this original research design are outlined in Table 8-2.

Table 8-2: Basic Assumptions and Hypotheses Underlying The Danfa Project Family Planning Program

ASSUMPTIONS:

(a) If comprehensive health care and family planning are introduced into the research area, quantifiable changes will be elicited.

(b) Non-Project inputs which affect fertility rates, morbidity and mortality will operate approximately equally in each of the four research areas.

HYPOTHESES:

(a) Comprehensive health care, as delivered by the Danfa Project, will reduce child morbidity and mortality rates.

(b) Family planning services within a program of comprehensive health services and health education are more effective in reducing fertility rates than family planning services without these additional components.

(c) Family planning services coupled with health education are more effective in reducing fertility rates than family planning services provided without health education.

(d) The introduction of family planning services utilized by the Danfa Project will result in a greater reduction of fertility rates than that elicited by the customary family planning services presently available in the research area.

In carrying out the original research design the family planning program was bound by two constraints. First, its operations had to be replicable; only such service methods were to be employed which would lie within the present and anticipated fiscal and manpower resources of Ghana, as judged by Ghanaian administrators. Most of the Project's research and evaluation activities, while admittedly costly, were not to be continued beyond the Project, although certain elements, such as records systems procedures, might be feasible for reproduction and adoption by the Ministry of Health. Second, the research design required that the family planning service inputs be comparable in quantity and quality in the three service areas.

To assure this comparability, the same personnel were used to provide family planning services in all three areas. In this way, differences in family planning acceptance rates among the areas were more likely to be related to quantitative programmatic inputs than to differences in the interest or efforts made by individual health workers. We planned to modify the program as we became more familiar with providing family planning services in the Project setting, so that it would be integrated more fully with the work of the regular MCH workers in each area, and to explore other approaches, including the use of volunteers and commercial distribution systems. It was thought that one family planning team composed of four persons and one vehicle could provide adequate opportunities for the acceptance of family planning in the three service areas, a region of 220 square miles and 47,000 population. We planned to add a second team if experience showed that the first team was fully utilized and if demand for services was not being met.

8.3 REVISED OBJECTIVES OF THE FAMILY PLANNING PROGRAM

Midway through the Project the Government of Ghana fully committed itself to providing family planning services as part of comprehensive health services. This decision was based partially on the Danfa Project's experience of three years of family planning activities which showed substantially higher acceptance rates in the Project area receiving the full range of comprehensive health and family planning services. As a result of this decision, the rigid research design developed to test the last three hypotheses (Table 8-2) was de-emphasized and more resources were employed to conduct flexible operations research of various strategies for delivering family planning services in rural Ghana.

According to the revised project paper of 1975, the primary family planning program objective was linked to the health care program objective, namely, the demonstration of several cost-effective health care systems that include family planning.

The major sub-objectives and their related activities are:

(a) To develop systems for increased accessibility of family planning services by:
- Continuing evolution and evaluation of the satellite clinic concept, to include family planning.
- Continuing development and evaluation of community-based approaches to delivery of family planning services.
- Experimenting with and evaluating extended family planning services through volunteers and traditional health workers.

(b) To develop methods of increased community participation in the family planning service program by:
- Experimenting with programs of community education including the design, implementation and evaluation of various approaches to the community.
- Involving the community both in planning and implementing family planning programs.

(c) To increase the effectiveness of human, physical and financial resources by:
- Analyzing costs to assure that services do not exceed availabilities and comparing cost effectiveness of alternative approaches.

- Carrying out functional analyses of services, sub-systems and components.
- Standardizing and simplifying patient management procedures.
- Developing innovative uses of health personnel to deliver family planning services by means of task analysis, development of job descriptions, simplified operational manuals and in-service training.

(d) Developing systems that improve the quality of family planning services by:

- Establishing feasible minimum standards for delivering family planning services.
- Establishing improved management methods (including functional job descriptions and operational manuals).

(e) Developing coordinated research and applied programs with systematic flow and feedback of information by:

- Maintaining formal links with the Ministry of Health and the Ghanaian National Family Planning Programme (GNFPP) at all levels.
- Conducting workshops with specialized personnel from operating agencies.

8.4 OVERVIEW OF FAMILY PLANNING EDUCATION

Making contraceptives available is not sufficient by itself to attract significant numbers of family planning acceptors in rural Ghana. Rather there are two essential elements. The first is education which must include both motivational support and information about methods. The second is the accessibility of contraceptive services.

This sub-section describes the educational methods employed, and the following sub-section describes the four service components that formed the Danfa family planning program package, and what the Project found to be the most cost-effective way of integrating these four service components with other comprehensive health services.

Danfa health workers who are engaged in family planning education strive to promote trust and confidence in themselves as health workers by presenting information and answering questions honestly, and by being

responsible and understanding. As a result, they are better able to help people decide in favor of family planning.

Early in the program health workers may talk with influential people in the village to gain their support. They identify the needs of the people and then show them how family planning can help meet some of their needs. Thus, they describe the health benefits of family planning to the mother and to the child, and the social and economic benefits to the family and the village. They dispel some of the common fears and rumors about family planning and about contraceptive failure. Finally, they present the facts about contraceptive methods and provide people with decision-making opportunities and reinforce seeking out of services and continuous use of a method.

Several types of personnel were and continue to be involved in family planning education:

- Health Education Assistants
- Family planning team members
- Resident Health Center staff
- Volunteer Village Health Workers
- Traditional birth attendants
- Satisfied acceptors
- Ghanaian National Family Planning Programme cinema van crews

8.4.1 Health Education Assistants

Health Education Assistants (HEA's) are a new category of health worker originally recruited specifically for the Danfa Project from the ranks of community health nurses, sanitation assistants, family planning field workers and Nutrition Technical Officers. In the process of becoming multi-purpose workers, they received broad training in health education emphasizing family planning, nutrition, maternal and child health, village sanitation and first aid. They are also trained in community development and the use of communication materials and methods. Each HEA resides in a rural village in a sub-area (clusters of 10-15 villages) of research Area I or II. HEAs receive the added incentive of about ₵1.50 (U.S. $1.30) per day as field allowance during residence

there. From these villages they provide health education services to the other villages in their sub-area. Besides engaging in general health education they act as family planning field workers, motivating and recruiting clients, and providing support to the acceptors for the continued use of contraceptives. The HEAs function at three levels: the individual or family, the group or community, and the clinic.

At the individual and family level, the HEAs conduct home visits on both a regular and special-need basis, using the opportunity to offer family planning advice and information as appropriate. There are other opportunities to advise individuals during informal contacts in the village.

At the group or community level, the HEAs find it useful to organize village meetings to create public awareness of family planning, to bring certain fears to the surface for public discussion, and to counteract various rumors about the program or specific contraceptive methods. Presentations are also made at smaller group meetings such as village development committees, parent-teacher associations, church fellowship groups, and farmers' associations. Women's groups are a regular and important focus of family planning talks with special efforts made during the national Family Planning Week in May of each year.

At the clinic level, the HEAs discuss family planning with parents of small children during their attendance at under-fives clinics. Even more important is the coordination of HEAs' efforts with the visits of the family planning team to the villages. The HEAs inform the populace of the coming visit, and they are present during the team visit whenever possible to provide support to referred clients and to aid in the education process. HEAs also provide support and reinforcement during follow-up of acceptors in their homes. During the five years of the family planning program the eight HEAs spent about 25% of their time in family planning education.

The importance of HEA input is illustrated by a study conducted at the Amasaman Health Post in Area II. During an eleven-week period, 8% of women attending a child clinic accepted family planning during sessions when family planning educational talks were provided by an HEA but only 2% accepted during sessions when no talks were provided. Moreover, it was found that talks involving group discussions were much more effective

in changing knowledge and attitudes than those during which information was presented without the opportunity for group discussion.

8.4.2 The Family Planning Team as Educators

The first time the team visits a village, as many interested villagers as possible are assembled for a short talk given by a member of the family planning team. Methods are illustrated, and discussion is encouraged. Men and women who are interested in adopting family planning are then registered by the clerk. The Family Planning Assistant talks to those registered about conception and fertility and explains the various contraceptive devices. They discuss methods together and each client makes his or her own selection.

8.4.3 The Health Center Staff as Educators

Family planning information and reinforcement to adopt it are provided by the nurses and nurse-midwives at the Health Center and their satellite clinics. Special emphasis is placed on reaching women attending postpartum and young child clinics, stressing the benefits of child spacing to the health of the mother and her children.

8.4.4 Volunteer Village Health Workers

Since 1977 volunteer Village Health Workers have been involved in educating fellow villagers through group and individual discussions. During their training they are given specific instruction and practice in educating men and women about family planning.

8.4.5 Traditional Birth Attendants (TBA's) as Educators

In Area I, 90% of the traditional birth attendants have been trained to improve their obstetrical techniques and to screen for high-risk pregnancies and deliveries. In addition, they have received training in family planning motivation and referral. Each month they report significant numbers of family planning acceptors but, because they tend to exaggerate the numbers of women they have referred, it is difficult to gauge the magnitude of their impact on acceptance rates.

8.4.6 Satisfied Acceptors as Educators

All acceptors are encouraged to discuss family planning with friends and relatives when appropriate. Word of mouth is the most important mode of family planning communication in the Project district. Various Project studies have shown that from 20-72% of adults who knew about family planning and contraceptive methods reported that they first received information from friends or relatives.

8.4.7 GNFPP Cinema Van Crews

During the first three months of the Danfa family planning program a Ghana National Family Planning Programme cinema van, together with one HEA and one member of the family planning team, visited 47 of the largest villages in research Areas I, II and III. One general health education film and one family planning film (produced in Ghana in the local languages) were shown in the evening after the adults had returned from farming and finished their supper. A questionnaire administered to a sample of villagers before and after the presentations showed that the percentage of adults who approve of family planning increased from 82% before the films to 92% afterwards, and that 63% learned of at least one new contraceptive method. However, the need to place more stress on specific details of local services was demonstrated by results which showed that after the presentations only 38% knew of the availability of services in their area, 22% of the correct location of the family planning clinic, and only 16% knew of the day and time of the clinic. Nevertheless, the film program was well received and helped to create a climate of acceptability for the program.

8.5 FAMILY PLANNING SERVICES

The family planning service program (4) gradually evolved into a package made up of four family planning delivery components: the family planning team (a mobile unit), the health center staff (both the Health Center and its satellites); the village-based primary care program, and the commercial program.

Chronologically the package evolved as follows:

- 7/72 - Family planning team only
- 10/74 - Family planning team, plus
  Health Center staff (Area II Health Post program began 10/74; Area I and III in 4/76)
- 4/77 - Family planning team, plus
  Health Center staff, plus
  Volunteer Village Health Workers
- 5/77 - Family planning team, plus
  Health Center staff, plus
  Volunteer Village Health Workers, plus
  Commercial Program (Area II only)

Each of these four components might stand alone if the resources needed for the other three were not available. This family planning package has been continually undergoing modification and integration in the Danfa Project. Although we feel that the most successful approach to family planning would be a combination of all four components, the actual combination chosen would depend on the population which the program would serve and its available resources. Each component should be modified to prevent or reduce overlap and fully utilize existing resources. The following sections describe each of the four components in more detail.

8.5.1 The Family Planning Team Activities

Because the original research design required that the family planning service inputs be comparable in the three service areas, we used the same personnel to provide family planning services in all three areas. Between July, 1972 and October, 1974 the family planning team, composed of four persons and one vehicle, single-handedly provided services to a region of 220 square miles with 47,000 population.

The family planning team is comprised of the following members:

(a) Family Planning Nurse: A state-registered nurse-midwife who has also completed eight weeks' training in family planning, she is the team leader and supervisor. It is her responsibility to see that schedules are met and that services are delivered in accordance with established policies. She prescribes the pills, performs pelvic examinations, inserts I.U.D.'s, and evaluates complications. She also screens and refers women for infertility problems. She maintains inventory controls and reorders supplies.

(b) Family Planning Assistant: The family planning assistant has an enrolled nurse's certificate (two years' training beyond middle school) and has taken an eight-week training course. This woman provides education, explaining the various contraceptive methods to interested men and women. She also may take pertinent pregnancy and medical histories and perform appropriate screening examinations, such as measuring weight and blood pressure. She is also able to perform simple urine examinations, simple hemoglobin determinations, and pregnancy tests. She can prescribe and dispense foam, condoms, and, in the absence of the family planning nurse, oral contraceptives. Thus, the team is able to function even on days when the family planning nurse is not available.

(c) Clerk: The clerk has a secondary school education. This person registers clients after identifying them on the census listing, completes the registration forms, issues patient identification cards, and maintains record books on acceptors. If a client cannot be found on the census list, a census registration form is completed for that person. During busy sessions the clerk may also aid in dispensing foam and condoms, and educating interested persons about family planning methods. Both male and female clerks have served satisfactorily at various times. This person's duties could be assumed by the family planning assistant in the non-research situation.

(d) Driver: The driver loads and unloads the vehicle and drives the other team members to their field locations.

Three clinic sites were selected for family planning services in each of the three areas. In Area I the sites selected were the Health Center and its two satellite clinics. In Areas II and III one clinic was attached to the government health post. In selecting the other two villages consideration was given to the geographical areas they could serve, population size, distance from other villages, accessibility, their status as market towns, the number and interest of the traditional midwives, the interest of the village leaders, and the availability of facilities in which to hold the clinics (to be donated by the communities). Although some reluctance about family planning was anticipated, all village chiefs contacted expressed interest and a willingness to have a family planning clinic in their villages. Many villagers hoped that it would be expanded into a general-purpose clinic in the future, although we explained that it would be strictly a family planning clinic.

The family planning team is not posted to any one clinic; rather each of nine clinic sites is visited by the team once every two weeks. Each morning the team leaves the base office in Accra for one of the scheduled clinic locations. Nine of every ten days are spent visiting these clinics; one day is spent at the base office to replenish supplies and maintain records. Except at Amasaman, Danfa and Obom, services are provided in facilities provided rent-free by the villagers. A locally-made wooden examination table and other inexpensive furniture are available at each location.

The vehicle is an unmodified two-wheel-drive van with seating space for five persons and a rear luggage compartment for boxes of equipment. The equipment consists of contraceptive supplies, sterile instruments for I.U.D. insertion, blood pressure manometer, scale, stethoscope, flashlight, urinary test tapes, urine pregnancy test kit, flip charts for client education, records, census lists, and an emergency medical kit. We prefer to use sterile, individually wrapped Lippes loop insertion packs, which are safer from contamination than are loops and inserters transported to the field in antiseptic solutions. Equipment is carried in small, locally-made wooden boxes.

As discussed in Section 8.4, "Family Planning Education," the first time the team visits a village, as many interested villagers as possible are assembled for a short talk on family planning and villagers select

the method they desire. No verbal or written consent from a spouse is required as a condition of receiving services. If appropriate, the family planning assistant takes the client's history, performs a urinalysis, and determines blood pressure. If there is any contra-indication to a method, the problem is discussed with the client and the family planning nurse. During follow-up visits, problems and side effects are discussed and new supplies are given. At the end of each client visit the family planning nurse or assistant completes a patient encounter card. No charge is made for services.

The family planning team carries a first-aid kit containing a few simple drugs such as aspirin and chloroquine, which enables them to provide some emergency assistance, if necessary. Very little time is spent in this activity, and persons coming with non-urgent complaints are referred to the nearest health facility. If a serious case is brought to them, the team members are authorized to transport the critically ill person to the nearest appropriate health facility; such instances have been rare.

EXTENDED FAMILY PLANNING SERVICES

An important modification of the family planning team's work was the extended program. Nine months after the program was initiated, a simple analysis was made of the hand-tallied numbers and percentages of acceptors as a function of the distance they lived from any of the three family planning clinic locations in their area. We found that 42% of all acceptors in Area I, 67% in Area II, and 90% in Area III were from the villages in which the clinics were held, although only 18% of the population in the three areas lived in these clinic villages. The mean acceptance rate among couples in these villages was 18% after nine months of program activity. There were two implications. First, there was a desire for family planning services as evidenced by the relatively high acceptance rates in the clinic villages, but women did not seem willing to travel very far for these services alone. Second, health centers and satellite clinics that offered other health services in addition to family planning attracted women from greater distances and provided contacts for family planning motivation.

Nine months after the program was initiated the demand for services had largely been met in these clinic villages, so the family planning team was involved with clients less than half of the total time the team spent at the clinics. Therefore, in May 1973, we extended their work to cover a larger number of villages. They now visit an additional village on their way to the regularly scheduled clinic; nearly 70% of the population in each area are reached in their own villages at least once every four months. This has been done without the addition of any more family planning workers, and the team is now fully utilized. From the back of the vehicle they register clients, take careful histories, dispense contraceptives, and handle follow-ups. Pelvic examinations are not performed at these extended clinics unless they are strongly indicated. Women who want IUD's have them inserted in their own homes. In the first few months of this program, our monthly acceptance rate doubled; before that it had begun to fall as numbers of interested women in the clinic villages diminished. Furthermore, since the onset of the extended program, the geographic distribution of our acceptors has closely paralleled that of the population in each area.

8.5.2 Health Center Staff

Family planning has now been integrated into the regular maternal and child health (MCH) services. The family planning clinics were always coordinated with the times and locations of the MCH clinics. However, family planning services were not available on a daily basis as were other MCH services, nor were they provided by the regular MCH clinic nurses. Although a separate family planning team working in a less hectic atmosphere might be able to provide a higher quality service, we feel that it is economically more realistic to have services provided on a daily basis by the regular clinic staff. For this reason, resident clinic nurses and midwives in all three areas have been phased into the delivery of family planning services. After a short in-service training program they are able to offer all reversible family planning methods, except IUD insertion. The training program has been very successful with marked improvement in post-test and practical examinations.

Although in-service training in all methods was provided for all clinic staff, the community health nurses, working in under-five's

clinics, were the most successful in recruiting new acceptors. These nurses see large numbers of mothers 9-18 months after a delivery when mothers are most anxious to ensure adequate child spacing. Immediate postpartum programs can have only limited impact in rural Africa where most women deliver at home and where the IUD is not popular. Rather it is in the popular under-five's clinics or child welfare clinics where the most rapid increase in family planning acceptance can occur.

Thirty percent of all acceptors in the entire three Project areas are now being motivated by and are receiving services from the Health Center staff at Danfa; there were 161 new acceptors in the initial six months after staff training was completed. This approach has now been adopted by the Ministry of Health, and Project staff have worked with them in developing a family planning training manual for all Ministry of Health personnel (5) which is now used in its regional training programs.

8.5.3 Volunteer Village Health Workers

Over the past six years, the Danfa Project increasingly has assumed a village-based orientation and has been developing and expanding its community distribution system. Besides family planning (discussed below), village-based services include the use of trained traditional birth attendants for maternal care, the use of health education volunteers to monitor the growth of children and to provide nutrition education, and the use of volunteers in mass immunization, malaria chemoprophylaxis distribution, and self-help sanitation projects. The Village Health Worker program is designed to coordinate all community-based primary health care programs through a multi-purpose volunteer village worker (see also Section 6.12).

After initial resistance has been overcome by a well-organized program, a further extension of acceptance may be possible by the use of community volunteers. In addition to the kind of Volunteer Village Health Workers trained, we believe that traditional midwives, herbalists, members of mothers' groups, and teachers could also be recruited to act as suppliers of contraceptives in their villages. These volunteers can be trained and authorized not only to resupply acceptors, but also to initiate acceptance of pills, foam, and condoms. The arguments for and against such an approach have been discussed in recent publications (6,7).

In Area I we have sought to make this approach part of a larger effort to develop village-based primary care programs, in which volunteer Village Health Workers assist in providing preventive and curative services. In experimenting with such family planning volunteers in three pilot villages, it was found that it is not a simple approach with quick and spectacular results. Careful recruiting, training, encouragement, and supervision are needed. Nevertheless, we think that this approach has great potential and may be a solution to the problem of accessibility.

Our experience is still limited but in nine months this group of Village Health Workers recruited 21 acceptors per month. This compares with the six acceptors per month recruited in these villages by the other two approaches during the first five Project years. The advantage here is the ready accessibility of information and services from a person who is part of the community structure, and a greater cost-effectiveness than that of the mobile team. Our mobile team will eventually spend more time supervising these community distributors than directly providing services. In this way, community distributors could greatly multiply the work of trained family planning workers.

8.5.4 Commercial Family Planning Services

In May 1977, a commercial program was started in Area II. Foam and condoms were offered for sale at GNFPP clinic prices at small kiosks in the more populated towns in Area II. There were few sales and when the shopkeepers (who were allowed to retain all monies collected) were questioned as to why there were so few sales, they answered that the people said they could get the same things free at the Danfa clinics. Because of this relatively easy accessibility of the Project's other family planning services, utilization of the commercial distribution outlets has not been significant.

8.6 POLICIES OF FAMILY PLANNING PROGRAM

Policies have been developed to deal with certain technical problems of importance in the rural African setting. There is controversy, for instance, over whether or not to dispense steroid contraceptives to lactating mothers. This issue has been discussed in several recent publications (8,9,10,11). At first the issuance of the pill to any

woman who was breastfeeding an infant under nine months of age was avoided. Because some of these women refused to use other methods, however, and because many have a return of their menses early in the first postpartum year despite lactation, Danfa policy was modified.

Currently lactating women are strongly advised to accept an IUD or a medroxyprogesterone acetate (Depoprovera) injection, but if a woman refuses both of these methods, the team recommends a combination low-dose estrogen (20-35 mcg) oral contraceptive. For lactating mothers who have not yet had a return of menses and whose infants are under nine months of age, the team also approves of the use of foam, since this method probably affords reasonable protection in an amenorrheic lactating mother. As a last resort, the team dispenses the usual oral contraceptive (currently Norinyl 1, with 50 mcg of estrogen), but only if lactation is well established and the infant is at least three months old. In these cases they also follow the child's weight carefully.

A second policy concerns the timing of IUD insertion. Most medical authorities recommend insertion of the IUD during the period of menstrual flow. This is a difficult practice to follow in a rural setting with clinics spaced two weeks to four months apart. As a result the family planning team has adopted the following policy: If history and physical examination confirm that a woman is not overdue for her period, the team will insert an IUD at any time during the menstrual cycle. If the woman has not yet resumed menses following a delivery, and the physical examination and pregnancy test are negative, they will also insert the IUD. If there is any suspicion of early pregnancy, the woman is given the pill or foam and instructed to report back in a few weeks. Using this policy there have been no serious complications in more than 200 insertions.

Originally it was felt that privacy would be very important for acceptance of services by women, so clinics were held in houses located away from the center of village activity. A screen separated the registration area from those waiting. For some women privacy is very important, especially for those who do not wish their husbands or parents to know that they are taking action to limit their fertility. These women, however, will usually travel to another village to get family planning services rather than seek them in their own village, where it is difficult to maintain secrecy under any circumstances.

Most women seem to prefer a fairly central and open location in which to receive services, where they can freely discuss family planning with their friends and gain reassurance by their presence. A few husbands have strongly objected when they learned that their wives had accepted family planning. One husband beat his wife; two others forced the women to have the IUDs removed. But episodes of this kind are rare and have not posed a threat to the program.

It has been suggested that family planning clinics in Africa offer services to evaluate and treat infertility. In reality there is little that one can do other than to take a client's history, perform a physical examination, and offer advice or referral to a gynecological clinic. Most true infertility problems require expensive gynecological evaluation that is not readily available in most parts of tropical Africa. Furthermore, the cause is often tubal scarring secondary to pelvic infection, which defies remedy even in the best medical centers (12). Thus it may be unwise to raise false hopes. During the first few months of the Danfa family planning program, quite a large number of women (22 out of 250 total visiting the clinics in the first four months) came seeking treatment for infertility. When they learned there was little to offer them, the number of such women diminished markedly.

The Project has not instituted a highly systematized procedure for the follow-up of defaulters (those acceptors who fail to return for follow-up visits). For the most part, such follow-up is accomplished when the family planning team contacts friends of the defaulters. In Areas I and II, Health Education Assistants are able to contact defaulters whom they discover in the course of their discussions with villagers.

8.7 MANAGEMENT OF FAMILY PLANNING PROGRAM

8.7.1 Program Controls

Controls are the management procedures that were instituted to ensure that events conformed to plans. Important among these controls are monthly staff meetings, budget and cost analyses, and clearly stated policies and procedures.

The staff meets monthly with a supervisory physician to discuss objectives reached, problems and program changes. Before the family planning program was implemented, a budget was developed to ensure that

the costs of the program would not exceed the per capita costs that the government might reasonably expend on a nationwide program. Regular cost analyses are carried out to be sure that the program is operating within budgetary constraints. These figures are also compared with the current per capita and per acceptor costs of the Ghana National Family Planning Programme. Written policies in the administrative and technical areas have been incorporated in the MOH manual for serving personnel which is used for reference and for orientation of new staff members.

8.7.2 Patient Appointment System

Although somewhat difficult to implement in a predominately illiterate population, an appointment system is by no means impossible. The system has worked fairly well in the Project district and most women endeavor to keep their appointments. One can use national or local calendar events as reference points in scheduling appointments. Appointment cards are issued and the women seek the aid of literate relatives to keep track of the return date. It is made clear that the appointment is a convenience for them and the staff and that, if for any reason they are unable to keep the appointment, they are welcome on any other clinic day.

8.7.3 Fees for Family Planning Services

The Danfa Health Center was organized originally with community help on the understanding that services would be free of charge. Family planning services were included in this understanding. Therefore, we have not been able to do a controlled study to assess the effect of free services as compared to charged services on acceptance rates. However, there is no evidence in the Danfa Project that free services result in people believing that the services are without value or that acceptance rates are reduced. Charging for service may discourage some of the most needy couples from seeking family planning methods. Our experience with a small commercial program suggests that people will seek free services in preference to a charged one. Therefore, we recommend that the cost benefits of family planning justify free service in Ghana.

8.8 EVALUATION METHODS FOR FAMILY PLANNING

It is not possible to evaluate every aspect of any health care program. Operational programs should only evaluate those aspects that are essential to monitoring the attainment of objectives. Even then, proxy measures of goal attainment may have to be used because of the difficulty or impossibility of measuring certain changes in population status.

Because of the research interest of the Danfa Project more topics were selected for evaluation than would be required by a typical operational program. The information obtained can be used to help assess the likely effect and impact of a similar program if replicated elsewhere in Ghana or West Africa.

The most important topics for evaluation were:

(a) The Delivery System
- Inputs: characteristics and geographical origin of acceptors, costs, assessibility of services.
- Processes: quality of care, task analyses, efficiency.
- Outputs: numbers of encounters.

(b) Effects
- Changes in knowledge, attitudes and practices (especially acceptance and continuation rates).

(c) Impact (or Status Change)
- Changes in fertility indices such as birth intervals, components of fertility, extended use effectiveness, pregnancy rates and fertility rates.

The major instruments used to provide data for these evaluations were:

(a) Longitudinal Male and Female KAP Surveys: From these surveys changes in the knowledge and attitudes about family planning and in the practice of contraception can be assessed.

(b) Family Planning Acceptor Registration Records: These records enable program managers to monitor numbers of acceptors, acceptor characteristics, geographic origin, methods accepted, and program component providing services.

(c) Family Planning Acceptor Follow-up Surveys: Two such surveys were carried out and provided essential information about reasons for accepting, length of continuation, reasons for discontinuation, use-effectiveness and change in fertility. The association of these variables with other factors such as program type and socio-economic characteristics can also be studied.

(d) Demographic Surveys: The dual collection of vital events and the longitudinal sample fertility survey provided information about certain indices of change in fertility.

(e) Functional Analyses: Periodically during the life of the Project, analyses were carried out concerning various Project inputs such as technical procedures, effective use of staff time, accessibility of services to the population, and the effectiveness of health education during clinic services. Results were used to improve the input-effectiveness of the service program.

8.9 INTRODUCTION TO RESULTS OF FAMILY PLANNING EVALUATION

At times there has been some pessimism that the traditional culture in rural Africa is so pro-natalist that family planning services would gain only very limited acceptance if offered. On the contrary, we believe that our results for the five-year period show that there is reason for optimism. In order to conform with overall Project goals and the need for replicability, the Danfa family planning program was not especially intensive nor aggressive. Yet, there have been significant changes in family planning knowledge, attitudes and practices and in some measures of fertility.

Results of evaluation of the family planning program are presented in the following subsections:

8.10 Results: Changes in Knowledge and Attitudes
8.11 Results: Patterns of Contraceptive Practice
8.12 Results: Characteristics of Acceptors
8.13 Results: Systems Factors and Functional Analyses
8.14 Results: Impact on Fertility
8.15 Costs of Family Planning Program
8.16 Conclusions and Recommendations

8.10 RESULTS: CHANGES IN KNOWLEDGE AND ATTITUDES

Table 8-3 shows that the improvement in family planning KAP in the Greater Accra Region that was noted in the few years before the Project began continued during the life of the Project. (See Subsection 7.4 for a discussion of the pre-Project KAP study.) During the 1977 longitudinal KAP survey about 90% of men and women in Area I said that they knew about modern methods such as the pill and approved of family planning, compared to 70% in 1972. However, similar increases were seen in all four research areas, including Area IV where no family planning program operated. These increases may represent a nationwide phenomenon resulting from the dissemination of information by word of mouth and the media. Since the study was longitudinal, one cannot be sure that the improved responses were not partly due to the learning effect of repeated questionnaire experiences. The median number of more children wanted also declined by one-half. Although the respondents were a few years older in 1977 the increase in age does not explain this marked reduction (See also Appendix 3).

Table 8-3: Changes in Female Family Planning KAP 1972 and 1977 Longitudinal Surveys[a]

		Area I	Area II	Area III	Area IV
Know of pill	1972	72%	72%	50%	64%
	1977	92%	91%	80%	86%
Approves of family planning	1972	70	69	70	76
	1977	89	86	85	88
Number additional children wanted (3 living children)	1972	2.9	3.3	3.7	2.8
	1977	1.2	2.2	2.3	1.0
Couples ever using modern FP	1972	11	7	2	8
	1977	34	21	8	9
Couples now using modern FP	1977 only	18	9	2	5

[a]For other KAP data see Appendix 3.

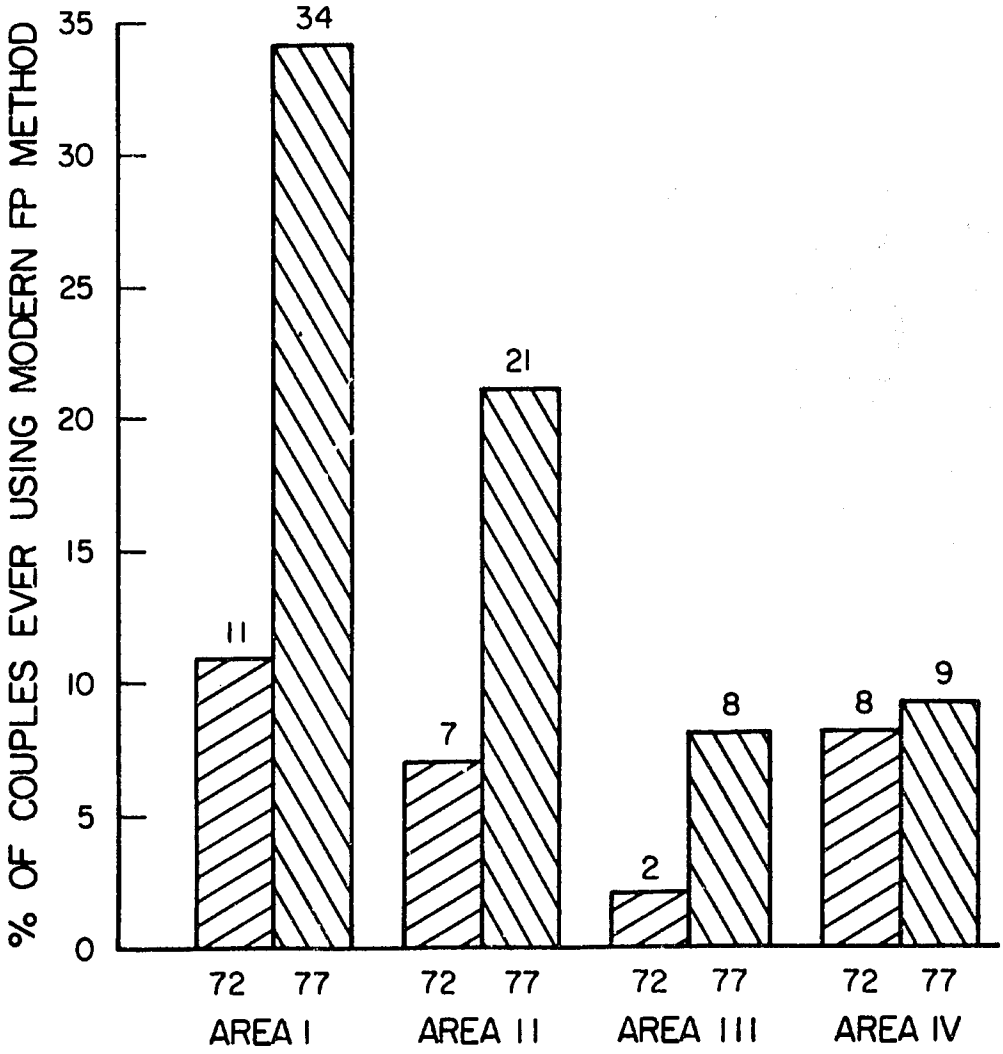
8.11 RESULTS: PATTERNS OF CONTRACEPTIVE PRACTICE

8.11.1 Acceptance of Family Planning

Table 8-3 shows three to fourfold increases in the numer of KAP survey couples reporting ever using modern contraceptives. (See also Figure 8-1.) It is important to note that the practice of family planning was already higher at the start of the Project in Area I than in the other two areas. This fact compromised to some degree the quasi-experimental nature of the original research design and was one of the factors that lead to its de-emphasis. Still, there was an increase from 11% in 1972 to 34% in 1977 in the number of couples in Area I reporting ever using modern contraceptives compared to an increase in Area II from 7% in 1972 to 21% in 1977, and from 2% in 1972 to 8% in 1977 in Area III; a marked difference that we think is related partly to different Project inputs in the three areas.

Despite a high level of knowledge and approval of family planning, (even at the baseline) in Area IV, there was no appreciable increase in the use of contraceptives in that area, presumably because services were

Figure 8-1
PERCENT OF KAP SURVEY COUPLES REPORTING THEY HAVE EVER USED A MODERN FAMILY PLANNING METHOD BY RESEARCH AREA, COMPARING 1972 WITH 1977



not easily accessible. This contradicts the argument of those who say that, with increasing socio-economic level and knowledge of family planning, people will seek out services themselves and that, therefore, making family planning services accessible is not important. The percentage of couples who reported they have ever used a modern family planning method is illustrated in Figure 8-1. Sixty-six percent of the survey couples in these three areas said they obtained their services from a Danfa Project source. Eighteen percent of couples who were present in Area I at the start of the program in 1972 were practicing contraception in 1977; about half of those who ever accepted. Of those women in Areas I, II or III who reported using contraceptives in the 1977 KAP survey, 66% came to Danfa Project sources for their services, 27% went to other government or private clinics and 4% went to a commercial outlet. For other family planning KAP results, see Appendix 3.

The number of men and women who accepted family planning in Danfa program clinics as determined by our family planning registration forms is shown in Table 8-4.

Table 8-4: New Acceptors by Method, Danfa Family Planning Program, 1972-1977

	Area 1	Area 2	Area 3	OPD[a]	Totals
Family Planning visits	4682	3190	2626	---	10498
Acceptors Total	1033	768	520	1422	3743
Acceptors Male	282	347	304	780	1713
Acceptors Female	751	421	216	642	2030
Women Only: IUD (%)	130 (17)	24 (6)	9 (4)	42 (7)	205 (10)
Pill (%)	465 (62)	307 (73)	160 (74)	464 (72)	1396 (69)
Foam (%)	118 (16)	82 (19)	35 (16)	93 (14)	328 (16)
Condom (%)	22 (3)	6 (1.4)	8 (4)	28 (4)	64 (3)
Injection (%)	16 (2)	2 (0.4)	4 (2)	13 (2)	35 (2)
Other (%)	0 (0)	0 (0.0)	0 (0)	2 (0.3)	2 (0.1)

[a]OPD = Acceptors resident outside Project district.

From 1972-1977 there were 10,498 family planning visits to clinics staffed primarily by the single family planning team. There were 3,743 acceptors, of whom 1,422 came from outside the Project areas. Forty-five percent of the acceptors were men. This service output represents approximately 175 visits and 62 new acceptors each month.

The pill was the most popular method among women in the district representing 63% of acceptances, followed by foam, IUD and condom. The popularity of the pill is increasing and there are fewer requests for foam or condoms. Although the acceptance of the IUD has been negligible in Areas II and III, 17% of female acceptors have consistently chosen the IUD in Area I. Use of the IUD fell from 21% in the first six months of the program to 4% in the last year while the pill rose from 35% of acceptance to 72%. Many people have heard bad rumors about the IUD and consider it unsafe, even though there were no major complications in the Program. Others seem to dislike the minor surgical nature of the insertion procedure. A low-estrogen pill is now being given frequently to women who are still breastfeeding and who desire a pill, and the injection is gaining rapidly in popularity, with little concern about the cessation of menses. More than half the men accepted foam, which suggests that they would rather have their partners use foam than use condoms themselves.

Acceptor rates representing only women and couples resident in the Project district who accepted in Danfa family planning program clinics are shown in Table 8-5. Rates are expressed as percentages of all women of reproductive age (married and unmarried) in the population. An acceptor is defined as anyone who registers and accepts a method, whether or not that person ever returns for a subsequent visit. Again, Area I shows a markedly higher rate of acceptance than Areas II or III, especially among women, and Area II far surpasses Area III. Although not a controlled experiment, we think that the increased acceptance in Area I is related to lower child death rates present at the start of the Project which continued, and, very importantly, to the increased contacts with susceptible women in the Project's maternal and child care clinics. The superior performance of Area II over Area III may be related to a large number of unmarried young men working and residing in the area, the health education program, the active health program at the Amasaman Health Post and to a

somewhat higher socio-economic level. In addition to acceptors resident in the Project district, 38% of our acceptors came from outside the Project district.

It is important to point out that these acceptance rates are based only on men and women who accepted in Danfa program clinics. The longitudinal KAP survey showed that a substantial number of people may accept elsewhere. Thus, the actual acceptance rates in the Project district must be even higher than the rates shown in Table 8-5.

Table 8-5: Acceptor Rates per 100 WRA by Area - 5 Year Period 7/72 to 6/77

Acceptors and Acceptance Rates	Area I	Area II	Area III	All Project Areas
Female Acceptors[a]	731	405	207	1343
Couple Acceptors	1013	752	511	2276
WRA[b]	2691	2424	3592	8707
Female Acceptors per 100 WRA	27.2	16.7	5.8	15.4
Couple Acceptors per 100 WRA[c]	37.6	31.0	14.2	26.1

[a]Aged 15-44 (acceptors 45 years^{+} are not included).

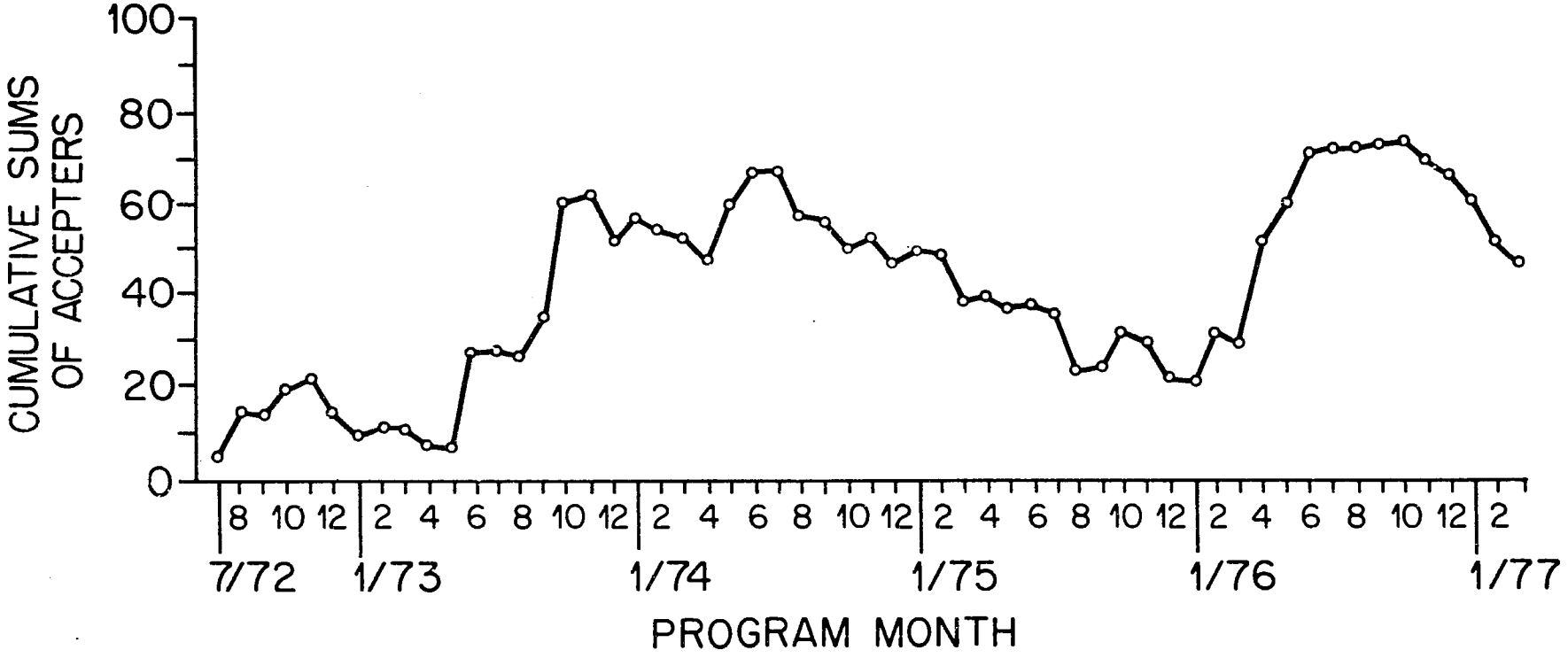
[b]Mean no. of women of reproductive age (15-44), married and unmarried in population during period July 1972 to June 1977.

[c]We assume that each man who accepts family planning is associated, on the average, with one woman of reproductive age. Thus acceptance rates for couples are all female and male acceptors divided by the mean number of WRA during the period July 1972 to June 1977.

The monthly acceptance in our program Area I has been plotted as a cusum graph (Figure 8-2). This is a graph of cumulated sums above or below the mean and gives a better indication of increases or decreases in trends of acceptance. It shows several distinct increases; once with

Figure 8-2:

CUSUM PLOT OF NEW FEMALE ACCEPTORS
AREA I, DANFA PROJECT, 7/72-6/77



the start of the extended out-reach program of the family planning team in June 1973 and again with the initiation of daily services by the Danfa Health Center staff in April 1976. Although it shows a marked decrease in early 1977, this was abruptly reversed as the involvement of the Village Health Workers in family planning began to be felt from June 1977 to September 1978. During this 16-month period Village Health Wworkers recruited 190 acceptors which represents 20% of couples in the villages they serve. Each new program component appeared to increase the number of acceptors and provide services to certain couples who would not have been reached by any other component. We think these acceptance rates are encouraging and that they are probably the highest yet observed in Africa, south of the Sahara.

MOTIVATING FACTORS OF ACCEPTANCE

It is commonly assumed that birth spacing for better child health is the most common motivating reason for the acceptance of family planning in Africa. In fact, two-thirds of our female acceptors did say that they accepted in order to space births but one-third said that they accepted either to delay their first pregnancy or to stop having children entirely. However, the health of the child was not the most common reason women gave for using contraceptives. Rather it was to protect their own health. The second most common reason was freedom to work or study, and to have an older child to help look after the next baby. Health of the child was only the third most common reason given.

The most common reason for family planning acceptance given by male respondents was the improvement and preservation of the health of their children. The next most important reasons were prevention of an unwanted pregnancy and freedom to work or study followed by preservation of the health of the mother. Better ability to educate the children was the fourth most common reason given by both men and women.

8.11.2 Continuation of Family Planning

These acceptors also used the methods for significantly long periods of time. In two follow-up surveys, Danfa program acceptors in Area I reported continuation rates only slightly below those of developing countries in Asia where marked fertility reductions have occurred (Table 8-6).

For all methods, 36% of female acceptors surveyed in the 1977 follow-up study were still practicing 12 months after acceptance. This is less than the mid-Project 1975 survey in which 46% of women reported continued use at 12 months. This could be partly due to the decreased use of the IUD which has the highest continuation rate of 65% at 12 months in the Danfa program.

Table 8-6: Comparison of Continuation Rates
Pill -- First Method (per 100 Acceptors)

Area	Sample Size	3 Mos.	6 Mos.	12 Mos.	24 Mos.	36 Mos.
I	60	77	65	38	14	10
II	79	70	49	28	12	8
III	44	66	45	36	18	--
All 3	183	71	54	33	14	7
International[a]			61	51	36	

[a]Average of 13 studies in developing countries (13).

Men reported much higher continuation rates than women; 70% at 12 months (see Table 8-7). There are several possible reasons why the men show higher continuation rates. One is that the methods they choose have few or no medical side effects--a common reason for pill and IUD discontinuation by women. Second, the men (or their partners) may be using the methods irregularly or intermittently and still be reporting continuous use. Third, many of these male acceptors have more than one partner; thus, they may "continue" using the method with one partner after another has become pregnant. Finally, as Bleek (14) has shown, Ghanaian men may be strongly motivated to prevent pregnancy in extra-marital or premarital relationships. In general, continuation rates for each method were higher in Area I than the other two areas, and higher in Area II than in Area III. (Additional tables of continuation rates are shown in Appendix 5, Tables A5-13 to A5-16.)

Table 8-7: Continuation Rates[a]
Any Method[b] (Per 100 Acceptors)

	Sample Size	3 Mos.	6 Mos.	12 Mos.	24 Mos.	36 Mos.	48 Mos.
Males	102	88	79	70	51	38	25
Females	259	72	55	36	17	9	3

[a]All months are expressed in ordinal months and continuation rates were determined by the Life Table methods suggested by Tietze.

[b]Any method refers to continuation of any modern contraceptive method regardless if method was changed during period of continuation (e.g. from I.U.D. to pill) as long as there was no break in the use of some contraceptive.

8.11.3 Discontinuation of Family Planning

As can be seen in the previous subsection, once they have accepted, the majority use the contraceptives correctly and for a significant length of time. These overall continuation rates were shown in Table 8-7.

ACCIDENTAL PREGNANCIES

One reason why a woman may stop using a contraceptive is that she becomes accidentally pregnant while using the method either because of misuse of the method or method failure. The probability of accidental pregnancies is examined first. The accidental pregnancy rate is defined as the number of accidental pregnancies (due to misuse or method failure) occurring in any partner with whom the methods were used per 100 couple-years of use.

Table 8-8 shows the Gross Cumulative Attrition rates due to accidental pregnancy for Danfa program acceptors in all areas. These hypothetical rates are determined by computer analysis and are the rates of accidental pregnancy that would have occurred if all other reasons for termination of use were eliminated. Thus, these rates are higher than the actual accidental pregnancy rates.

Table 8-8: Gross Cumulative Attrition Rates for Accidental Pregnancies per 100 Woman-Years Use (First Method), All Three Project Areas

IUD	0
Pill	16
Foam/Condom	38
(Sample size = 259)	

Note that the accidental pregnancy rate for the pill has ranged in our studies from 10 to 20 per 100 woman years use, assuming all other reasons for termination are eliminated. This is higher than the 2-5% found in developed countries and indicates that 10-20% of women repeatedly forget to take the pill every day or else fail to maintain adequate supplies.

The rate for males using condoms and foam was 4 per 100 couple years use. This is less than the rate for female acceptors in the Project who experience an overall accidental rate of 19 per 100 woman years use of any modern method. Again, accuracy is questioned because males might not be aware of pregnancy in a partner or might not report it.

OTHER REASONS FOR DISCONTINUATION

Rates of various reasons for termination of the pill and the IUD as reported in the 1977 Danfa program acceptor follow-up survey are shown in Tables 8-9 and 8-10. These can be compared with overall continuation rates shown in Table 8-6 and 8-7.

Table 8-9: Rates of Termination in First Year First Method: Pill

Reason	Rates per 100 Acceptors
Accidental Pregnancy	10
Planning Child	10
Spouse Objected	3
Supply Problem	10
Other (mostly medical)	35
Still Using Pill at 12 mos.	33
(Sample size = 183)	

Table 8-10: Rates of Termination in First Year
First Method: I.U.D.

Reason	Rates per 100 Acceptors
Accidental Pregnancy	0
Planning Child	2
Spouse Objected	4
Supply Problem	0
Other (mostly medical)	29
Still Using I.U.D. at 12 mos. (Sample size = 52)	65

Reasons why women stop using the contraceptives accepted are shown in Table 8-11. The accidental pregnancy rate (for all types of contraceptives, except I.U.D.) is too high and it is clear that the ideal contraceptive--safe, effective and practical for use in rural Africa--has yet to be found.

One probable reason for the high accidental pregnancy rate is the popularity of foam in the district. Female acceptors report a very high accidental pregnancy rate with its use; but even though half our male acceptors took the foam, they reported a low rate of accidental pregnancies. Because foam is expensive and has such a high accidental pregnancy rate, its inclusion in a national program might be questioned, if it weren't for the low accidental pregnancy rates reported by male acceptors for their partners.

Table 8-11: Reason Stopped FP Method, Female Acceptors, Danfa Project, 1977 Acceptor Follow Up Survey

Reason	Per 100 Discontinuers
Side Effects	26
Accidental Pregnancy	22
Wanted Child	22
Supply Problem	12
Pregnant before started	4
Fear	3
Partner Objected	2.5
Inconvenient	2.5
Other	6
(Sample size = 239)	

8.12 RESULTS: CHARACTERISTICS OF ACCEPTORS

Characteristics of the typical female acceptor in the Danfa program are shown in Table 8-12 and are very similar to those of the typical woman of reproductive age in the Project district as determined from census data. The typical female acceptor is married, illiterate, farms and accepts the pill. Male acceptors were a year older than the women with one less living children. Additional characteristics of acceptors are presented in Appendix 5, "Family Planning."

Table 8-12: Typical Female Acceptor, Danfa Project

Age	28
Grava	4
Living Children	3.5
Child Died	0.5
Mos. since last pregnancy	18
Interval last two pregnancies	32

Other characteristics: married, illiterate, farms, accepts pill.

8.12.1 Age and Sex

The distribution of acceptors by age group is shown in Table 8-13. About 50% of both male and female acceptors are between the ages of 20 and 29. We also estimated age-specific acceptance rates for women in Areas I, II and III (see Table 8-14). According to our family planning clinic registration records, approximately 40% of women between the ages of 20 and 34 in Area I have accepted family planning in Danfa clinics sometime in the five years following the start of the program.

Table 8-13: Percentage of Acceptors in Areas I, II and III, by Age Group: Danfa Family Planning Program, July 1972-June 1977

Age Group	Acceptors	
	Women	Men
Under 15	0.2	0.2
15-19	7.8	3.9
20-24	29.1	26.8
25-29	26.0	30.3
30-34	17.5	14.4
35-39	10.9	10.2
40-44	5.3	6.4
45 and over	2.8	7.4

Table 8-14: Age-Specific Acceptance Rates per 100 Women of Reproductive Age, by Age Group and Area: Danfa Project, July 1972-June 1977

Area	Age Groups					
	15-19	20-24	25-29	30-34	35-39	40-44
I	10	39	46	34	23	14
II	9	31	31	24	18	10
III	2	11	10	10	7	4

The mean age of our female acceptors, 28 years, is the same as the mean age of women of reproductive age in the Project district. Differences between areas were not striking and therefore are not shown. As in most other countries, IUD acceptors tended to be older and of higher parity than women who accepted other methods.

8.12.2 Literacy and Education

Female acceptors were somewhat more literate than age matched controls; 34% compared to 27% but literacy is more of a factor in determining male family planning acceptance. There was a significant association between literacy and acceptance of family planning by men even when controlling for age, religion, Project area, and accessibility of family planning services ($z=4.06$; $p<0.01$). We found that 80% of the male acceptors in the Danfa family planning program were literate compared with an expected 56%, based on Project census data weighted for acceptor ages. The importance of male literacy is further demonstrated by the fact that, whereas only 36% of spouses of the male acceptors were literate, 72% of spouses of female acceptors were literate.

Once having accepted, however, there was no significant differences in continuation rates in literate compared to illiterate acceptors.

8.12.3 Religion

Religion was also associated with acceptance. Seventy-three percent of our male acceptors were Christians compared with only 49% of males aged 15-49 in the general population. When religion was controlled for age, Project Area, accessibility of services, and literacy, Christians were more likely to accept family planning than males holding other religious beliefs ($z=3.07$; $p<0.01$). Among female acceptors 47% were Christian compared to 36% of controls.

8.12.4 Marital Patterns

Eighty-nine percent of female acceptors interviewed in the acceptor follow-up study were married at the time of acceptance, 4% were single and 7% were widowed or divorced. Seventy percent of the male respondents were married (including non-registered unions) at the time of acceptance,

and, of these, 94% were still married at the time of interview. Seventy-six percent had at least one living child.

Although we did not do a study of sexual behaviour we did ask a sample of our male acceptors some questions about their sexual relationships in order to assess the impact of their acceptance on fertility. The 70% of male acceptors who were married at the time of acceptance reported a mean of 1.8 current sexual partners, however, of these married men 55% reported only one partner. Single men had a mean of two sexual partners but, again, 44% had only one. The average frequency of sexual intercourse was about three times per week for both single and married men. If these findings are representative of all males in the Project district they reflect a pattern of male sexual behaviour very similar to that found in most other countries studied.

Around 66% of married male acceptors reported that they used the contraceptive method only with their wife, 20% said they used it exclusively with another partner, and 12% used it with both their wife and other partners. This contrasts with the findings of Bleek (15), who observed that in an Ashanti region of Ghana most of the married men using contraception did so exclusively in extramarital relationships. It may be that men in our survey were more reluctant to admit that the methods were being used outside of marriage, although they seemed quite willing to report that such relationships did exist. It may also be that contraceptive use by married couples is more acceptable in the Ga region of southern Ghana than it is in the Ashanti region, which is further from Accra, because social innovations are adopted sooner in rural areas that are close to large cities.

8.12.5 Occupation and Socioeconomic Status

There were more traders and fewer farmers among Danfa female acceptors. Forty-five percent of the male acceptors reported farming as their principal occupation. There were relatively more teachers (11%) and clerks (7%) among the acceptor group than in the general male population. In acceptor follow-up studies we found no significant difference in the continuation of contraceptive use by the higher socioeconomic class as compared to the lower.

8.12.6 Ethnicity

As might be expected from the baseline survey which showed that the Ga and Akan ethnic groups reported twice as much use of family planning methods as the more recently arrived Ewes, there was a higher rate of acceptance among the Ga. However, the representation of the Ga in the acceptor group between 1972 and 1977 was only 22% higher than predicted, based on their representation in the population, and the Ewes had a rate only 10% lower than predicted. Thus, it appears that this family planning education and service program resulted in a catch-up in family planning practices in other ethnic groups. Moreover, the higher rates of acceptance in Area I cannot be significantly explained by ethnic differences between areas or a higher percentage of Ga in that area.

8.12.7 Interspouse Communication

Ninety percent of female acceptors were married and in three-fourths of the cases the acceptor said that she had spoken to her spouse about family planning and that he approved. Of married male acceptors, 78% reported that they had discussed family planning with their wives, with literate men being more likely to do so than illiterate men.

8.13 RESULTS: SYSTEM FACTORS AND FUNCTIONAL ANALYSES

We have found that tne use of family planning services is related to several important factors:

- Information and motivation
- Accessibility of services
- Quality of services
- Choice of contraceptives

Compelling reasons exist for the use of family planning in rural Ghana. Although a small minority of women feel in such need that they will take the initiative to seek out information and services, the great majority of women require information that will increase their awareness of their own needs, clarify the benefits of using modern contraceptives and reassure them concerning risks, fears and rumors.

8.13.1 Information

The two most important sources of information are advice from health and family planning workers, and by word of mouth from friends or relatives. Media campaigns can have an impact, both positively and negatively, but up until now our experience and other studies suggest that they have not been the major source of increased awareness of family planning in Ghana. The manner of providing information is also important. A study done at the health post in Area II showed that when family planning information was provided to all women attending a child health clinic where FP services were available, acceptance increased fourfold. However, the highest levels of knowledge and acceptance occurred when the approach was one of group discussion with audience participation (16).

8.13.2 Accessibility of Services

The most important sub-factors related to accessibility that affect contraceptive behavior are: location, frequency of services, time of day, and cost (in time or money).

Of all these sub-factors, bringing the services in close geographic proximity to all potential acceptors is the most important. Experience throughout the world proves that this point cannot be overstressed. A study of the relationship between geographic accessibility and family planning acceptance carried out in the Danfa Project ten months after the onset of family planning services clearly and dramatically illustrated this importance. During the first ten months of program activity, half of all female acceptors came from the nine villages where clinics were held. During the next 25-month period, after services were made more accessible through an extended mobile program, 80% of acceptors came from villages other than the original nine. The geographic distribution of our acceptors now parallels that of the population.

Frequency of services is also important. During the first two years, family planning services were offered at the Amasaman Health Post in Area II only once every two weeks. Women desiring services at other times were told by the nurses to return on a family planning clinic day. In November 1974, the nurses staffing the Amasaman Health Post were trained in family planning and began to offer services daily. During

the next 12 months, 33% of all female acceptors in the three Project areas first received services from the Amasaman staff and female acceptance in all of Area II increased from two acceptors per month in the 12 months prior to November 1974, to 13 per month in the 12-month period afterwards.

In Area I a similar pattern was observed after the Health Center staff was trained. The explanation for these increases is attributed in part to the improved performance of Health Center staff in influencing women to accept, and partly to the increased accessibility of services as a result of daily services being offered.

It is also important to point out that 24% of men and 12% of women who discontinued family planning did so because of difficulty in obtaining supplies from the family planning team, presumably not making contact with the team on their visits either every two weeks or every four months. Thus, it is ideal if services are available when the people need them.

In addition, our studies of accessibility indicate that the cost equivalent of travel is an important determining factor in family planning services utilization.

8.13.3 Quality of Services

Quality of services offered is also important. Women must feel confident that the family planning workers are responsible and competent. The Danfa family planning services were originally organized with standards for services similar to those of the family planning clinic at the Korle Bu teaching hospital. Not all these proved to be essential to assuring adequate quality of services and some were found to limit accessibility. Therefore some standards were modified to improve accessibility. The rationale was that, because pregnancy itself constitutes such a risk to the mother's life when maternal mortality is at the level of 10 per 1000 births, rigid standards that have not been shown to affect any health risks of family planning should not be enforced if they limit accessibility to family planning services. Such an approach is supported by the work of Huber who showed that no health benefit could be demonstrated from currently employed screening procedures used in family planning clinics in Great Britain (17). Specifically the following standards were modified:

(a) Full Eight-week Training Programme for F.P. Assistants: The training program of the Ghanaian National Family Planning Programme was modified so that Health Center staff could be trained in 30 hours of task-oriented training at the Health Center over a ten-week period, without requiring disruption of clinic schedules or staff dislocation.

(b) IUD insertion in a clinic location: Strict sterile insertion technique was enforced. However, during visits to villages served by the extended mobile program the family planning nurse was permitted to perform insertions in the woman's own home (using individually wrapped IUD insertion packs). Thus, accessibility to IUD insertions for women in more remote villages away from health centers was increased.

(c) Urinalysis, BP, and Pelvic Examination Before Dispensing Oral Contraceptives: The requirement for urinalysis and pelvic examination was abandoned for extended mobile visits. Surveillance of blood pressure was continued by nurses but was not done by village volunteers. Diabetes that might be discovered by urinalysis or uterine cancer that might be discovered by pelvic examination are not known definitely to be adversely affected by oral contraceptives. Because hypertension might be related to use of the pill, blood pressure surveillance was continued by the family planning nurses and Health Center staff. The risks of pregnancy were calculated to greatly exceed the risks of inducing hypertension with the pill. Therefore, dispensing of pills by Village Health Workers was permitted. There is a policy that these acceptors visit the Health Center at regular intervals for blood pressure check.

Lastly, we have found that a choice of contraceptives is important. Men and women develop strong preferences for various methods and many will not accept a substitute. Therefore, a fairly wide choice of contraceptive methods will ensure higher acceptance rates.

Fertility and contraceptive attitudes and behavior are changing in Ghana; in some areas very rapidly. In some locations people's desire for contraceptive services may be developing more rapidly than are

accessible services. In others, information and careful motivation may be necessary to awaken this interest. Monitoring people's attitudes and behavior will help program planners to develop family planning programs that best meet the needs of the people.

8.14 RESULTS: IMPACT OF FAMILY PLANNING ON FERTILITY AND HEALTH

Wherever significant numbers of couples have accepted modern family planning methods and used them correctly for a reasonable length of time, fertility change has been observed when studied by accurate methods. Although acceptance and continuation rates can serve as a proxy of fertility change, program administrators like to have some definite assessment of the fertility impact of their programs. However, fertility change is difficult to measure in many African countries where vital events registration is deficient. Still, significant advances have been made, even in the past eight years, toward measuring fertility in developing countries. Detailed pregnancy and contraceptive history questionnaires such as those developed by a USAID-funded group at the University of Chicago (18) permit the calculation of various fertility indicators using small computers that are usually available in countries such as Ghana.

Fertility change was examined in the Danfa Research areas in a number of ways:

(a) By determining extended use effectiveness rates and changes in birth intervals in our acceptor follow-up studies.
(b) By determining changes in the pregnancy rate of various fertility components of acceptors and controls in these same follow-up studies.
(c) By estimating changes in birth and fertility rates directly from our dual system for the collection of vital events: vital events registration and census of the entire population.

8.14.1 Extended Use Effectiveness

The extended use effectiveness rate is defined as the percent of acceptors, (or if male acceptors, their female partners), who did not become pregnant for a specified period after acceptance, regardless of

whether they continued to use the method or not. Others have shown that only 12% of women will not become pregnant within 12 months after the removal of an IUD if they are exposed to sex. Table 8-15 shows that 60% of Danfa female acceptors had not become pregnant 12 months after acceptance. Men reported an even higher rate of use effectiveness. The reduction in the risk of pregnancy for the 12 months after acceptance is thus 55% in women and 85% in the partners of male acceptors.

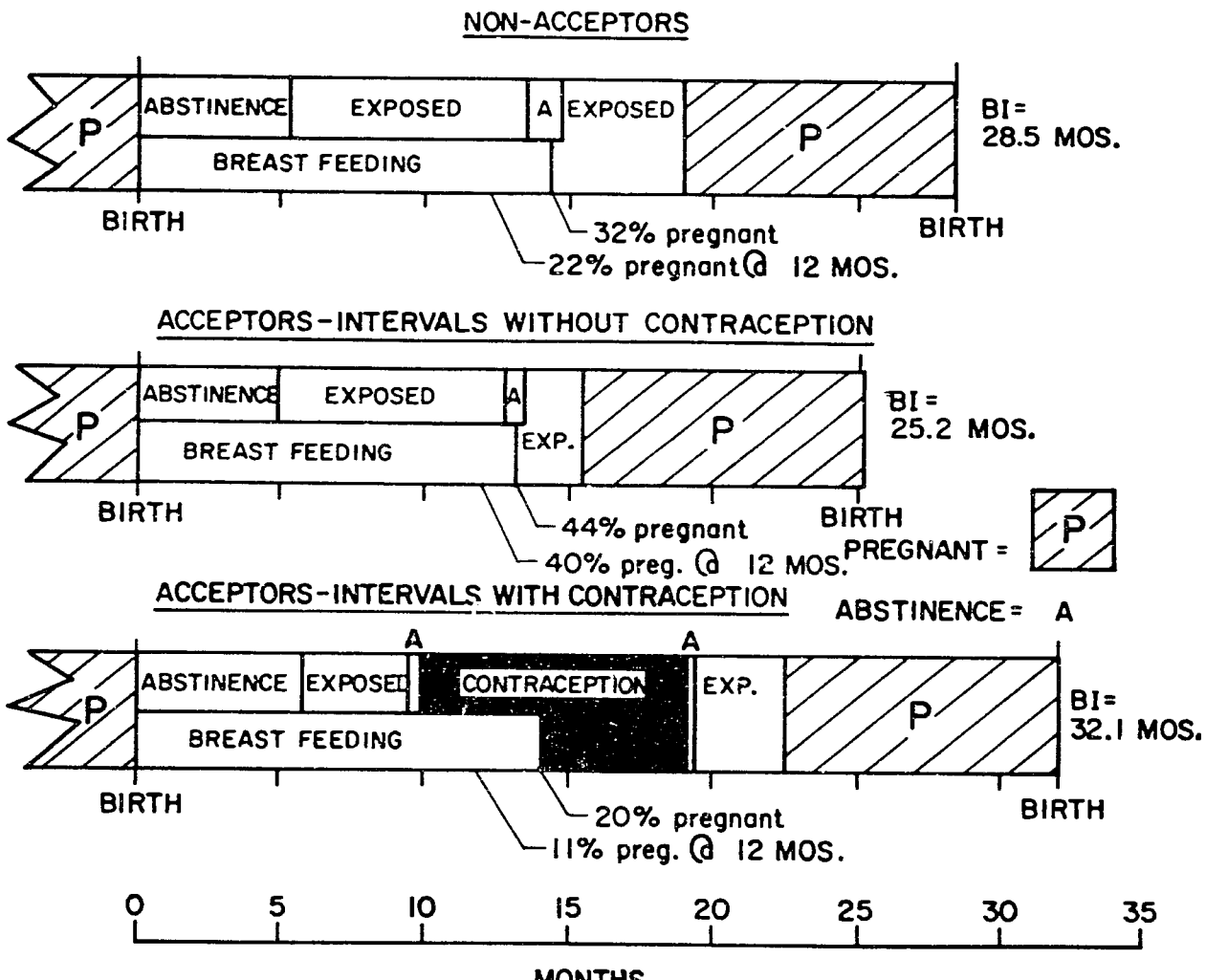
Male reporting of extended use-effectiveness in their partners must be accepted with some reservation. For example, it is possible that the men may have been unaware of some of the pregnancies that occurred. If the reported figure does reflect the true rate, these couples may have achieved a pregnancy rate lower than the Project's female acceptors partly because many of the men in this study were unmarried or were using the method with a partner other than their spouse and, as was mentioned earlier, motivation to avoid pregnancy outside of marriage may be greater than in marital unions. Single men, for example, reported fewer accidental pregnancies than married men. It may also be that the degree of sexual exposure of the female partner in such unions is less than that of married female acceptors. More importantly, the women involved in these extramarital unions may be less fertile than female acceptors, as it has been observed in many African countries that women who have proved to be infertile often enter into such relationships after one or more unsuccessful marriages (19).

Table 8-15: Extended Use Effectiveness, Danfa Project
Percent with No Pregnancy 12 Mos. Post Acceptance

Female Acceptors	60%	(Sample size = 259)
Male Acceptors	87%	(Sample size = 102)

Table 8-16 and Figure 8-3 show the anatomy of birth intervals in non-acceptors and acceptors. The birth intervals for the 1977 study of Table 8-16 and for Figure 8-3 were calculated only for intervals that began and ended during the period 1972 to 1977. Thus, there is a natural bias towards the selection of shorter intervals in the 1977 study. This is the reason that the intervals in the 1977 study are about six months

Figure 8-3: ANATOMY OF BIRTH INTERVALS



shorter than in the 1975 study which examined all intervals regardless of date of onset. Nevertheless, some important information was obtained. First, the use of family planning appeared to increase birth intervals by almost six months, both in the 1975 study and in the 1977 study. Second, it may not be true that most women abstain from sex during the entire period of lactation in Ghana. The mean duration of postpartum abstinence was only five months in these women, whereas breastfeeding lasts about 16 months. Third, a significant proportion of women become pregnant while breastfeeding, even in the first 12 months. For those intervals that began and ended between 1972 and 1977 the Danfa acceptor sample appeared to be particularly vulnerable (44% of those exposed and not using contraceptives became pregnant while breastfeeding) and this may have been a factor motivating them to accept family planning. Fourth, acceptors appear to be a more fecund group with shorter non-contracepting intervals between pregnancies than non-acceptors.

Table 8-16: Mean Birth Intervals (Female Acceptors), Based on 1975 and 1977 Follow-up Studies

	1975 Study (see text)	1977 Study (see text)
With FP:	37 Mos. (n=187)	32 Mos. (n=132)
Without FP:	31 Mos. (n=333)	25 Mos. (n=80)

8.14.2 Components of Fertility

Interesting changes were noted in the components of fertility study undertaken in a group of acceptors and non-acceptors in 1977, using methods developed at the University of Chicago (20). Table 8-17 shows that the acceptors used modern contraception 18% of the time during the entire five-year period. During that time they had a higher General Fertility Rate than did non-acceptors (271 per 1000 women compared to 245 for non-acceptors). However, note again that they are a much more fecund group than their age-matched controls, with a General Pregnancy Rate of 823 per 1000 woman years exposure without contraception compared to 637 in controls. This rate for acceptors was reduced 75% to 208 when exposed and using any modern method of contraception. Using the I.U.D. the risk reduction was 100%. (See also Appendix 5, Tables A5-19 and A5-20.)

Table 8-17: Measures of Fertility Change, Danfa Project (21)
Components of Fertility

	Pregnancy Rate Pregnancies per 1000 woman-years Exposure	
	Acceptors	Controls
Exposed, no contraception	823	637
Exposed, modern contraception	208	-
Total Exposed	536	505
% Time using contraception	18%	1%
% Reduction in GPR during FP	75%	-

General Fertility Rate (1972-77)	
Acceptors	Controls
271	242

8.14.3 Changes in Fertility Rates

Table 8-18 shows the changes estimated from the dual collection of vital events system (see Appendix A-2). In Area I it shows a fall in observed birth rate from 43 to 33 and in general fertility rate from 226 to 178.

Table 8-18: Changes in Observed Birth Rates (BR) and Observed General Fertility Rates (GRF) as Estimated from Dual System for the Collection of Vital Events. Danfa Project Areas 1971-72 to 1976-77

	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
Area I						
BR	42.8	39.2	34.7	35.7	38.5	32.9
GFR	226	206	184	192	208	178
Area II						
BR	44.7	47.8	41.5	51.7	45.7	44.6
GFR	235	235	204	273	235	235
Area III						
BR	51.2	63.1	52.0	54.1	52.1	54.2
GFR	241	306	286	270	266	283
Area IV						
BR	38.1	50.6	45.1	42.2	43.3	43.2
GFR	191	253	227	213	221	222

There were a number of problems encountered in the collection of vital events records as discussed in Appendix 2, "Demography." In particular, it appears that there was a substantial underenumeration of births and deaths in 1971-72 and, to a lesser extent, in the other years. As a result we cannot be confident that the results shown in Table 8-18 accurately reflect the true rates during each of the Project years. Nevertheless, since there was probably a greater underenumeration in the first registration period (1971-72) it is likely that any reductions in rates reflect actual trend directions. The actual magnitude of these changes, however, is open to greater question.

It is important to note that only in Area I is the decrease in birth rates and general fertility rates significant when the regression lines were tested ($r=-.756$, $p<0.05$ and $r=-.681$ $p<0.10$, respectively). The level of family planning observed in Area I from 1971-72 to 1976-77 seems unlikely to have produced a fall in the birth rate of the magnitude shown. Nevertheless the program does seem to have contributed to a real reduction in birth rate in Area I during the five Project years.

These results again illustrate the difficulties of measuring fertility changes in a relatively small, mobile rural population in a developing country where vital events registration is far from complete.

8.14.4 Impact of Family Planning on Health Status

It is also difficult to measure any health impact of family planning. One of the most important and neglected health problems in Africa is that of maternal mortality. Because child mortality is so frequent and can be estimated from census results, it is often more visible and thus receives more attention. The reporting of maternal deaths is very poor and they cannot be reliably estimated from census data; therefore, the problem is often overlooked. Data collected about maternal deaths in four Project areas show a rate of four deaths per 1000 live births. However, the population sample and the frequency of maternal deaths is relatively small. Thus, the rates are so variable and have such wide confidence intervals that significant changes could not be detected in the years that we have been collecting data. It would be ideal if national systems that collect death information included detailed protocols to elicit more accurate information about pregnancy status in women dying who are aged 15-49.

The health status of children born shortly prior to birth intervals in which modern family planning was used was also examined. First we found that the mean duration of breastfeeding was prolonged by about one-half month for intervals in which any contraception was used, and by two and one-half months when the method was the pill. This is a very important finding. Up until now the concern had been whether the pill reduced the quantity or quality of milk. This question cannot be answered by this study but it appears from our study that the pill often prolongs breastfeeding because it prevents the pregnancy during lactation that often occurred in these fecund acceptors and which often resulted in the abrupt termination of lactation. Thus, there may be a trade-off: some women prolonging their lactation because of the pill; others suffering a diminished quantity or quality of milk.

No difference was found in child survival rates or in the percent of children who fell below 80% of the standard weight-for-age between children born before contracepting intervals as compared to those born before non-contracepting intervals.

8.15 RESULTS: COSTS OF FAMILY PLANNING PROGRAM

The program costs are outlined in Table 8-20. Most significant is the per capita cost of $0.65 (total program cost divided by total population of these Project areas). This is a feasible cost in many African countries. The health and social benefits of such fertility reduction practices should be a worthwhile investment for these countries.

Table 8-20: Danfa Family Planning Program Costs, 1976

	Cedis (₵)	U.S. Dollars ($)
Family Planning Team	₵ 21555	$ 18743
Health Education Component	5044	4386
Health Center Components[a]	3237	2815
Contraceptives	5509	4790
Total	₵ 35345	$ 30734

Cost per capita (all 3 areas)[b] ₵ 0.75 ($ 0.65)
Cost per new acceptor (1976)[c] ₵23.00 ($20.00)

[a] Danfa Health Center (₵2380) Amasaman Health Center (₵857)
[b] Exchange rate $1 = ₵1.15
[c] Assume one-half of total costs for new acceptors.

8.16 CONCLUSIONS AND RECOMMENDATIONS

Based on the first five years of experience of the Danfa family planning program, the three most important conclusions are:

(a) Interest in fertility reduction is significant in this rural population.
(b) People need information and services if they are to act on this interest.
(c) If information and services are provided, results will be acceptable.

There are several specific recommendations based on this experience and these conclusions and recommendations follow.

8.16.1 Immediate Integration of Family Planning Service Components With Other Health Services in Rural Ghana

The integration of family planning with other health services is often regarded as being much more complicated than it really is. There are many countries in Africa where health services are reasonably accessible

to 50% of the population. The easiest and most cost-effective way to immediately integrate family planning with other health services and also to rapidly expand the numbers of current acceptors in Ghana or other West African countries is to train all serving health personnel to deliver family planning services as a regular part of their other duties. This is especially important for nurses who conduct the maternal and child health clinics. Thus, we recommend integrating family planning and maternal child health clinics as to time, place and personnel. In other words, a nurse who conducts an under-fives clinic would offer, as one of a number of clinic services, family planning advice and methods to mothers of children attending the clinic.

To illustrate one of the simplest and yet most effective motivational encounters: a community health nurse asks the mother of a nine months old infant, "I see that your child is now nine months old. When do you plan to have your next child?" Usually the mother will answer, "Oh no! I don't want the next one for another three or four years!" If the woman indicates that she has resumed sex with her husband the nurse asks her if she or her husband are taking any measures to prevent a pregnancy. The woman usually says that she didn't realize that there were any reliable measures to be taken. The nurse can inform her of the modern methods available and how they work. In most cases, the mother accepts a method. In the Danfa Project district at least 10% of women become pregnant in the first 12 postpartum months despite lactation and 35% of our acceptors reported such an experience in the past five years. It is our contention that if the opportunity were used to introduce family planning to women in child welfare clinics in Africa, family planning would become widespread in a short period of time.

Although one might consider the maternal prenatal and postpartum clinics to be the logical places where the greatest impact could be made by integration, they are not. This is because women in prenatal clinics do not need family planning at that time and because postpartum clinics are often poorly attended. Even where postpartum attendance is good, women in postpartum clinics may not be as concerned about avoiding a subsequent pregnancy as women in child welfare or under-five's clinics when the child is six to nine months old. This is because most women abstain for about six months postpartum and thus know they are not yet in danger.

Nevertheless, these prenatal and postpartum clinics are very important. First, the subject of family planning is of interest to women attending these clinics because they know that within the coming year they will be in need of such services. Second, some women who require a Caesarean section would elect to undergo a tubal ligation if given the opportunity. Third, some highly motivated women in the postpartum clinics, for example those of high parity and over 30 years, will accept the I.U.D. to assure protection.

There are two situations in which training must be carried out: in the professional schools (medical, nursing, health center superintendent) and as in-service training for personnel already serving at post. Instructors from the professional schools and those who will conduct the in-service training can be sent to special training courses for trainers. (A manual for training trainers of health personnel has been produced jointly by the Ministry of Health and Danfa Project staff.) Competence in family planning should be one of the requirements for graduation from these schools. We have found that health center staff can be adequately trained with ten three-hour sessions given over a ten-week period at post, or the staff can be brought to a central district location for a long weekend or week-long course.

Family planning topics should be included in any syllabus of health talks given to women attending maternal or child clinics. Moreover, it is critical that nurses, health center superintendents and physicians regard family planning as one of their routine, but priority, health duties, not as something apart from routine maternal or child health care for which they should receive an extra stipend as financial incentive.

Extra incentives are not necessary if workers are properly motivated about this new service. Motivation can be achieved if the regional and district professional supervisors (matrons, public health nurses, and medical officers) are sincerely interested in the program, require monthly reports, feedback results and express their interest. Supervisors must make regular field visits and use an objective check list to evaluate field activities. Logistics must be carefully managed to assure adequate supplies of contraceptives and referral channels. A good family planning program will not evolve as a result of good planning alone. It is the diligence and conscientiousness of those who implement and supervise that will finally determine success or failure.

Family planning nurses or teams can also be used in a district to help integrate and expand services in the following ways:

(a) Outreach Programs: The Danfa experience has shown that women will not walk far for family planning services. This problem can be partially overcome by contacting women when they are visiting the MCH clinics for other reasons. In areas that are poorly served by MCH clinics, outreach programs can be justified. The extended program of the Danfa family planning team demonstrated that acceptor rates can be approximately doubled by having a mobile family planning team visit outlying villages as infrequently as once every four months. Employing such a schedule a team can easily cover a district of 150 sq. miles and 60,000 population.

(b) In-Service Training and Support of Health Service Staff: As part of their district responsibilities, the family planning team can train serving health personnel in family planning. This responsibility could be ongoing and include refresher courses, supervision where appropriate, collection and feedback of monthly returns, consultation for problem cases, monthly I.U.D. insertion, or special weekly clinics during very busy days in certain urban locations.

(c) Supervision of Village-based Family Planning Programs: During outreach village visits the family planning team can recruit and supervise village volunteers who can act as village agents for family planning and be able to influence other villagers and supply them with contraceptives. These volunteers may be teachers, TBAs, members of women's groups, or Village Health Workers. Although such a village-based family planning program could stand alone, it would be more efficient to integrate it with other village-based primary health care programs. Even in an integrated program, the family planning team still could play a useful support role.

In rural areas a village-based family planning program can be very effective, and once organized it can be relatively inexpensive to maintain. However, the start up costs in time and money should not be underestimated. Moreover, continued support and supervision must be vigoriously maintained. Because this support often requires expensive vehicles and personnel it can be more easily justified if it is combined with the support of other village-based programs such as TBA training, malaria prophylaxis, village-based primary care, or other outreach family planning services. Theoretically, village-based primary care programs can be organized and supported by health center staff. But this can only occur if the staff can be partially freed from the daily routine of health center-based curative activities. This requires re-orientation of both the health center staff and often of their district and regional supervisors as well.

Commercial programs can supplement those family planning services provided by health personnel. Commercial contraceptive distribution sources may be especially important for unmarried men and women anxious to avoid unwanted pregnancy and who prefer the anonymity of a commercial source. Such services should be available in every settlement of 5000 people and greater.

The estimated costs of each of these four components for a hypothetical district of 50,000 population are shown in Table 8-21.

Table 8-21: Costs of Program Components of the Integrated Family Planning Program for a Hypothetical District of 50,000 Population

Component	Cost of Isolated Program		Cost in Integrated Program	
	Total	Per acceptor/yr	Total	Per acceptor/yr
Health Center Staff	$ 9123	$ 9.12	$ 9123	$ 9.12
Family Planning Team	21589	21.60	11621	17.42
Village-based Distribution[a]	13269[a]	13.27[a]	11621[a]	17.42[a]
Commercial	3263	16.31	3263	16.31
		Total	$35628	$14.06
		Per Capita	$ 0.71	

[a]Not combined with other village-based primary care.

As shown the health center program can be the most cost-effective provided the staff are adequately motivated and supervised. Outreach programs are more expensive but the additional acceptors recruited that could not be reached in any other way probably justifies the cost. Moreover the costs of the outreach programs can be substantially reduced if combined with other village-based health programs. For example, the cost per acceptor of a village-based distribution system would be only about one-third of that shown in Table 8-21 if the distribution system were combined with other village-based primary care programs. The village-based distribution system would then be the most cost-effective delivery component. We believe that the benefits of family planning are such as to warrant the integration and implementation of all four program components (health center staff, family planning team, village-based distribution and commercial distribution) in rural Ghana.

8.16.2 Free Family Planning Services

We recommend that family planning services be offered free of charge.

8.16.3 Multi-faceted Program Evaluation

To evaluate programs we recommend that:

(a) Regular analysis of acceptor registration forms should be carried out, especially by geographic origin.
(b) Periodic acceptor follow-up sample surveys should be conducted to determine contraceptive behavior and use-effectiveness.
(c) That if fertility indices are desired to evaluate impact, then retrospective pregnancy history sample surveys should be conducted (perhaps as part of the national census). This should be the most cost-effective manner of deriving these indices.

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9. INSTITUTIONAL DEVELOPMENT IN GHANA AND INFORMATION TRANSFER

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9. INSTITUTIONAL DEVELOPMENT IN GHANA AND INFORMATION TRANSFER

9.1 BACKGROUND AND OBJECTIVES OF INSTITUTIONAL DEVELOPMENT IN GHANA AND INFORMATION TRANSFER

In the revised Project paper of the Danfa Project for 1975-1979, it was stated that the Project would focus on four main objectives, among which were:

(a) "strengthening of institutional capability at the Ghana Medical School to conduct research and training of doctors and other health workers in the delivery of rural health and family planning services," and

(b) "transfer of information derived from Project activities to relevant Government of Ghana agencies on an ongoing basis."

The contract also recognized that the Department of Community Health was the principal Ghanaian institution responsible for research into the health and family planning services. Project outputs required to strengthen the Medical School's institutional capability included:

(a) Training of doctors, medical students and other health care workers to better understand and manage rural health problems.

(b) Developing training methodologies for all levels of health workers, including traditional and community volunteer health workers.

(c) Training specialists with the full range of capabilities needed in the long-range teaching and research programs of the Department of Community Health.

Project outputs required to achieve the desired information transfer involved fostering a systematic information flow to Government of Ghana (GOG) agencies by means of conferences, committee meetings, annual review meetings, articles, monographs and training manuals. Formal links were developed with relevant GOG agencies, particularly the Ministry of Health (MOH) and the Ghana National Family Planning Programme (GNFPP). These institutional links were strengthened through frequent participation in workshops and seminars, and production of journal articles, reports and training manuals for various

levels of health personnel. Although these objectives were explicit in the 1976 Project Paper, they had been implied in previous Project documents.

The institutional development objectives of the Danfa Project had their roots in the objectives of the University of Ghana Medical School. During the planning stages of the Medical School, two objectives were paramount to the founders: that the doctors trained by the School be able to deal competently with rural health problems, and that the School be in the forefront of medical research relevant to the needs of a developing country with a large rural population. The Department of Preventive and Social Medicine (as the present Department of Community Health was then called), was expected to play a significant part in these two objectives of the Medical School. Therefore, the teaching activities of the Department of Preventive and Social Medicine, especially those that related to rural communities, were to permeate the total teaching program of the School.

Community "wards" were planned where students would learn to deal with rural and community health problems and where the faculty would be able to carry out relevant research. In order to provide these community wards, it had been decided to set up teaching, service and research "stations." One station was planned for Asamankese, located 50 miles from Accra in a tropical rain forest; Asamankese had a population of 25,000 in 1960. The other community station was intended to be in the new port town of Tema (population 25,000 in 1960). The latter site was chosen in view of the emerging urbanization in Ghana and concommitant health problems.

9.2 PROGRAMS AND ACTIVITIES OF INSTITUTIONAL DEVELOPMENT IN GHANA

When the plan to install teaching and research stations at Asamankese and Tema fell through, Professor F. T. Sai, then Head of the Department, managed to arrange for construction of the rural component of the Medical School plan at Danfa. In order to add to the Medical School's resources, he sought aid from various national and international agencies as well as the cooperation of the Development Committee of the seven village consortium of which Danfa was the center. The villages gave the land as a gift to the University, approved the plans for the Health Center and assisted in the digging of the foundations. The Danfa Health Center cost ₵117,000 (approximately U.S. $120,000) to build and was formally opened by the Prime Minister, the late Professor K. A. Busia, in January 1970.

Under the Danfa Project the strategies adopted for achieving the two aforementioned objectives of institutional development included:

(a) The institution of a Policy Advisory Committee
(b) Training at all levels, including local and overseas training
(c) The dissemination of information through manuals, monographs, workshops and seminars.

9.2.1 The Policy Advisory Committee

The Policy Advisory Committee (PAC) was instituted in early 1975, after other formats for involving the MOH, the GNFPP and other agencies in high level interaction with the Project had been tried. The PAC met twice a year. The PAC comprised:

- Dean of the Medical School
- Director of The Institute of Social, Statistical and Economic Research (ISSER), University of Ghana
- Director of Medical Services
- Deputy Director of Medical Services (Public Health)
- Regional Medical Officer of Health of the Greater Accra Region
- Executive Director of the Ghana National Family Planning Programme
- Principal Secretary of the Ministry of Economic Planning
- Director of Social Welfare
- Representatives of the Ministries of Education, Department of Rural Development, the Central Bureau of Statistics (Census and Vital Events Division)
- Danfa Project codirectors (two)
- Members of relevant non-governmental agencies as well as USAID

The purpose of the PAC was to foster collaboration, optimal attainment of the Project objectives and flow of information from the Danfa Project to the agencies represented. The PAC antedated the 1976 Project Paper and generated some of the ideas found there.

9.2.2 Local Training

The training provided by the Project dealt with two categories: local training and that occurring outside of Ghana. The development of training

schedules was largely dependent on the professional staff of the Department of Community Health (DCH) and the Danfa Project, particularly in the area of local training. The development and modification of these schedules were affected by the experiences of the professional staff.

FIELDWORKER TRAINING PROGRAMS

Table 9-1 depicts numbers and types of fieldworkers trained during the Project.

Table 9-1: Field Worker Training Programs

Category	Approximate Number Trained
Research/data gathering field workers and assistants	250
Health service paraprofessional workers	
• Health Center staff	35-40
• Health Education Assistants (mainly from the Ministry of Health)	16-20
Traditional birth attendants	90
Village Health Workers	20
Community volunteers for specific programs such as in nutrition, nutrition surveillance, malaria prophylaxis, etc.	40
APPROXIMATE TOTAL	455

At the inception of the Project, various categories of fieldworkers such as mappers, interviewers, coders, vital events registration assistants, and other staff needed for baseline data collection were trained first. Since then over 30 different training courses, both introductory and refresher, have been given by senior DCH and Danfa staff. Many of those trained are working for the Project.

MEDICAL STUDENTS

Student interaction with Project rural activities was approached cautiously until the senior departmental faculty and UCLA counterparts had determined the health service methods to be used in the Project district.

Project senior staff also had to balance the need to provide an active, participative program for students against the sometimes conflicting need to adhere to the original research design, which specified resources in each of the three research areas. (In particular, the service component of Area I could not be overloaded.)

Student efforts in Project health care programs have increased over time, and students have been able to take part in practically all service activities in all three service areas of the Project since 1975, including those at the Danfa Health Center and its satellites, and at the Amasaman and Obom health posts in Areas II and III respectively. Students also carried out surveys which they later compared to Project data, thereby understanding more clearly the mechanics and problems associated with community diagnosis.

The Senior Clerkship Program in the Medical School divides students into four groups which rotate through internal medicine, surgery, special clinics, and community health, in ten-week blocks. In the ten-week period under the Department of Community Health the students are divided into two subgroups. One subgroup of seven or eight students spends a month in district hospitals in various regions of Ghana, while the other subgroup spends four weeks in Danfa and at Akosombo. The two subgroups then exchange programs and by the ninth week both subgroups return to the Department for seminars, report writing and evaluation.

The Danfa experience is the heart of the community health program. During this time the faculty and senior staff relate material from previous classroom lectures and tutorials to the "real life" programs in community health care which students observed and experienced at Danfa. The student interaction with the faculty and other health workers in the Department is most intense during their period in the Danfa Project district. Since 1970 nearly 500 Ghanaian medical students have participated in the valuable community health experience at Danfa. Moreover, each year there have been one or two students from the United States, Europe and neighboring African medical schools joining the Ghanaian students in these activities.

OTHER LOCAL TRAINEES

Students from many health training institutions of the Ministry of Health (approximately 700 during 1970-1978) spend short periods studying the programs

at Danfa. These include students from the Public Health Nursing School (Accra), the Nursing Training College (Accra) and the Health Center Superintendent School (Kintampo).

Students from the University of Ghana departments at Legon (approximately 640 during 1970-1978) also visit the Danfa Project district for varying lengths of time. Students come from departments of Post-Basic Nursing, Home Science, Agricultural Extension, Sociology (Social Administration), and from other departments as the need arises. In the past students from the Geography Department, the Regional Institute of Population Studies, and other programs also have visited.

Occasionally, courses have been held for unique groups of students. For example, a course was held in 1977 for nurses expected to staff mobile clinics of the Cocoa Marketing Board. Special observation and training sessions were also held in the Danfa Project district for the Ministry of Health family planning trainees.

It has become urgent to extend the hostel facilities at Danfa so that non-medical students might spend longer periods in the Project district.

9.2.3 Training Outside of Ghana

TRAINING ACTIVITIES

Overseas participant training of selected Ghanaians was crucial to the strengthening of the Medical School's teaching and research capability. Some personnel spent short periods (up to five months) participating in seminars while others studied for a year or more earning university degrees and conducting valuable field studies.

Table 9-2 shows that a total of 19 Ghanaians used the participant training resources of the Danfa Project for 22 different training experiences (two participants had two training experiences, each separated by one to two years of work with the Danfa Project in Ghana, and one participant took two consecutive degrees in the United States). Eight of the trainees were physicians, three were behavioral and social scientists, six studied information management and data processing, one studied health management (he had previously received training in information management under Project auspices), and one was trained in cytotechnology.

The program supported participants in 14 degree courses (one degree candidate will finish in 1980) and eight in non-degree pursuits related to health management and research support.

Table 9-2: Summary of Danfa Project Participant Training

Category	No. of Training Experiences	Degree Courses	Non-Degree Courses
Public Health (M.D.'s)	8	7	1
Behavioral Science	5[a]	4	1
Information and Data	7[b]	2	5
Health Management	1[b]	1	0
Lab Technology (Cytotechnology)	1	0	1
TOTAL	22 (19)[a,b]	14	8

[a]One trainee took two consecutive degrees and another had a second (field experience) more than one year after obtaining her degree.

[b]One of the information and data participants later earned a health management training degree. Therefore, there were 22 training experiences involving 19 different participants.

ACTIVITIES OF PARTICIPANT TRAINEES FOLLOWING THEIR RETURN TO GHANA

Most of those who took part in the participant training program worked for some time in the Danfa Project before the specified training was undertaken, and almost everyone worked for the Project subsequent to his or her return.

Of the eight physicians (Table 9-2) participating in Project-sponsored training, three are full-time members of the Department of Community Health, one is likely to become a full-time member by 1980 and the other four are in position to assist in the Department from time to time. The latter group comprise: (1) Deputy Director of Medical Services of the Ministry of Health; (2) the Senior Medical Officer in charge of the WHO/Ghana Schistosomiasis Control Research Project (who is a member of the Department of Community Health on secondment to the Schistosomiasis Project), (3) the Senior Medical Officer in charge of the WHO-sponsored community-based health research project

at Kintampo in the Brong-Ahafo Region, and (4) senior lecturer in charge of the Department of Community Health in the Medical School of the University of Science and Technology, Kumasi.

All three social scientists are full-time members of the Department. The graduate in health management is Assistant Registrar of the Medical School Administration. Two of the data processing personnel work full time in the Department. The laboratory technologist is in the Ministry of Health's Laboratory Service. One computer programmer is with the Institute of Social, Statistical and Economic Research, and one non-degree trainee is with the Ghana Institute of Management and Public Administration.

To summarize, this means that of the 19 persons who were involved in the Danfa Participant Training Program, only three at present are out of direct contact with the Danfa Project and Department of Community Health, 11 are presently with the Department (or will be soon), and five persons occupy positions which facilitate their teaching or consulting with the Department.

9.2.4 Summary of Numbers of Persons Trained by the Danfa Project

Table 9-3 indicates the large number of persons trained under Danfa Project auspices, both locally and outside of Ghana.

Table 9-3: Summary of Numbers of Persons Trained by the Danfa Project

Category	Approximate Number Trained
Field workers	455
Medical students	500
Students from Ministry of Health Training Institutions	700
Students from various University of Ghana (Legon campus) departments	640
Participant Trainees	19
Other (local)	50
TOTAL	2364

9.3. INFORMATION TRANSFER

Since the beginning of the Project, transfer of information about relevant Project experience has been high priority activity. This came to be considered such an important activity that information transfer became one of the four primary objectives of the final Danfa 1976 PROP. The rationale for this emphasis was simple enough: useful Danfa Project information, both negative and positive, has little value unless it is effectively transmitted to motivate those who make policy decisions and who allocate resources to take action. A component of the information transfer process is education, training and motivation of staff who will implement new proposals.

Information transfer is arbitrarily divided between those activities taking place within Ghana and externally. Besides sharing valuable experience with other countries, external information transfer is a means for testing and validating information and tentative conclusions, benefiting from the experience of others. It also can indirectly contribute to acceptance of ideas in Ghana; when Ghanaian political officials hear "home grown" ideas reinforced by important officials externally, the likelihood of acceptance of those ideas and associated suggestions is enhanced.

9.3.1 Information Transfer Within Ghana

OFFICIAL GOVERNMENT OF GHANA CHANNELS

One of the most important channels of information dissemination within Ghana was via the Ghana Ministry of Health Planning Unit. From its inception, the Health Planning Unit of the Ministry of Health has been intimately associated with the Department of Community Health. Because members of the Department and the Danfa Project serve on MOH Planning Unit committees, the Unit has incorporated Danfa Project findings such as morbidity patterns, costs of services, and strategies of village health care delivery into basic information in the National Primary Health Plan.

Ghanaian professionals associated with the Danfa Project also serve on key health-related national advisory committees and councils. Danfa senior staff members met regularly with Ministry of Health officials to discuss Danfa Project progress, findings and future plans in order to optimize its value to the Ministry of Health.

TRAINING AND CONFERENCES

Under Danfa Project auspices, formal training was conducted for traditional birth attendants, Village Health Workers, family planning workers, and Health Education Assistants. In the field, programs included Danfa Health Center staff inservice training, Danfa field staff orientation and training, and training for medical and nursing students, health center superintendents and sanitarians. Most of these are or will become personnel of the Ministry of Health.

Within the Ministry of Health, the divisions which have been most closely associated with the Project since its inception are MCH and Family Planning, Health Education, Nutrition, Communicable Disease Control and, later, the Health Planning Unit. In addition, members of the Department of Community Health have regularly given courses or lectures at the MOH's School of Public Health Nursing, the University of Ghana's Post-Basic Nursing School, the Health Education Training Program and the course for training health center superintendents. Members of the Department and Project have also taken part in Ministry of Health seminars covering topics of family planning, traditional midwifery reorganization, child health and health education.

In addition, the Danfa joint staff meetings have an information sharing and clearly a training function, especially for the participant trainees. The nineteen Ghanaians who obtained training overseas, financed by Danfa scholarships, were employed by the Ministry of Health and the Ghana Medical School; they spent substantial periods working with the Danfa Project.

All categories of trainees combined totaled 2364.

9.3.2 Publications and Traning Manuals

Publication of Project findings and the development of manuals on several Project activities have entailed intensive effort by Danfa staff. A complete list of publications, manuals and monographs is given in Appendix 8.

Over 50 journal articles and monographs describing Project activities or findings have been published or are now in press. There are approximately 30 additional publications in progress. At least 25 conference presentations also have been given throughout the world since the Project began. These publications and conference presentations have been invaluable in disseminating information about the Project to health officials in Ghana and in other countries as well.

Of substantial practical significance have been the manuals developed out of the Project's training experiences:

(a) A Program Manual for Traditional Birth Attendants -- Organization, Training and Evaluation (1977). The TBA training manual was accepted for use by the Ministry of Health in 1978.

(b) MCH and Family Planning for Health Workers and Serving Personnel (1977). This manual, divided into four separate sections covers general family planning information (Manual A), a manual for instructors in family planning (Manual B), insertion of IUDs (Manual C) and management and integration of family planning programs into MCH services (Manual D--now in the final production stages). Over 4,000 copies of Manual A have already been printed by the Ministry of Health and are in use in many health training institutions in Ghana.

(c) Preliminary Manual for Trainers of Village Health Workers (1977). The MOH has been provided with this manual for potential use in MOH training efforts of VHWs or similar village level personnel.

(d) Manual of Maternity and Child Health Procedures (1972). Used by Danfa Health Center personnel.

More manuals are under active development. Senior members of the Ministry of Health have cooperated in developing these manuals by serving on manual production committees.

Several of the Project's monographs are descriptive of the planning, organization and implementation of Project activities including census and field interviewing and village health surveys. These monographs serve as manuals or guides and contain information of interest to health personnel working in and outside of Ghana.

Hundreds of copies of the UCLA Danfa Annual Reports and Annual Review Meeting Proceedings are distributed each year. Finally, thousands of Danfa general information summaries have been distributed, and copies of speeches the senior staff have presented at scores of meetings and conferences within and without Ghana have been given out on request. Also, more than 20,000 reprints of Danfa publications have been distributed by request. The number of reprints per paper distributed has ranged from about 250 to 3000.

9.3.3 Information Transfer External to Ghana

FORMAL SEMINARS AND CONFERENCES

Danfa senior staff were invited to present Danfa Project papers ac international meetings of the International Pediatric Association, the East African Medical Association, the International Union of Nutrition Scientists, the World Health Organization and foundations and universities.

TEACHING AND TRAINING

The Danfa Project experience has significantly enriched the teaching resources of the UCLA School of Public Health. Many UCLA students from other parts of the world have and will benefit because of the Danfa Project. The Ghanaians interested in health who have come to UCLA have benefited because their instructors have included faculty with extensive experience in Ghana and much Ghanaian data are available.

USAID staff who have directly worked with the Danfa Project and/or who have reviewed the 1978 case study of the "Danfa Comprehensive Rural Health and Family Planning Project: Ghana" by Gene Peterson, as part of the USAID Office of Personnel and Training/Professional Studies and Career Development division, have gained valuable knowledge which is carried over to other countries.

Teaching programs in many other universities also benefit from the Danfa experience from the many articles, reports, conferences, presentations and first-hand knowledge brought back by visitors to Danfa.

VISITORS

The importance of "information transfer" both formally and informally with official Project visitors cannot be underestimated. Innumerable visitors came to Danfa to view Project activities and meet with senior staff during the course of the Project. While time consuming for staff, these visits were important in disseminating information beyond the confines of Ghana and provided an arena for exploring problems and solutions related to rural primary health care delivery with experts from outside Ghana who had viewed the Project first-hand.

The many hundreds of visitors to Danfa came from a variety of countries, including Ghana. Many had been or were involved in similar health projects elsewhere. A sample of the types of visitors seen by Project staff included:

- Commissioners of Health, Government of Ghana
- Directors and Assistant Directors of Ministry of Health, Ghana
- Regional Medical Officers of Health, Ministry of Health (Ghana)
- Ambassadors/diplomatic staff members
- Representatives from World Health Organization (including the Director General and Regional Director for Africa)
- Directors, USAID Mission to Ghana
- Representatives of USAID/Washington
- Representatives from Department of Health, Education and Welfare, United States
- Dozens of faculty from schools of public health, medicine and from other university departments
- Representatives of many Ministries of Health, especially African countries
- United Nations Family Planning Association representatives
- International Planned Parenthood Association representatives
- Association of Medical Schools of Africa representatives
- British Medical Research Council representatives
- United States Congressman
- United States Senatorial staff members
- Royal Society of Health, West Africa Examination Board representatives
- British Pediatric Association (over 60 members)
- Representatives of the American Public Health Association
- Representatives of the Ford and Rockefeller Foundations

9.4 EQUIPMENT TRANSFER

The University, the Medical School and the Department of Community Health acquired various pieces of equipment and appliances which had been purchased with UCLA contract funds for Danfa Project use (see Table 9-4).

The University of Ghana's IBM 1130 Computer was greatly enhanced by the addition of a tape drive system purchased, by agreement with USAID, from funds made available through the UCLA contract. The tape drive was brought in principally to expedite Danfa data processing but was used on a University-wide basis.

The Medical School acquired vehicles, office equipment and household furniture and appliances which, under the Project agreement, were to be turned over to the School when they were replaced by the Danfa Project and/or UCLA contractor, or when the UCLA staff residences were vacated as UCLA staff were phased out (provided USAID/Ghana did not requisition the items for Mission use).

The Department of Community Health shared its resources with the Project, particularly in the early period before Project equipment and vehicles arrived. The cooperation between the Project and Departmental staff continued throughout the life of the Project. With the formal ending of UCLA involvement in the field and withdrawal from Ghana, most of the usable equipment and supplies were turned over to the Department for the continuation of Danfa Project-related work, as well as for other departmental programs. A considerable number of books and journals were also acquired by the Department from the Project. One of the major pieces of equipment soon to be acquired by the Department is a minicomputer system which will greatly enhance the Department's ability to continue to analyze major portions of the data bank which the Project has created, and will allow the Department and the School to develop new areas of research work at Danfa and elsewhere.

Table 9-4: Assets Transferred to Ghana Medical School, Department of Community Health and University Legon Campus

Items	Quantity (Items or Units) Transferred
Field vehicles	17
Sedans	2
Vehicle spare parts	several hundred
Office furniture	19
Office electrical equipment (typewriters, dictation machine)	4
Electronic calculators	9
Desk minicomputer	1
Computer tape drive for IBM 1130 at University of Ghana	1
Computer packaged programs	2
Lab equipment	4[a]
Household furniture	168
Household electrical equipment (freezers, refrigerators, air conditioners, washing machines, dryers)	18
Books and journals	several hundred
Reprints	several thousand
Miscellaneous office and medical supplies	---

[a]Many additional laboratory items were turned over at the outset of the Village Health Survey to the Ghana Medical School laboratory departments participating in the survey.

9.5 RESULTS OF INSTITUTIONAL DEVELOPMENT AND INFORMATION TRANSFER

The Danfa Project is an evolutionary project which over the past eight years interacted vigorously with all sectors of health and family planning work in Ghana, especially in the Greater Accra Region. A catalog of most of the "results" includes practices initiated de novo by the Project, matters jointly developed with the Ministry of Health or other government or non-government agencies, and ideas from other sources which were utilized and modified by the Project. Most of these ideas, innovations and modifications are described in Section 6, "Health Care Delivery," and Section 8, "Family Planning." These naturally form the basis of the transfer of information and enhancement of skills in the teaching and demonstration efforts of the Project and the Department of Community Health.

EXPANSION OF STAFF

Prior to the Danfa Project the Department of Community Health had a staff of one part-time and five full-time physicians. The Department also had two graduate social scientists, and seven nursing, social worker and nutritionist staff members. Contemporaneously with the Danfa Project implementation, the Department appointed two more physicians, but lost four who resigned from lectureships. There have been changes at other levels.

During the life of the Danfa Project the Department of Community Health grew significantly in size as well as in research and teaching expertise. Many of the new faculty and staff were trained under Danfa auspices. Table 9-5 illustrates the Department's expansion throughout the life of the Project.

Of the total faculty and senior staff, two physicians, three social scientists, and two information and data specialists joined or assumed upgraded positions in the Department after training specifically designed to prepare them for their Department posts.

Table 9-5: Department of Community Health Faculty and Staff: Comparison of 1969 and 1979 Staff Composition

Title	(1) 1969	(2) 1979	(3) Expected New Personnel	(4) Total (2+3)	(5) Danfa Trained
Faculty	6[a]	10[b]	2	12	7
Senior Staff	9	10	2	12	7[c]
Research Assistants	--	--	20	20	20[d]
TOTAL	15	20	24	44	34

[a]Four physicians resigned between 1969 and 1979.

[b]Three former senior staff were upgraded after acquiring higher qualifications. (Two acquired such training via Danfa Project auspices.)

[c]Two trained in United States as Project participant trainees.

[d]All locally trained by Project senior staff and supervisors.

The process of absorbing staff recruited specifically for the Danfa Project into the Department is currently underway. It is expected that before the end of 1979 one computer programmer, one family planning nurse and about 20 junior research assistants and supporting staff will be given permanent appointments in the Department. The Medical School Administration will also absorb some of the administrative and clerical staff from the Project. When these remaining positions are filled and major equipment installed, the Department of Community Health will have the expertise to carry out extensive research in community health.

PHYSICAL SPACE

One of the major constraints in the achievement of institutional strengthening has been physical space. A new building was to be ready for occupation by the Department of Community Health by 1974, but because of a space crisis at the Korle Bu campus, the Medical School Administration claimed this new building. The hope was that the Department would be given new accommodations, but this still has not been realized. Recent plans call for the construction of a new Medical School Administration building which would enable the Department to move into the originally designated building.

STAFF RESEARCH AND TRAINING CAPABILITIES

In addition to the participant training discussed, five members of the Department, under Project auspices and utilizing UCLA Project contract funds, were able to spend varying periods of time at UCLA (one on sabbatical) working with Project data in cooperation with their UCLA colleagues. One Project staff member based in the Department of Community Health came to UCLA under Project auspices to study the workings of the writing/editing unit of the Project at UCLA in order to organize and implement a similar unit in Ghana. Furthermore, two Department members were able to attend important international conferences, under Project auspices, where they were able to exchange ideas related to rural health development and field research as well as formally present papers concerning the Danfa Project.

The Department has already demonstrated its capability as a research and teaching organization. A few key members of the Department's research staff went to Kintampo (Brong-Ahafo Region) to assist the WHO/UNICEF Health Project in data analysis. The data processing unit also helped the same project with computer work in 1978.

A small team of research assistants helped to carry out a field survey under a Canadian International Development Assistance water use research project in the Weija Area in southern Ghana.

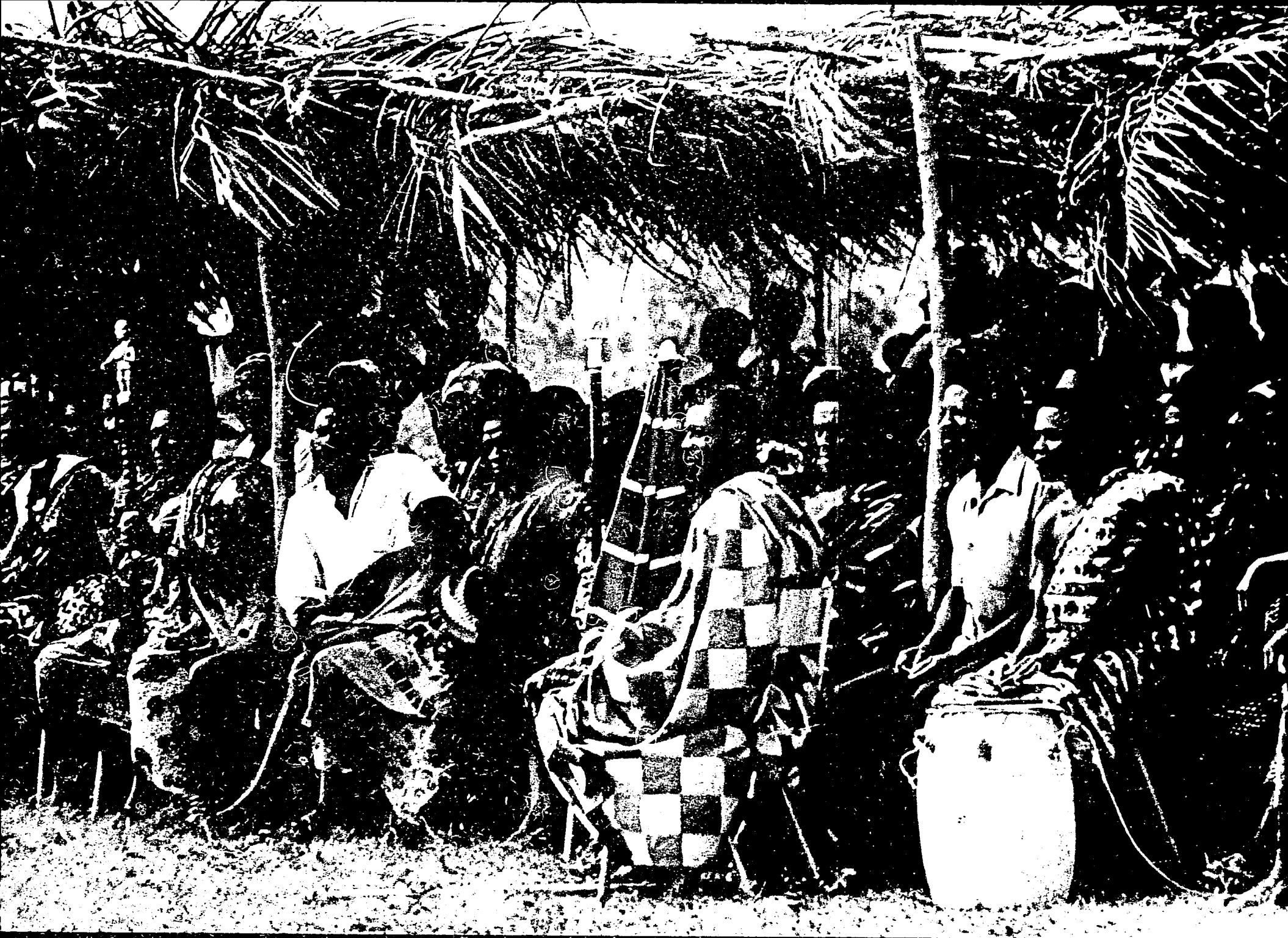
Project staff have helped a Japanese medical team at the Mamprobi Health Center area in Accra, and research staff have also been loaned to the National Health Planning Unit for data analysis.

The Ghana Medical School is also left with data generated by the Danfa Project in the field of health services research, utilization and impact. These data are available in Ghana in several formats, including the original field interview forms and data sheets, the original card decks, the master computer tapes and tapes containing the latest generation Danfa data resulting from the editing and merging of data files. This work was done both in Ghana and at UCLA for different files and the tapes were exchanged so that identical data sets would be available in Ghana and at UCLA. The data has been transcribed onto Wang discs for use with a new Wang Computer purchased by UGMS with significant help from USAID Danfa Project funds. Purchase of the Wang discs and diskettes was facilitated by the USAID UCLA Danfa Project budget.

Thus, the Danfa Project has contributed computer hardware and packaged programs, has produced a great deal of useful information which is available in Ghana, has trained programmers and other data management specialists, and has added to the data analysis and writing experience of many Ghanaian health-sector specialists.

It is expected that the Department's enhanced research capability will be utilized, beginning with the 1979-1980 academic year, by the epidemiological and data analysis units of the new Medical Research Institute (built by the Japanese government in honor of Hideyo Noguchi) which will be investigating endemic and major disease problems.

The Department's capacity to gather, analyze and disseminate information and to play a significant role in improving the health of the people of Ghana as expected of a university institution in a developing country is now demonstrable. Furthermore, with the increased numbers of well-trained staff appointed to the Department, it is now possible to establish a post-graduate training program which will utilize, among other facilities, the Danfa Project district as an important teaching and research medium for the post-graduate trainees.



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10. ATTAINMENT OF GOALS AND OBJECTIVES (10-1)

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10. ATTAINMENT OF GOALS AND OBJECTIVES

10.1 GOALS AND OBJECTIVES

Section 2, "History of the Danfa Project," describes the issues in provision of rural health services in the developing world, including family planning services, which were current in the 1960's and which led to the original design of the Danfa Project. Broadly, these issues were concerned with reaching the unserved or underserved rural population with effective health services directed at local health problems, and to do so at a cost which could be afforded by the nation, in this case Ghana, in terms of human and fiscal resources. Since Ghana had recently adopted a policy advocating family planning, these services were to be given emphasis along with other maternal and child health services. And overall, preventive services were to be increased to the maximum extent feasible, considering prevailing high rates of infectious disease and consequent high demand for curative services.

Thus, the scene was set for the first statement of goals and objectives of the research and development-oriented Danfa Project. Specifically, as stated in the first Project Paper agreed to by USAID, University of Ghana Medical School (UGMS) and UCLA, the goals were:

(a) "To investigate the state of the rural community, its physical amenities, its social organizations, the factors that make for an effective participation in health problems and programs."

(b) "To undertake research into the most useful and efficient means of utilizing available manpower and other resources in the operation of Health Post-centered comprehensive rural health services."

(c) "To train doctors, sanitarians, midwives, community health nurses and other health personnel, both separately and in teams, specifically in their role for rural health work."

(d) "To provide manpower oriented and equipped to handle the problems of the community."

Because a major part of the research was to be an investigation of the most effective methods of delivering family planning services, the four-cell design was organized within the framework of the four goals (See Sections 3 and 8). Following the review of the Project in 1975, a new PROP was written

that guided Project activities in a similar vein, but with more emphasis on the development of model health service components and less on the testing of the original hypotheses concerning different approaches to provision of family planning services. This followed from two important changes in government policy and planning which had taken place by this time. Most significantly, the Ministry of Health (MOH) had already established a policy incorporating family planning into the fabric of general health services, and further comparative testing of the concept was judged less important for national replication than demonstrating a functional model. In addition, policy and planning in many developing countries was evolving toward the concept that adequate provision of primary health services in rural areas would require a great deal of community-based self-help because the scarcity of trained professionals in the rural areas was unlikely to be remedied in the near future.

Aside from these national and international policy changes that influenced the Project direction, the revised goals made explicit a requirement for timely transfer of information from the Project to government agencies, which simply had been assumed as an objective under the earlier PROP. The reformulated set of goals in the 1976 PROP were the following:

(a) Institutional Development and Training: Strengthening of institutional capability at the Ghana Medical School to conduct research and to train doctors and other health workers in the delivery of rural health and family planning services.

(b) Information Transfer: Transfer of information derived from Project activities to relevant Government of Ghana agencies on an ongoing basis.

(c) Operational Research in Health and Family Planning: Demonstration of several different health care models to include family planning as an integrated component suitable to the Ghanaian context.

(d) Epidemiological Investigation: Investigation of the state of the rural Ghanaian community, concentrating on factors associated with health and family planning behavior.

Each of the four goals was subdivided into a set of objectives which were then operationalized as a series of tasks and programs. The tasks, such as the survey of health practices, and the programs, such as the family planning team program and the training of Ghanaian participants outside Ghana, have been described in detail in other sections of this report. They are summarized here for convenience.

10.2 INSTITUTIONAL DEVELOPMENT AND TRAINING

10.2.1 Teaching Staff Development

Eight faculty or staff of the UGMS Department of Community Health and three senior staff of the Ministry of Health received advanced training in the United States under the auspices of the Danfa Project. Nine graduate degrees and one baccalaureate were awarded to this group. All of these training participants returned to Ghana with broadened substantive knowledge in their fields of specialization within the larger field of public health. All of them presently are active in the teaching work of the Department of Community Health or as administrators and/or researchers in the Ministry of Health. One had been appointed to an administrative position in the Medical School and will contribute to the teaching of health services administration in the Department of Community Health. A list of Ghanaian-participant training outside of Ghana is in Appendix 9.

10.2.2 Research Capability Development

Seven mid-level staff were sent to the United States for advanced training in various technical specialities which were integral to the Project's research activities. Three graduate degrees were received by this group, the other five completed programs which culminated in certificates. One of the latter is currently one of two qualified cytotechnologists at the UGMS teaching hospital. Another participant, upon finishing a Master's degree in computer science, will return to the Department of Community Health as the only computer scientist on the Medical School staff. As one of only a few Ghanaians with such a degree, he will organize and direct the Medical School's first electronic data processing unit. Another participant trainee, holder of a baccalaureate degree with additional training in the U.S. in health records and data management, has been taken from the temporary rolls of the Danfa

Project onto the permanent staff of the Department of Community Health. He brings to the Department a successful record of mid-level management in field research with progressively greater responsibility. Finally, the Department of Community Health also has been able to create permanent positions for 12 of the Project field staff, thereby retaining a cadre of supervisory personnel experienced in the organization of field staff, such as interviewers. All of this considerably strengthens the Department's ability to carry on research in health services delivery without external augmentation.

In addition to personnel, the research facilities of the entire University of Ghana have been enhanced by hardware and software improvements at the University computer center. The addition of tape capability and the packaged program software created by the Project open new vistas for research requiring the facilities of the Ghanaian computer center.

10.2.3 Rural Orientation of Medical Students

The use of the Danfa Rural Health Center in the teaching program of the Department of Community Health has been described. Medical students who rotate through the Health Center as part of their clinical clerkships in community health are given practical experience in recognizing and managing the special health problems of the rural population.

10.3 TRANSFER OF INFORMATION

10.3.1 By Published Material

One of the major modes of transfer of information from the Project to the outside world is by the written word. Project staff have published more than 50 journal articles, with more in progress. In addition, four manuals designed to facilitate replication by others of important Project programs have been published, again with others in progress. The manuals also facilitate information transfer to the Ministry of Health because MOH staff are usually drawn into their development.

10.3.2 By Interstaff Meetings

Regular meetings by Project staff with all levels of Ministry of Health staff (including the Deputy Director of Medical Services), also served to communicate Project results to the Ministry. In particular, data on

morbidity, service system organization and utilization, and costs were transmitted to the Health Planning Unit when that arm of the Ministry was formed. Project staff also had meetings with the MCH/FP Division of the Ministry and with the Ghana National Family Planning Programme to discuss matters of mutual interest.

10.3.3 By Staff Integration

A number of staff permanently assigned to other agencies, such as the Ministry of Health, the Planned Parenthood Association of Ghana and the Institute for Statistical, Social and Economic Research (ISSER), were seconded to the Project for various lengths of time. All of these people were exposed to the Danfa "team approach" to the provision of rural health services and to the field research activities of the Project, and took these experiences back to their home organizations. The impact of these experiences on those organizations has not been measured and, indeed, may not be recognized for some time to come. The training of medical students also falls into this category.

10.3.4 By Workshops and Seminars

Project staff participated in, and in some instances played key leadership roles in, seminars and workshops covering family planning, health education, health services organization, cost analysis, the role of traditional health care, and traditional midwifery. Other participants included staff from many Ghanaian government agencies, as well as some private voluntary groups, such as the Planned Parenthood Association of Ghana and the Christian Medical Association of Ghana.

10.3.5 By Visitor Orientation

A long list of visitors to the Project is cited in Section 9. Some were provided only overview tours of the Project, but others participated in intensive orientation sessions, including demonstrations and detailed briefings.

10.4 RESEARCH IN AND DEMONSTRATIONS OF THE PROVISION OF HEALTH AND FAMILY PLANNING SERVICES

10.4.1 Increased Accessibility of Health and Family Planning Services

Early studies of utilization patterns at the Health Center showed that the effective outreach of the Health Center was only a few miles. This meant that the Danfa Health Center was accessible to only about 35% of the people in this rural area which was supposed to receive comprehensive health services under the Project scheme. The satellite program was conceived to solve this problem and, when fully developed, was found to have extended the health service system coverage to about 85% of the population.

Accessibility also was increased by bringing certain health services directly into the communities. The Health Education Assistants (HEAs) were assigned to operate well-baby clinics, which primarily were regular village-based weighing sessions using "road-to-health" charts. The high level of participation in this program enabled HEAs to detect incipient problems of malnutrition and to provide health education discussions for a key target group, mothers of young children.

The HEAs themselves were an experiment in bringing the health system to the people. No such trained entity had previously existed in Ghana, and no guidelines existed for their training, or for their integration with the more conventional components of the Ghanaian health care system. All of these were devised, organized, evaluated and reorganized by the Project. The subjective judgment of the Project senior staff was that the program was successful, that the HEAs were able to carry out the tasks assigned to them and that the link between HEAs and the Health Center activities could be institutionalized. Moreover, favorable changes in health practices (as measured by the Health Practices Survey) indicated a satisfactory level of health education effectiveness on "targeted" health problems. HEAs also proved very successful in recruiting family planning acceptors.

It is estimated that 75% of births in Ghana are attended by traditional birth attendants (TBAs). Given the scarcity of health centers, health posts, and transportion in rural areas, it is likely that TBAs will continue to deliver the majority of Ghanaian babies for years to come. Therefore, it is appropriate to improve the TBAs' skills. The TBA training program described in Section 6.9 was a means for extending the health care system to

the people. The evaluation methods described in that section lead to a conclusion that the program is successful.

Mass immunization and malaria prophylaxis programs also brought health services directly into villages rather than requiring parents to bring their children to the Health Center or satellite clinics, and at acceptable cost levels. Both of these programs are believed to have contributed significantly to the reduction of child mortality in Area I.

The initial research design of the Project, which tested hypotheses about family planning acceptance, inhibited efforts to maximize accessibility of family planning service, since Areas I, II, and III all had to have similar service inputs. Nevertheless, the extended service plan described in Section 8.5 is estimated to have made family planning services geographically accessible to 70% of the population in each area. With the advent of the new PROP, the requirement for equal inputs was eliminated and further experimentation with increasing accessibility could be conducted. In 1977, village-based health workers began to offer initial contraceptive and resupply services along with curative services. Although our experience is very limited, judging from the rate of acceptor recruitment, the program appears headed for success. By contrast, an experiment with commercial distribution to increase accessibility does not appear to be successful initially in the Danfa Project district. However, this commercial distribution scheme is in its early stages and should be given more time before final conclusions are drawn.

10.4.2 Increased Community Participation in the Health Care System

Since bringing the health care system to the population directly in their villages was the Project's main focus in attempting to increase accessibility, that subject and that of increasing community participation are linked inextricably. The HEAs were used extensively for this effort. In addition to providing services themselves, HEAs were also trained to encourage the villagers to maintain--or form, if necessary--an active Village Development Committee. The Committee's purpose in the health area was twofold: first, to use community action and peer pressure to solve problems of environmental sanitation, and second, to encourage participation in preventive health programs. The HEA acted as a technical advisor to the Committee, and the Committee determined priorities for the village, perhaps with some

guidance from the HEA. The Health Practices Survey showed that the HEAs were reasonably effective in their roles as catalysts, encouraging villagers to participate in community health programs.

Village Health Workers (VHWs) had a great effect on bringing communities into closer relationships with the health care system. First, a workshop was held with representatives of the villages where the potential activities of a VHW were described by the Project staff. At the same time, the villagers were able to state their own preferences concerning how a VHW would function in the village. Next, the villagers selected those individuals to be trained as VHWs by the Project. Also, the village decided how to remunerate the individual, and the village evaluated his or her performance. Since the VHW was supervised, resupplied and given in-service training reinforcement by a government health service employee, the VHW and the staff member served as a continuous link between the village and the health care system. The Village Health Worker program is being used, along with a similar program elsewhere in Ghana, as a model for the expansion of village-based primary care on a much larger scale.

Since traditional birth attendants are community members, the TBA training program also increases community participation in the health care system. However, although other types of traditional healers are active in the villages, their role in Ghanaian health care remains controversial and the Project did not attempt to devise an analogous program for traditional healers.

10.4.3 Increased Effectiveness of Human, Physical and Financial Resources

HUMAN RESOURCES

The Health Education Assistant, traditional birth attendant and Village Health Worker programs all reflect increases in the effective and efficient use of human resources in the rural area. In many villages, TBAs and VHWs each represent a potential health care resource. This resource can be utilized with relatively little input from existing human and fiscal resources. The HEA is a new kind of health worker who combines the capabilities of several different kinds of existing health workers. This multipurpose worker is more efficient than a single-purpose worker. Moreover, since HEAs are used to motivate villagers to participate in preventive

programs, such as malaria prophylaxis, immunization and well-baby clinics, it is likely that they also increase program effectiveness.

At the Health Center, redefinition of worker roles cut patient flow-through time. At a very busy health center, this increased efficiency could enable the staff to see more patients. At Danfa, the time gained enabled the staff to participate more in community health projects. The Health Center staff was also given a new task, the promotion and provision of family planning services, which they carried out quite successfully.

PHYSICAL RESOURCES

The Danfa Project has demonstrated that health services can be offered via satellite clinics and family planning clinics which operate from very simple and inexpensive physical facilities. As we have shown, these may be one or two rooms of a village structure used regularly. Clearly, however, the Danfa Health Center itself could not operate in such minimal facilities, since permanent storage for records, drugs and equipment is vital. But one health center could easily serve four or five satellite clinics.

FINANCIAL RESOURCES

The Danfa operational cost studies demonstrate that a comprehensive health care package of higher quality than that generally available today in rural Ghana can be purchased for approximately what the government now spends. The key is extension of service by low-cost programs such as satellite clinics, malaria prophylaxis using volunteer distribution, immunization and the use of village-based health workers. These same studies have also shown that substantial savings could be effected if overstaffing, which is prevalent in the rural health centers, were eliminated and drug utilization rates were monitored systematically.

10.4.4 Improved Quality of Care

One of the main issues in quality of care is comprehensiveness of coverage. The Danfa health care package is, as the report of the Institute for Development Studies states, "currently the best feasible range of primary care services in Ghana" (1). The package includes curative services and extensive preventive and promotive components. At the Danfa Health Center, regular in-service training is given to review problems in diagnosis and

treatment, re-emphasize basic objectives of the health care system and improve the Health Center staff's participation in community programs. The Danfa Health Center drug formulary not only cut costs, it also improved quality of care by eliminating those drugs which were inappropriately used by nonmedical workers, while at the same time recommending appropriate drugs for most of the problems encountered at the Health Center. Moreover, a cohesive plan for provision of health care services for Area I was drawn up to integrate the full range of services. Similar plans, though with a less complete range of services, were drawn for Areas II and III tying together the resources available in each of those areas. An MCH procedures manual also was completed and applied.

10.4.5 Improved Environmental Sanitation

Project health education about water concentrated on its proper storage and on avoidance of contamination of pond and river sources with guinea worm and excreta. Village Development Committees were encouraged to promote construction of pit latrines; over the years of health education activity in Area I, 103 new latrines were built. A demonstration latrine was completed at the Health Center, but construction materials recently have become scarce and expensive, making latrines difficult to replicate. The health education program also stressed the reduction of breeding places for flies and mosquitoes.

10.5 INVESTIGATION OF THE STATE OF THE COMMUNITY

10.5.1 Planning and Evaluation Data

DEMOGRAPHIC DATA

The age and sex distribution of the population, and fertility and mortality levels were determined in an annual census and a continuous vital events registration program. Initially, these data proved to be lower in quality than the Danfa evaluation program required, and consequently, some changes were made midway through the Project. Subsequent data were of much higher quality, but the poorer data from the beginning of the Project made difficult analysis of results of the health care program based on fertility and mortality. Nevertheless, careful analysis of these data permitted the

conclusion that mortality rates declined significantly in Area I and not in the other areas. Demographic studies also revealed that the annual resident turnover is as high as 30%. This surprisingly high turnover complicated the demographic analysis (especially in the key indicator of infant mortality) and also reduced the power of the longitudinal survey as a tool for measuring change in MCH and family planning knowledge, attitudes and practices.

EPIDEMIOLOGICAL DATA

Data on incidence and prevalence of significant health problems were obtained through the Village Health Surveys and several special surveys such as the polio survey. Complaints recorded at the Health Center over the years also indicated the relative importance of some problems in the Danfa Project district, but of course not actual incidence or prevalence rates. Attempts were made to obtain reasonably accurate data on causes of death, but to no avail. Relatives of the deceased usually were not sufficiently precise about symptoms to permit retrospective analysis of the death forms.

HEALTH SYSTEM UTILIZATION

The Health Center/satellite EDP patient encounter record was used to analyze patterns of utilization for evaluation of coverage and villager-perceived accessibility. These data were the basis for the creation of the satellite program. The data also highlighted the implausibility of some drug usage levels and lead to corrective measures and recommendations for future procedures. Special studies of participation in malaria prophylaxis and mass immunization programs were used to determine factors involved in participation and nonparticipation.

10.5.2 Determinants of Health and Family Planning Behavior

The characteristics of family planning acceptors were determined by means of the Family Planning Follow-up Surveys. For example, male literacy was a more important determinant of acceptance than female literacy. Also, the more times a man married, the more children he was likely to produce in his lifetime; the same relationship did not hold for women.

The results of the Health Practices Survey and the longitudinal maternal and child health surveys were used to focus the health education program and then to evaluate progress. It was found that knowledge about underlying

causes of important children's diseases, such as worms, was increasing. This information was used to educate mothers on the treatment and prevention of worms and other problems.

A socioeconomic study was done. These data are to be combined with data from the longitudinal surveys and Family Planning Follow-up Surveys to help clarify the relationship of economic variables and sociodemographic variables in determining health and family planning behavior. These studies were delayed considerably by personnel problems and EDP hardware/software problems in Ghana and are not yet completed.

REFERENCES 10: ATTAINMENT OF GOALS AND OBJECTIVES

1. Institute of Development Studies Health Group. Health Needs and Health Services in Rural Ghana, Volume I. Brighton, U.K.: Institute of Development Studies, University of Sussex, 1978, p.54.

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APPENDIX 1: TRAINING AND RESEARCH COSTS FOR SELECTED ACTIVITIES

APPENDIX 1: TRAINING AND RESEARCH COSTS FOR SELECTED ACTIVITIES

The Danfa Project is a combination research and development, training, and service endeavor. The Project has three broad aims: one, to develop rural health programs replicable in modules or in totality by the Government of Ghana; two, to develop data and procedures which will help the government increase the efficiency and effectiveness of Danfa and other health service programs; and three, to help accelerate the development of the Ghana Medical School Department of Community Health and other Ghanaian agencies dealing with the development and provision of health services in Ghana. While the costs of model operational programs, such as the Health Center and satellites or the family planning program, were designed to be maintained within a replicable range, the costs of research and experimental training programs should be viewed as one-time, sunk costs with a payoff over a long, and generally unknown, time horizon. For this reason, these costs have not been mingled with service program costs and are shown separately in this appendix.

Component costs shown here must be considered against the backdrop of the Danfa Project central services organization which supported Project components and effected extensive economies of scale as discussed in Section 4. For example, central services had the effect of reducing the costs for transportation in an individual Project component because the vehicles were pooled and used for several Project components, reducing the cost attributed to each component. For example, assuming similar labor and logistic expenses the cost of replicating a single program in another country probably would be greater than was the cost here because similar economies of scale would not be possible, unless a similar central services organization were functioning. Conversely, had a major component, such as the longitudinal survey at an estimated cost of $368,848 not been included, the Project would have saved only a part of this because many of the fixed costs of staff, vehicles and equipment would not be reduced and would simply have had to be attributed on a pro rata basis to the remaining Project components.

The costs shown for individual training programs do not reflect replication costs for two reasons. First, each program was a new development and required more time input than would be needed for replication. And second, each training program contained a block of UCLA staff time. The cost

of maintaining UCLA staff resident in Ghana is relatively high, and subsequent training modules, developed originally with input by the UCLA staff but operated entirely by local staff, would be far less expensive. This was illustrated in Section 6 for the cases of the Health Center staff, Health Education Assistants and the family planning team, where reductions of 66%, 68% and 72%, respectively, could have been obtained if Ghanaians had done all the work. Since the data for each training program is aggregated over the life of the Project, most of the training program costs shown here include initial training and continuous in-service training.

The Danfa Project has spanned a full decade, 1969-1979, and in that time, all costs have increased, including UCLA and University of Ghana Medical School (UGMS) salaries, which are the dominant cost factors in these programs. However, averages have been estimated so that a single figure is given for the cost of staff (in man-months), material, transportation and data analysis.

Each man-month for UCLA faculty resident in Ghana is costed at ₵6,432 ($5,593). This includes salary; social security, insurance and retirement benefits; overseas allowance and cost-of-living post adjustment; children's educational allowances; rented housing; relocation expenses; annual and emergency leave travel; and UCLA overhead, as agreed to by the U.S. government. Each man-month for senior faculty resident at UCLA is costed at ₵4,105($3,570). In certain cases where UGMS senior faculty spent long periods in residence at UCLA in Los Angeles, their costs are shown in the UCLA column and at the UCLA rate. Each man-month for senior UGMS faculty is costed at ₵805($700). Each man-month for junior UGMS staff is costed at ₵172($150). The average cost per mile for transportation was estimated to be ₵0.35($0.30).

Table A1-1 shows the costs of the selected research activities. Table A1-2 shows the costs of various training programs.

Table A1-1: Costs of Research Activities, Cedis (Dollars)

	UCLA Unit	UCLA Cost	UGMS Unit	UGMS Cost	Total
LONGITUDINAL SURVEY (1972, 1975, 1977)					
Plan, perform, process					
in Ghana	26m-m	167,232(145,419)	11m-m	8,855(7,700)	176,087(153,119)
			420m-m	72,240(62,817)	
in L.A.	8m-m	51,456(44,744)			51,456(44,744)
Material, shipping		8,050(7,000)			8,050(7,000)
Transportation	26,250mi.	9,188(7,989)			9,188(7,989)
Analysis, reporting					
in Ghana	8m-m	51,456(44,744)	8m-m	6,440(5,600)	57,896(50,344)
in L.A.	12m-m	49,260(42,835)			49,260(42,835)
TOTAL					424,177(368,848)
VILLAGE HEALTH SURVEY (1972, 1975, 1977)					
Plan, perform, process					
in Ghana	15m-m	96,480(83,896)	13m-m	10,465(9,100)	106,945(92,996)
			60m-m	10,320(8,974)	10,320(8,974)
Material, shipping		10,580(9,200)			10,580(9,200)
Transportation		2,185(1,900)			2,185(1,900)
Analysis, reporting					
in Ghana	12m-m	77,184(67,117)	9m-m	7,245(6,300)	84,429(73,417)
in L.A.	15m-m	61,575(53,543)			61,575(53,543)
TOTAL					276,034(240,030)
CENSUS/VITAL EVENTS					
Plan, perform, process	18m-m	115,776(100,675)	18m-m	14,490(12,600)	130,266(113,275)
			1,012m-m	174,064(151,360)	174,064(151,360)
Vital events reg. assistants				46,120(40,100)	46,120(40,100)
Material, shipping				4,830(4,200)	4,830(4,200)
Transportation	98,000mi.	34,300(29,826)			34,300(29,826)
Analysis, reporting					
in Ghana	4m-m	25,728(22,372)	8m-m	6,440(5,600)	32,168(27,972)
in L.A.	16m-m	65,680(57,113)			65,680(57,113)
TOTAL					487,428(423,846)
HEALTH CENTER OPERATIONS STUDIES					
Plan, perform, process	5m-m	32,160(27,965)	4m-m	3,220(2,800)	35,380(30,765)
			3m-m	516(449)	516(449)
Transportation	1,500mi.	525(457)			525(457)
Analysis, reporting					
in Ghana	3m-m	19,296(16,779)	2m-m	1,610(1,400)	20,906(18,179)
in L.A.	3m-m	12,315(10,709)			12,315(10,709)
TOTAL					69,642 (60,559)

	UCLA Unit	UCLA Cost	UGMS Unit	UGMS Cost	Total
HEALTH CENTER EDP RECORDS/EVALUATION					
Plan, perform, process					
in Ghana	9m-m	57,888(50,337)	4m-m	3,220(2,800)	61,108(53,137)
			147m-m	25,284(21,986)	25,284(21,986)
in L.A.	3m-m	12,315(10,709)			12,315(10,909)
Material, shipping		1,380(1,200)			1,380(1,200)
Analysis, reporting					
in Ghana	5m-m	32,160(27,965)	5m-m	4,025(3,500)	36,185(31,465)
in L.A.	4m-m	16,420(14,278)			16,420(14,278)
TOTAL					152,692(132,775)
HEALTH PRACTICES SURVEY (1973, 1974, 1976)					
Plan, perform, process	9m-m	57,888(50,337)	12m-m	9,660(8,400)	67,548(58,737)
			49m-m	8,428(7,329)	8,428(7,329)
Material, shipping		4,025(3,500)			4,025(3,500)
Analysis, reporting					
in Ghana	6m-m	38,592(33,558)	6m-m	4,830(4,200)	43,422(37,758)
in L.A.	4m-m	16,420(14,278)			16,420(14,278)
TOTAL					139,843(121,602)
FP RECORDS/EVALUATION					
Plan, perform, process					
in Ghana	10m-m	64,320(55,930)	6m-m	4,830(4,200)	69,150(60,130)
			60m-m	10,320(8,974)	10,320(8,974)
Material, shipping		230(200)			230(200)
Transportation		345(300)			345(300)
Analysis, reporting					
in Ghana	6m-m	38,592(33,558)	6m-m	4,830(4,200)	43,422(37,758)
in L.A.	3m-m	12,315(10,709)			12,315(10,709)
TOTAL					135,782(118,079)
FP FOLLOW-UP STUDIES (1975, 1977)					
Plan, perform, process	6m-m	38,592(33,558)	2m-m	1,610(1,400)	40,202(34,958)
			50m-m	8,600(7,478)	8,600(7,478)
Material, shipping		230(200)			230(200)
Transportation		2,415(2,100)			2,415(2,100)
Analysis, reporting					
in Ghana	2m-m	12,864(11,186)	3m-m	516(449)	13,380(11,635)
in L.A.	8m-m	32,840(28,557)			32,840(28,557)
TOTAL					97,667(84,928)

	UCLA Unit	UCLA Cost	UGMS Unit	UGMS Cost	Total
POLIO SURVEY					
Plan, perform, process	1m-m	6,432(5,593)	1m-m	805(700)	7,327(6,293)
			1m-m	172(150)	172(150)
Analysis, reporting	2m-m	12,864(11,186)	1m-m	805(700)	13,669(11,886)
			1m-m	172(150)	172(150)
TOTAL					21,250(17,779)
IMMUNIZATION SURVEYS					
Plan, perform, process	3m-m	19,296(16,779)	4m-m	3,220(2,800)	22,516(19,579)
			7m-m	1,204(1,047)	1,204(1,047)
Transportation	1,450mi.	490(426)			490(426)
Analysis	3m-m	19,296(16,779)	2m-m	1,610(1,400)	20,906(18,179)
TOTAL					45,116(39,231)
GUINEA WORM					
Plan, perform, process	2m-m	12,864(11,186)	3m-m	2,415(2,100)	15,279(13,286)
			2m-m	344(299)	344(299)
Transportation	700mi.	245(213)			245(213)
Analysis, reporting	1m-m	6,432(5,593)	1m-m	805(700)	7,237(6,293)
TOTAL					23,105(20,091)
MALARIA SURVEYS					
Plan, perform, process	10m-m	64,320(55,930)	4m-m	3,220(2,800)	67,540(58,730)
			30m-m	5,160(4,487)	5,160(4,487)
Material, shipping		230(200)			230(200)
Transportation	4,200mi.	1,470(1,278)			1,470(1,278)
Analysis, reporting					
in Ghana	3m-m	19,296(16,779)	1m-m	805(700)	20,101(17,479)
in L.A.	2m-m	8,210(7,139)			8,210(7,139)
TOTAL					102,711(89,313)
TBA KAP STUDY					
Plan, perform, process	4m-m	25,728(22,372)	1m-m	805(700)	26,533(23,072)
Materials, shipping		230(200)			230(200)
Transportation	1,050mi.	368(320)			368(320)
Analysis, reporting	2m-m	12,864(11,186)	1m-m	805(700)	13,669(11,886)
TOTAL					40,800(35,478)
MANUALS PRODUCTION					
Staff - in Ghana	6m-m	38,592(33,558)	6m-m	4,830(4,200)	43,422(37,758)
- in L.A.	12m-m	49,260(42,835)			49,260(42,835)
- in L.A.	12m-m	24,633(21,420)			24,633(21,420)
Materials		3,450(3,000)			3,450(3,000)
TOTAL					120,765(105,013)

Table A1-2: Costs of Training Activities, Cedis (Dollars)

	UCLA Unit	UCLA Cost	UGMS Unit	UGMS Cost	Total
OVERSEAS PARTICIPANT					
Participant-months @$400 (21 programs)	258 mos.	118,680(103,200)			
Tuition, books, fees @$2,600	19	56,810(49,400)			
Travel		24,840(21,600)			
Training staff at UCLA		57,960(50,400)			
UCLA overhead		49,105(42,700)			
TOTAL					307,395(267,300)
TRADITIONAL BIRTH ATTENDANTS					
Staff	1m-m	6,432(5,593)	3m-m	2,415(2,100)	8,847(7,693)
Transportation	4,500mi.	1,575(1,370)			1,575(1,370)
Materials		1,150(1,000)			1,150(1,000)
TOTAL					11,572(10,063)
DANFA RURAL HEALTH CENTER STAFF					
Staff	7m-m	45,024(39,151)	14m-m	11,270(9,800)	56,294(48,951)
Transportation	7,000mi.	2,450(2,130)			2,450(2,130)
Materials		1,150(1,000)			1,150(1,000)
TOTAL					59,894(52,081)
HEALTH EDUCATION ASSISTANTS					
Staff	12m-m	77,184(67,117)	18m-m	14,490(12,600)	91,674(79,717)
Transportation	12,600mi.	4,410(3,835)			4,410(3,835)
Materials		3,450(3,000)			3,450(3,000)
TOTAL					99,534(86,552)
FAMILY PLANNING TEAM					
Staff	9m-m	57,880(50,337)	9m-m	7,245(6,300)	65,133(56,637)
Transportation	8,400mi.	2,940(2,557)			2,940(2,557)
Materials		2,300(2,000)			2,300(2,000)
TOTAL					70,373(61,194)
VILLAGE-BASED PRIMARY CARE					
Staff	2m-m	12,864(11,186)	6m-m	4,830(4,200)	17,694(15,386)
Transportation	4,200mi.	1,470(1,278)			1,470(1,278)
Materials		1,150(1,000)			1,150(1,000)
TOTAL					20,314(17,664)

In view of the fact that the basic conceptualization of the Danfa Project was accomplished in Ghana by Ghanaians prior to any approach to AID (see Section 2, "History of the Danfa Project"), that Ghana has capable professionals, and that bringing in expatriates is costly, why not simply draw on indigenous resources? The answer must be viewed in the context of available Ghanaian health manpower at the end of the 1960s and early 1970s. According to the first Ghanaian Codirector, Dr. Sai, there were not enough qualified Ghanaians who could be spared from important positions to work for the Danfa Project. The AID support which facilitated the UCLA contract made it possible to bring in skilled resources who could concentrate 100% on the Danfa Project. They accelerated the activity timetable and brought additional perspectives from other developing countries. One of the guests at the Danfa Final Review Meeting summarized the value of the external assistance by saying, "You have accomplished in ten years what, in the absence of similar aid, would have required thirty years."

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APPENDIX 2: DEMOGRAPHY (A2-1)

A2.1	Sources of Demographic Data and Methods of Collection	(A2-1)
A2.2	Techniques of Analysis	(A2-6)
A2.3	Methodology of the Estimation of Vital Rates by C-D Method	(A2-10)
A2.4	Results of Coverage Estimates for Births and Deaths	(A2-11)
A2.5	Population Size and Age/Sex Distribution	(A2-13)
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A2.7	Conclusions and Recommendations	(A2-68)

APPENDIX 2: DEMOGRAPHY

In a complex experimental project with an important research component, the collection of demographic data is a fundamental requirement. The demographic data for the Project were obtained through a variety of sources. In this appendix, the sources of demographic data, methods of collection, techniques of analysis, results of coverage estimates for births and deaths, age and sex distribution and population growth are discussed.

A2.1 SOURCES OF DEMOGRAPHIC DATA AND METHODS OF COLLECTION

A2.1.1 Baseline Census

A population census provides information about the volume and structure of the population at a point in time, and subsequent changes due to births, deaths and migration. The baseline population census was used to form a sampling framework for the Project's longitudinal studies as well as a profile of the essential demographic features of the Project residents.

There are two ideal types of total population counts: the de facto[a] and the de jure[b] counts. Most of the modern censuses use a modification of one of these types of enumeration, but there are a number of difficulties in applying these techniques in the field. For example, in the application of the de jure concept there has always been the problem of obtaining accurate information about persons who are absent; equally the de facto approach involves obtaining information about visitors, many of whom are present at the time of the interview and who may have little connection with the household in which they are staying. In any case, the choice of either the de facto or the de jure method allows the enumerator what could be a research endangering loophole: any unwanted or doubtful case can be excluded on the grounds that the respondent belongs to the category not included. In order, therefore, to

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[a]De facto population consists of permanent residents, current and temporary residents (long-term visitors) and short-term visitors. For all practical purposes temporary residents and short-term visitors come under the general heading "visitors."

[b]De jure population consists of permanent residents who are present, and permanent residents who are temporarily away.

avoid a serious undercounting of the population of the Project district, both the de jure and de facto methods of enumeration were used for collecting Project baseline population information. This also allowed us to initiate the vital events registration system for the Project which could either use de jure or de facto methods in registering the events. Furthermore, enumerating the population by both these counts gave us an important leverage to use either de jure, de facto or both methods, as appropriate, at the time of analysis.

Initial planning for data collection included discussions with a number of participating agents, compilation of maps of villages and hamlets, selection and training of field staff and the organization of field work. Methods and procedures were perfected and refined, and record forms revised as the data collection proceeded.

The collection of population census by both de jure and de facto enumeration necessitated additional training of enumerators to register both the de jure and de facto populations. The enumerators were taught to identify those who are usual residents and were present at the time of enumeration, those who are usual residents but were temporarily away, as well as those classified as visitors. Only one form was filled in for each household but each individual in the household was enumerated and characteristics of each person were recorded separately. Information was sought about each individual's age, sex, marital status, relationship with head of household, ethnicity, religion, occupation, alleged literacy, and level of education. All this information was considered essential for studying the characteristics of the population in different Project areas and for analyzing the relationships between fertility, mortality and other health indices and sociodemographic variables.

A2.1.2 Annual Surveys

The 1971 baseline census gave us the initial population of the four Project areas. Since the population continuously changed, census data was updated through repeat annual surveys concerning births, deaths, and migration. Each household enumerated at the baseline survey was revisited by an interviewer at yearly intervals and all births, deaths, in-migration and out-migration occurring during the intervening period in the household were recorded separately. If an entire household moved out of the area or a new

household moved into the area, "out-migrant" and "in-migrant" codes were assigned. In-migrants' characteristics were recorded similarly to the initial baseline survey.

A2.1.3 Vital Events Registration

Demographic measures are not isolated pieces of information, but rather particular facets of a structural whole. Although repeat annual surveys provide us information about births and deaths, there must be sufficient supplementary information about events from independent sources to detect errors or inconsistencies. One such method is to establish a vital registration system along with the collection of births and deaths through periodic repeat surveys.

Although experimental attempts to establish limited vital registration systems in African countries have had disappointing results, accurate registration of births and deaths for all areas is preferable since it provides valuable demographic data independent of census data. Comparative checks are advantageous and their use could bring rapid improvement in demographic knowledge of countries with deficient information. Such checks are of great value, particularly for accurate estimation of birth and death rates. A vital registration scheme to record births and deaths on a continuing basis in the four Project areas was established to validate and improve annual census findings.

GHANAIAN GOVERNMENT COOPERATION

The establishment of such a system in the Project areas involved cooperation with government agencies responsible for vital registration. Since there was a vital registration system already operating in certain parts of Ghana, it was decided to integrate the scheme of the Project areas with those existing in other parts of the country. Such integration involved close cooperation with the office of the Registrar of Births and Deaths using identical data forms and issuing official birth and death certificates to cover those events registered by Project personnel. One barrier to residents reporting vital events--a penalty for delay in registration--was waived for Project residents. Issuance of birth certificates, has become increasingly popular in the Project areas.

REGISTRARS AND REGISTRATION ASSISTANTS

The second problem was the selection of registrars. Such factors as age, stability, attitude toward work and motivation were considered. Initially, school teachers or other literate persons who were permanent residents of the villages within the Project areas were chosen for part-time registration roles on a semi-voluntary basis.

A third problem was to devise an equitable workload for the part-time registration assistants. Each of the four areas was divided into several clusters of villages. Village size and the distance between villages were considered in designing clusters. No village within a cluster was more than three miles away from the assistant's base village. Incentives included a monthly five cedi honorarium and an annual cash prize to the two best registration assistants for achieving most complete registration.

The success of the scheme largely depended upon the number and type of informants used by the registrars. They were advised to contact chiefs, clan heads, village team leaders, other school teachers, and traditional midwives about births and deaths at weekly intervals. This informant system reflected a respect for traditional leaders and local observers.

People cooperated well, but in several villages where the registration assistants were mistaken for government officials concerned with taxation or arrests, coverage of events was less satisfactory. To communicate with recent immigrants who could not speak the local language, a Project staff member accompanied the assistant to meet the chiefs and elders and explain that registration helped to solve health problems of the community.

With time it became more clear that supervision of the registration assistants was inadequate and marked under-reporting was occurring. Several factors were involved. In some areas where there were no schools and few potential registration assistants the problem of finding replacement assistants for discharged or resigned registrars was acute. When confronted with poor coverage of events, registration assistants complained about the difficulty of walking long distances and the dangers of walking along bush paths at night. Some of the assistants had limited leisure time or left their bases on weekends. The use of teachers as vital registration assistants often resulted in a declining number of events recorded during holiday periods at Christmas time and in the summer.

INFORMATION ON VITAL EVENTS REGISTRATION FORM

The information collected on the births can be classified under five main headings:

(a) Child: name, sex, date of birth, place of birth and type of birth.
(b) Mother: name, ethnic group, nationality, age, number of children ever born (including this birth), number born alive and now living, born alive and now dead, parity or live birth order, still born children, occupation, education and place of usual residence.
(c) Father: name, age, ethnic group, occupation and level of education attained.
(d) Informant: name and relationship to the child.
(e) Registrar: name and the date of registration.

On death, information collected included the deceased's name, age, sex, date of death and age at death; socioeconomic data of the deceased (marital status, nationality, ethnic group, occupation and level of education); the particulars of the mother and father if under 15 years; the causes of death and also the name of the informant and the registrar, and the date of registration.

OVERALL DIFFICULTIES ENCOUNTERED IN V.E. REGISTRATION

Establishing an accurate vital registration system is difficult in developing countries, and conceptual and organizational problems were encountered in this Project. The key to an effective vital registration system is motivating both registrars and the public to register events. Other difficulties include problems of definitions, statistical analysis, financing, and staffing. An illiterate population is less accurate about time periods, ages, and often hold cultural beliefs that misfortune may follow the disclosure of certain facts.

A2.1.4 Longitudinal Events Registration

Fertility surveys are used to measure fertility and evaluate family planning programs because demographic data is deficient and vital events registration systems are inadequate or non-existent. The Danfa Project's fertility survey of women's pregnancy histories was conducted to improve the

data obtained through the vital events registration system and annual census surveys. The longitudinal fertility surveys were based on a stratified random sample of about 2000 households comprised of approximately 500 in each of the four areas. These surveys were carried out in 1972, 1975 and 1977 and the same cohort of women was interviewed three times. In the 1972 survey, all preceding pregnancy experiences were recorded. In the 1975 and 1977 surveys only pregnancies which occurred in the intervening periods were recorded. All women in these households were interviewed to obtain a chronological record of every pregnancy containing the following information:

(a) Date at which pregnancy terminated.
(b) Outcome of pregnancy. (live birth, still birth, spontaneous abortion, induced abortion.)
(c) Sex of live born children.
(d) Survival of live born children. (Is child living at time of survey?)
(e) Age at death of deceased children.

In order to obtain the above data reliably, a battery of interview questions and a special reporting form were developed. Interviewers completed an intensive training course that emphasized techniques to help the respondents to recall all their pregnancies and relevant facts by probing and reprobing. For example, an unusually long interval between two reported pregnancies was the basis for probing questions about miscarriages or still births.

A2.2 TECHNIQUES OF ANALYSIS

A2.2.1 De jure and De facto Populations

As mentioned above, the baseline population census enumerated both the de facto and the de jure populations while the repeat surveys and vital registration systems accounted for events related to all the three broad categories of respondents: (a) usual residents present within the area at the time of survey; (b) usual residents temporarily away from the area at the time of the survey; and (c) visitors to the area, as shown in Table A2-1.

Table A2-1: Classification of Vital Events by Resident Status

Residential Status	Registrar	Survey
URP 1	URP 1	URP 1
URP 2	URP 2	URP 2
URA 1	URA 1	URA 1
URA 2	URA 2	URA 2
V 1	V 1	V 1
V 2	V 2	V 2

URP 1 Live births or deaths to normal residents who were present in Area at the initial reference date and found present or deceased at the time of the subsequent visit. (Birth or death took place in the area).

URP 2 Live births or deaths to normal residents in the area who outmigrated during the period between visits, and not found at the time of visits as they were not present in the household or the whole household had migrated.

URA 1 Live births to normal resident occurred outside the area, resident has now returned to the household and present at the time of visit; or normal residents who died during the period outside the village.

URA 2 Live births to the normal resident occurred outside the area, resident has not returned to the household or has migrated out.

V 1 Live births or deaths occurred in the area to the visitor who has visited a household and now returned to the usual place of residence or still present in the household.

V 2 Live births or deaths to the visitor who had come to maternity home/institution and returned to the usual place of residence after delivery.

There was considerabl mobility of the population to and from these study areas. It was important to avoid counting a large number of births and deaths occurring among visitors, many of whom were attracted to the Project areas' health facilities. Therefore, the following analysis is limited to the de jure population, and all events (births and deaths) correspond only to the de jure baseline population, excluding vital events related to visitors, i.e. V 1 and V 2 in Table A2-1.

A2.2.2 Matching Census and Vital Events Registration Data

Since we had adopted a system of obtaining vital events which was based on a combination of census and vital registration data, appropriate matching procedures and analytical techniques were used to make an accurate estimate of events and the extent of coverage.

The main steps adopted for matching of vital events recorded by two different procedures consisted of mechanical operations, several manual operations and a field check of partially matched or non-matched events. Major problems included differences in recorded information about names, and the large number of items that had to be compared and verified. These were related to memory decay or lapse over time, inconsistency among household members who supplied the information, and the mobility of Project individuals and households over time. The uniform matching method which compared events from the registration with each of the events from the survey used these code classifications:

(a) Reports agree on each item;
(b) Reports contradict each other;
(c) No entry for the characteristic for one or both groups.

Agreement and contradiction are defined with reference to specified tolerance limits (e.g. ±5 years for adult age reported) to allow for common errors and distributions in the reporting characteristics (see below). After the initial office matching, events were categorized as: clearly matched, probably matched, probably unmatched, or clearly unmatched, and a follow-up team was sent to the appropriate household to re-verify all doubtful cases.

The enumerators followed up unmatched cases with geographically out-of-scope errors and classified them as: the household located near the boundary;

disagreement on the exact date of birth or death, date of birth/death unknown; changes in the household composition between rounds.

One of the major problems in matching vital events reports was the selection of matching criteria. Too stringent a criterion may cause the same events to be counted as two events and too loose a criterion may result in different events being considered as the same event. Based on experience with matching procedures, several variables were selected for use in matching vital events: the house number, the name of the child/deceased, the sex of the child/deceased, date of birth/death, place of birth/death (and residential status), name of the mother for births, and the age at death for the deceased.

Even a child's name created problems because of variations in spelling or different naming systems used by various cultural or ethnic groups in the Project areas. Often the name reported to a registrar was different from the name reported to the enumeration team. Names of newborn babies were a special problem for assistants because babies often were named some time following birth.

The house number, another criterion required to match information, was available because the Danfa Project carefully mapped all villages and dwellings before starting field surveys and registration. While discrepancies or mismatches in alleged house numbers were common--their verification on visits was relatively easy.

Many mismatches were the result of cultural variations. For example, in some societies pregnant women may leave their husband's households where they were previously enumerated to go to their mother's or grandmother's homes for delivery.

The date of birth was matched using a tolerance limit of plus or minus one month. The sex of the child was accurately recorded and matched well in almost all cases.

Immediately after each enumeration, lists of pregnant women were compiled and distributed to both the registrars and the survey team. The registration assistants were requested to follow up these pregnant women for the outcome of their pregnancies. Focusing on the outcome for pregnant women is intended to improve the accuracy of the reporting of events, particularly infant deaths. One difficulty in the follow-up validation exercise was caused by resident mobility. Enumerators were unable to obtain sufficient information about

children of out-migrated parents (name, date of birth, sex, place of birth and whether still alive) because they could not be contacted.

One of the basic assumptions made in using the Chandrasekhar-Deming formula to estimate vital rates is that the two systems of data collection are independent. Collusion might occur if the village registrars and the Project enumerators exchanged information; lessened effort could result in an event being missed by both systems. By using rigorous field controls and weekly collection of the vital events data from the registration assistants, we were able to markedly improve the performance of the registration system.

A2.3 METHODOLOGY OF THE ESTIMATION OF VITAL RATE BY C-D METHOD

The estimation procedure was based on the theoretical work of Chandrasekhar and Deming (1949) which is fully discussed in the literature. The essential feature of this procedure is the collection of data by two independent systems: the registration system and the periodic household surveys. The vital events collected by the two systems are matched so that the following categories can be obtained:

- C The number of events recorded by both systems (registration and survey)
- N_1 The number of events recorded by survey only
- N_2 The number of events recorded by registration only

From these three categories, estimates of events missed by both systems (under the assumption of statistical independence between the two systems) were derived using the Chandrasekhar-Deming formula which can be given as follows:

$$N = C + N_1 + N_2 + X$$

where X is the estimated number of missing events and can be estimated as

$$\frac{N_1 N_2}{C}$$

this leads to $N = C + N_1 + N_2 + \frac{N_1 N_2}{C} = \frac{(C + N_1)\ (C + N_2)}{C} = \frac{RS}{C}$

where $S = C + N_1$ and $R = C + N_2$

On rearranging the formula $N = \frac{RS}{C}$, the formula estimates the completeness of the coverage of the registration system as the match rate of the survey, and estimates the completeness of the coverage of the survey as the match rate of the registration. This leads to the following equations for the completeness of coverage rates shown as:

$\frac{R}{N} = \frac{C}{S}$ for the completeness of registration;

$\frac{S}{N} = \frac{C}{R}$ for the completeness of survey.

The major theoretical features of the method are few, simple in conception, and difficult to apply but valuable owing to their unique self-checking features.

A2.4 RESULTS OF COVERAGE ESTIMATES FOR BIRTHS AND DEATHS

Table A2-2 shows that estimated coverage of vital events was lower in the initial two years and then improved considerably in the later years. It is also clear from this table that the estimated coverage for births is higher than that for deaths in all four areas. Much of the improvement was due to a change from part-time registrars in 1973-74 to full-time salaried Project registrars. Variation in the coverage estimates from one area to another probably reflects differences in sources of bias operating in different project areas as well as differences in coverage. For example, Area IV seems to be more efficient in the collection of births and deaths by survey method as compared to the other three areas, the coverage of events by registration appears to be somewhat better in Area I, although there is considerable annual fluctuation in the coverage of vital events. In most cases lack of independence can be expected to overestimate coverage. A similar pattern was noted in previous surveys and sample registration systems in Africa where

Table A2-2: Yearly Percentage Distribution of Estimated Coverage of Vital Events During the Years 1971-77 in All Areas

Year	Survey Births	Survey Deaths	Registration Births	Registration Deaths	Both Births	Both Deaths
			A R E A I			
1971-72	53.2	47.9	59.6	69.9	81.1	84.3
1972-73	78.5	59.8	66.1	55.0	92.7	81.9
1973-74	65.5	64.3	68.5	43.7	89.1	79.9
1974-75	82.5	80.0	92.4	76.0	98.6	95.3
1975-76	68.4	64.9	96.0	77.4	98.8	92.0
1976-77	73.1	60.0	90.1	61.5	97.4	84.6
			A R E A II			
1971-72	52.9	32.4	41.4	24.7	72.4	49.1
1972-73	72.4	40.7	55.8	25.0	87.8	55.5
1973-74	62.5	57.3	64.3	57.3	86.6	69.5
1974-75	75.0	63.6	90.0	75.4	97.5	91.0
1975-76	67.4	61.0	95.2	67.3	98.4	87.3
1976-77	66.6	50.9	86.0	72.9	95.3	86.7
			A R E A III			
1971-72	50.3	31.5	42.1	25.4	71.1	48.9
1972-73	63.9	47.9	39.6	22.1	78.2	69.4
1973-74	61.0	59.1	53.0	24.1	81.7	68.9
1974-75	75.5	65.3	80.1	63.2	95.1	87.2
1975-76	71.4	68.5	78.9	62.2	93.9	88.1
1976-77	66.8	61.4	78.9	57.9	93.0	83.8
			A R E A IV			
1971-72	65.2	57.9	45.6	39.2	81.0	74.9
1972-73	65.5	56.8	45.8	39.3	81.3	73.8
1973-74	65.5	54.8	48.2	27.0	82.1	67.0
1974-75	80.2	72.4	78.3	52.7	95.7	86.9
1975-76	73.7	47.6	71.4	33.8	92.5	65.3
1976-77	71.2	63.8	68.3	57.7	90.8	82.5

reporting of deaths has always been low. Improvements in coverage from the initial year (1971-72) to the year 1976-77 when the data collection ended were highest (37.4%) in Area I compared with 32.8%, 25.9% and 9.2% in Areas III, II and IV, respectively. Area III showed 94.5% improvement in deaths covered while respective improvement shown by Areas I, II and IV was 25.3%, 57.1% and 10.2% respectively.

When vital events by registration is considered, Area II showed the highest improvement in the coverage of births (107.7%, from 41.4% to 86.0%) compared to 51.2% in Area I, 87.4% in Area II and 49.8% in Area IV. Regarding coverage of deaths by registration, improvement in efficiency was spectacular (195.1%, from 24.7% to 72.4%) for Area II. It was 127.9% for Area III and 47.2% for Area IV.

By the final year of data collection, registration of vital events by both of these methods covered more than 90% of births and slightly higher than 80% of the deaths in all four Project areas.

A2.5 POPULATION SIZE AND AGE/SEX DISTRIBUTION

A2.5.1 Population Size

Since the size and the age/sex structure of a population affect both the level and pattern of fertility, mortality and migration, it is the first demographic analysis to be developed from a census survey enumeration. The de jure population in each area for the initial and subsequent years is shown in Table A2-3. These figures pertain to August 31 of a given year. Since the baseline (1971) census was completed in different areas at different times it was adjusted to 31st August by adding births (age and sex specific) reported during the period when the census was actually completed in a particular area and August 31, 1971. Once the age and sex distribution of the population has thus been determined for calculating next year's age and sex distribution, the single year ages were advanced by one year. Then the adjustment for the components of the population, i.e., immigration, out-migration, births and deaths was made. For this purpose age and sex specific immigration and out-migration figures for the period September 1, 1971 to August 31, 1972, obtained from the annual repeat surveys, were added and subtracted respectively from the baseline. Then the sex distribution of births and age and sex distribution of deaths reported by survey only, registration only, by

Table A2-3: The Size of the Population by De Jure Enumeration

YEAR	AREA I	AREA II	AREA III	AREA IV	TOTAL
1971					
Male	5981	5314	6761	6972	25028
Female	5641	5239	6957	7008	24845
Total	11622	10553	13718	13980	49873
Sex Ratio	106.0	101.4	97.2	99.5	100.7
1972					
Male	6759	5339	7288	7180	26566
Female	6499	5416	7479	7212	26606
Total	13258	10755	14767	14392	53172
Sex Ratio	104.0	98.6	97.5	99.6	99.8
1973					
Male	7377	5790	8463	8048	29678
Female	7140	5846	8816	8087	29889
Total	14517	11636	17279	16135	59567
Sex Ratio	103.3	99.0	96.0	99.5	99.3
1974					
Male	7958	6651	9744	8553	32906
Female	7466	6693	10152	8577	32888
Total	15424	13344	19896	17130	65794
Sex Ratio	106.6	99.4	96.0	99.7	100.1
1975					
Male	8502	7101	10135	8819	34557
Female	7926	7014	10476	8852	34268
Total	16428	14115	20611	17671	68825
Sex Ratio	107.3	101.2	96.7	99.6	100.8
1976					
Male	8996	7921	10942	9383	37242
Female	8247	7678	11162	9332	36419
Total	17243	15599	22104	18715	73661
Sex Ratio	109.1	103.2	98.0	100.5	102.3
1977					
Male	9567	8167	11769	9939	39442
Female	8738	7822	11966	9793	38319
Total	18305	15989	23735	19732	77761
Sex Ratio	109.5	104.4	98.4	101.5	102.9

survey and registration both which occurred between September 1, 1971 to August 31, 1972 were obtained. The missing events were calculated separately for each age and sex by using Chandrasekhar-Deming (C-D) method. The sex-specific births and age and sex specific deaths were then added and subtracted from the above net of migration age and sex distribution. The resultant figures were age and sex distribution of the population as of August 31, 1972. This process of adjustment was repeated for all subsequent years until the age and sex distribution of population as of August 31, 1977 was obtained.

Table A2-3 shows a marked increase in Project population from 49,873 in 1971 to 77,761 in 1977. In six years the total population of the Project grew by 55.9%. Areas I, II, III and IV growth rates were: 57.%, 51.%, 73.0% and 41.1%, respectively. The 1971 sex ratio of 100.7 males: females increased to 102.9 by 1977, probably due to sex differentials in migration and mortality.

A2.5.2 Age and Sex Distribution

After the 1971 baseline enumeration, the sex and age distribution for subsequent years (as mentioned above) was derived by making adjustments for the various components of the population change, i.e., births, deaths and migration. For the purpose of this analysis the entire population has been distributed by sex and nineteen age classes as follows: Under 1(0), 1,2,3,4; 0-4...25-29; 65+. Tables A2-4 to A2-7 show the percentage distribution of the total population in these age groups for the four areas from 1971-77.

Since fertility, rather than mortality, is the principal determinant of a population's age structure, the proportion of a population less than 15 years is a fairly reliable index of births or fertility. Since nearly half of the Project population are persons under 15 years of age, it shares with the rest of Ghana and many developing countries an age structure reflecting consistently high birth rates.

The proportion of the population aged 65 and over in different Project areas and years ranges from 3.7 to 5.5 percent. Furthermore, approximately two-fifths of the total female population was in the reproductive age groups (15-49). This proportion was initially highest (42.4%) in Area III and lowest (38.9%) in Area I. Areas II and IV had 40.8% and 39.6% of their respective female populations in these age groups in 1971. By 1977 these percentages dropped slightly, particularly in Area III, probably related to a decrease in net in-migration for this population sub-group.

Table A2-4: Percentage Distribution of Population in Various Age and Sex Groups

Area I - August 31, 1971 through 1977

AGE	1971			1972			1973			1974			1975			1976			1977		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
0	2.1	2.1	2.1	4.9	5.4	5.2	3.7	4.0	3.8	3.4	3.2	3.3	3.4	3.5	3.5	3.6	3.3	3.5	2.6	3.7	3.1
1	3.2	3.5	3.3	2.4	2.3	2.3	5.1	5.8	5.4	3.4	3.8	3.6	3.2	3.0	3.1	3.3	3.2	3.3	3.6	3.1	3.4
2	3.1	2.9	3.0	3.1	3.7	3.4	2.5	2.2	2.4	5.3	6.0	5.7	3.3	3.9	3.6	3.1	2.9	3.0	3.4	3.0	3.2
3	3.0	3.4	3.2	2.9	2.9	2.9	3.0	3.4	3.2	2.5	2.3	2.4	5.5	6.6	6.0	3.3	4.1	3.7	3.0	2.8	2.9
4	3.7	3.7	3.7	3.3	3.4	3.3	2.9	3.1	3.0	3.2	3.4	3.3	2.4	2.4	2.4	5.8	7.1	6.5	3.4	4.2	3.8
0-4	15.1	15.6	15.4	16.6	17.7	17.1	17.2	18.5	17.8	17.8	18.8	18.3	17.9	19.4	18.6	19.2	20.6	19.9	15.9	16.7	16.3
5-9	17.0	17.7	17.3	17.9	17.4	17.6	17.6	16.8	17.2	16.6	15.9	16.3	15.3	15.4	15.4	14.7	14.5	14.6	16.8	18.4	17.6
10-14	15.1	14.0	14.5	14.9	13.3	14.1	14.8	13.3	14.0	14.4	13.8	14.1	15.1	14.0	14.6	15.0	13.4	14.3	15.6	13.4	14.6
15-19	10.4	9.3	9.9	10.7	9.7	10.2	11.1	9.9	10.5	10.9	9.9	10.4	10.6	9.8	10.2	9.9	9.9	9.9	10.0	10.0	10.0
20-24	5.2	6.1	5.6	5.7	6.7	6.2	5.7	6.9	6.3	6.8	7.3	7.0	7.0	7.2	7.1	7.6	8.0	7.8	7.7	7.5	7.6
25-29	5.4	5.6	5.5	4.9	5.5	5.2	4.6	5.6	5.1	4.6	5.5	5.0	5.0	5.5	5.2	5.3	5.2	5.2	5.7	5.9	5.8
30-34	4.6	5.1	4.8	4.7	4.8	4.8	4.4	4.6	4.5	4.3	4.5	4.4	4.2	4.5	4.4	4.4	4.5	4.4	4.3	4.6	4.4
35-39	4.5	4.9	4.7	3.9	4.3	4.1	4.1	4.4	4.2	4.1	4.2	4.2	4.2	4.4	4.3	3.7	3.9	3.8	4.0	4.1	4.0
40-44	3.7	4.0	3.9	4.0	3.8	3.9	3.5	3.8	3.7	3.8	4.1	4.0	3.6	3.8	3.7	3.6	4.2	3.9	3.2	3.7	3.4
45-49	3.6	3.9	3.7	2.9	3.7	3.3	3.2	3.5	3.3	3.0	3.2	3.1	3.1	3.1	3.1	3.0	2.9	2.9	3.2	3.0	3.1
50-54	3.4	3.7	3.6	3.3	3.5	3.4	2.9	2.9	2.9	3.1	3.0	3.1	2.9	2.7	2.8	2.7	2.8	2.8	2.5	2.8	2.6
55-59	2.8	2.6	2.7	2.5	2.2	2.4	2.5	2.4	2.5	2.2	2.3	2.2	2.5	2.7	2.6	2.4	2.6	2.5	2.6	2.4	2.5
60-64	2.4	2.4	2.4	2.0	2.3	2.1	2.1	2.2	2.1	2.3	2.2	2.3	2.1	1.8	1.9	2.1	1.8	2.0	2.0	1.7	1.9
65+	6.1	4.5	5.3	5.2	4.1	4.7	5.4	4.3	4.9	5.2	4.3	4.8	5.7	4.8	5.3	5.7	5.0	5.4	5.8	5.1	5.4
UNKNOWN	0.7	0.6	0.6	0.9	1.0	1.0	1.0	0.9	1.0	0.8	0.9	0.9	0.7	0.9	0.8	0.6	0.8	0.7	0.6	0.7	0.7

Table A2-5: Percentage Distribution of Population in Various Age and Sex Groups

Area II - August 31, 1971 through 1977

AGE	1971			1972			1973			1974			1975			1976			1977		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
0	2.3	2.7	2.5	5.2	5.8	5.5	4.9	4.7	4.8	4.5	4.3	4.4	5.7	4.6	5.2	4.3	4.2	4.3	4.5	4.2	4.3
1	3.9	3.7	3.8	1.9	2.6	2.3	4.9	5.6	5.3	4.7	4.2	4.5	4.6	4.4	4.5	5.1	4.2	4.7	4.2	3.8	4.0
2	3.5	3.7	3.6	3.7	3.4	3.5	2.2	2.4	2.3	4.5	5.4	4.9	4.9	4.3	4.6	4.5	4.5	4.5	4.8	4.1	4.5
3	4.2	4.3	4.2	3.5	3.5	3.5	3.5	3.5	3.5	2.2	2.5	2.3	4.5	5.4	5.0	5.1	4.3	4.7	4.5	4.8	4.7
4	3.4	3.7	3.6	4.1	4.0	4.1	3.2	3.2	3.2	3.1	3.4	3.3	2.2	2.6	2.4	4.7	5.4	5.0	5.5	4.3	4.9
0-4	17.4	18.1	17.7	18.4	19.4	18.9	18.7	19.4	19.1	19.0	19.9	19.4	21.9	21.4	21.7	23.7	22.6	23.1	23.5	21.2	22.4
5-9	16.3	15.6	16.0	16.5	15.7	16.1	16.2	15.5	15.9	15.9	15.6	15.8	14.8	14.4	14.6	13.5	14.1	13.8	15.1	16.2	15.7
10-14	12.4	10.9	11.7	12.1	10.8	11.5	12.7	10.9	11.8	12.0	10.6	11.3	12.3	10.9	11.6	12.0	10.7	11.4	11.8	10.9	11.3
15-19	9.0	8.2	8.6	9.4	8.8	9.1	8.8	8.0	8.4	9.2	8.7	8.9	8.8	8.0	8.4	8.8	8.2	8.5	8.4	7.9	8.2
20-24	6.3	7.5	6.9	6.3	6.7	6.5	6.8	7.6	7.2	7.0	7.5	7.3	6.4	7.7	7.0	6.2	7.3	6.8	6.3	7.1	6.7
25-29	6.1	6.0	6.0	5.3	6.6	6.0	5.5	6.5	6.0	6.1	6.6	6.4	5.5	6.6	6.0	5.9	6.7	6.3	5.2	6.0	5.6
30-34	5.2	6.3	5.8	5.2	5.8	5.5	5.6	6.3	5.9	5.2	5.6	5.4	5.2	5.7	5.5	5.1	5.2	5.1	5.2	5.8	5.5
35-39	4.5	4.3	4.4	4.6	4.3	4.5	4.2	4.2	4.2	4.9	4.9	4.9	4.4	4.3	4.4	4.4	4.7	4.5	4.1	4.6	4.3
40-44	3.8	4.6	4.2	3.8	4.3	4.1	3.9	4.2	4.0	3.5	3.6	3.6	3.6	4.0	3.8	3.5	3.4	3.4	3.7	3.5	3.6
45-49	4.1	3.9	4.0	4.2	3.7	3.9	3.8	3.3	3.5	3.7	3.7	3.7	3.5	3.3	3.4	3.2	3.6	3.4	3.0	3.3	3.2
50-54	3.9	4.3	4.1	3.6	3.8	3.7	3.3	3.6	3.5	3.4	3.0	3.2	3.3	3.1	3.2	3.1	2.8	2.9	3.1	2.8	3.0
55-59	2.5	2.7	2.6	2.4	2.9	2.6	2.8	3.0	2.9	2.8	3.2	3.0	2.6	3.1	2.8	2.9	3.4	3.1	2.6	3.1	2.9
60-64	2.5	2.1	2.3	2.2	2.0	2.1	2.2	2.2	2.2	1.9	1.9	1.9	2.0	2.2	2.1	1.8	2.0	1.9	1.9	2.2	2.0
65+	5.6	5.1	5.3	5.4	4.6	5.0	5.1	4.6	4.8	5.2	4.8	5.0	5.3	4.9	5.1	5.9	5.1	5.5	5.7	5.2	5.4
UNKNOWN	0.3	0.3	0.3	0.5	0.6	0.6	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3

Table A2-6: Percentage Distribution of Population in Various Age and Sex Groups

Area III - August 31, 1971 through 1977

AGE	1971			1972			1973			1974			1975			1976			1977		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
0	3.1	3.7	3.4	6.4	5.4	5.9	6.4	6.9	6.6	6.2	5.1	5.6	5.0	4.9	5.0	5.5	4.8	5.2	5.0	5.6	5.3
1	4.1	4.3	4.2	2.6	3.2	2.9	5.9	4.9	5.4	5.9	6.4	6.2	6.1	4.5	5.3	4.7	4.4	4.5	5.3	4.6	4.9
2	4.2	3.7	3.9	3.9	4.1	4.0	2.5	3.5	3.0	6.0	4.9	5.4	6.0	6.4	6.2	5.8	4.1	4.9	4.3	4.0	4.2
3	4.3	4.3	4.2	4.0	3.4	3.7	3.7	3.9	3.8	2.7	3.4	3.1	6.6	5.2	5.9	6.1	6.4	6.2	5.7	3.8	4.7
4	4.0	4.2	4.1	3.8	4.1	3.9	3.7	3.1	3.4	3.7	3.8	3.8	2.6	3.2	2.9	7.1	5.3	6.2	6.2	6.4	6.3
0-4	19.4	20.2	19.7	20.7	20.1	20.4	22.2	22.2	22.2	24.6	23.5	24.0	26.4	24.3	25.3	29.2	25.0	27.1	26.5	24.3	25.4
5-9	18.2	15.5	16.8	17.6	16.3	17.0	17.0	16.2	16.6	16.4	15.7	16.0	15.9	15.6	15.7	14.3	15.2	14.8	18.2	16.9	17.5
10-14	12.8	10.2	11.5	12.7	10.8	11.8	13.0	10.8	11.9	12.0	10.3	11.1	12.6	10.8	11.7	12.2	10.7	11.4	12.2	10.9	11.6
15-19	8.8	8.6	8.7	9.3	8.5	8.9	8.8	8.0	8.4	9.3	8.4	8.8	8.3	7.8	8.1	8.1	7.7	7.8	7.8	7.6	7.7
20-24	6.6	8.4	7.5	6.1	7.9	7.0	6.5	8.1	7.3	6.1	7.8	7.0	5.9	7.7	6.9	5.9	7.5	6.7	6.2	7.1	6.6
25-29	5.2	7.3	6.3	5.3	8.0	6.7	5.5	7.1	6.3	5.7	7.4	6.6	5.6	7.1	6.4	5.4	7.0	6.2	5.0	6.6	5.8
30-34	5.3	5.4	5.3	5.2	5.2	5.2	5.0	5.5	5.2	4.7	5.2	5.0	4.1	5.6	4.9	4.0	5.8	4.9	4.1	6.0	5.0
35-39	4.4	4.7	4.5	4.3	4.6	4.5	3.8	4.3	4.1	4.2	4.4	4.3	4.0	3.9	4.0	4.2	4.2	4.2	3.9	4.0	4.0
40-44	3.6	4.0	3.8	3.5	3.7	3.6	3.7	3.7	3.7	3.5	3.5	3.5	3.5	3.7	3.6	3.1	3.4	3.2	3.1	3.3	3.2
45-49	3.6	4.0	3.8	3.4	3.7	3.6	2.9	3.1	3.0	2.8	3.2	3.0	2.7	3.0	2.8	2.5	2.9	2.7	2.5	2.6	2.6
50-54	3.2	3.8	3.5	3.0	3.7	3.4	3.0	3.5	3.3	2.7	2.9	2.8	2.5	2.8	2.6	2.5	2.7	2.6	2.3	2.6	2.5
55-59	2.2	2.3	2.3	2.2	2.3	2.3	2.2	2.3	2.2	2.1	2.4	2.2	2.3	2.4	2.3	2.3	2.5	2.4	2.1	2.4	2.2
60-64	2.3	1.9	2.1	1.9	1.5	1.7	1.9	1.7	1.8	1.7	1.7	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.6	1.7	1.7
65+	4.4	3.5	4.0	4.2	3.1	3.7	4.1	3.2	3.7	3.9	3.4	3.6	4.2	3.4	3.8	4.5	3.6	4.1	4.3	3.6	3.9
UNKNOWN	0.1	0.1	0.1	0.4	0.5	0.5	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.2

Table A2-7: Percentage Distribution of Population in Various Age and Sex Groups

Area IV - August 31, 1971 through 1977

AGE	1971			1972			1973			1974			1975			1976			1977		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
0	3.9	3.9	3.9	4.3	4.0	4.2	5.6	5.2	5.4	4.7	4.7	4.7	4.0	3.6	3.8	4.4	4.2	4.3	4.4	4.1	4.3
1	2.9	3.1	3.0	3.7	3.6	3.7	4.1	3.7	3.9	5.3	4.7	5.0	4.6	4.6	4.6	3.7	3.3	3.5	4.4	4.1	4.3
2	3.5	3.6	3.5	2.7	3.0	2.9	3.8	3.5	3.7	4.2	3.8	4.0	5.1	4.6	4.9	4.5	4.4	4.4	3.4	3.1	3.2
3	3.8	3.6	3.7	3.2	3.4	3.3	2.8	3.0	2.9	3.8	3.4	3.6	4.5	4.2	4.3	5.0	4.5	4.8	4.3	4.3	4.3
4	3.3	3.4	3.3	3.8	3.6	3.7	3.1	3.3	3.2	2.8	2.9	2.9	3.7	3.4	3.5	4.8	4.4	4.6	4.9	4.5	4.7
0-4	17.4	17.6	17.5	17.9	17.6	17.7	19.4	18.7	19.0	20.8	19.7	20.2	22.0	20.3	21.2	22.4	20.8	21.6	21.4	20.0	20.7
5-9	18.3	16.8	17.5	17.9	16.3	17.1	17.4	16.2	16.8	16.7	15.6	16.2	16.0	14.6	15.3	15.6	14.9	15.2	17.7	16.3	17.0
10-14	14.4	13.2	13.8	13.8	13.4	13.6	13.8	13.1	13.4	13.6	13.0	13.3	13.8	13.5	13.6	14.5	12.6	13.6	13.5	12.3	12.9
15-19	11.3	8.3	9.8	11.8	9.2	10.5	11.3	9.5	10.4	11.2	9.8	10.5	10.2	9.6	9.9	10.0	9.8	9.9	10.1	9.5	9.8
20-24	6.1	7.6	6.8	6.5	6.8	6.6	7.0	6.9	6.9	6.6	6.3	6.4	6.8	6.4	6.6	6.8	6.5	6.7	6.9	7.2	7.1
25-29	4.8	6.0	5.4	4.6	6.6	5.6	4.6	6.6	5.6	4.9	6.9	5.9	5.2	6.5	5.9	5.1	6.4	5.7	5.2	5.7	5.4
30-34	5.4	5.7	5.5	4.9	5.4	5.2	4.9	5.3	5.1	4.5	5.0	4.7	4.3	5.5	4.9	4.2	5.0	4.6	4.1	5.6	4.9
35-39	3.9	4.5	4.2	4.3	4.6	4.4	4.0	4.5	4.2	4.5	4.9	4.7	4.3	4.3	4.3	4.1	4.7	4.4	3.6	4.4	4.0
40-44	3.8	4.0	3.9	3.6	3.9	3.8	3.9	3.9	3.9	3.7	3.5	3.6	3.5	3.9	3.7	3.4	3.6	3.5	3.5	3.6	3.6
45-49	3.3	3.5	3.4	3.2	3.5	3.3	2.8	3.0	2.9	2.9	3.3	3.1	2.9	3.2	3.0	3.1	3.2	3.1	2.9	3.0	3.0
50-54	2.9	4.2	3.6	2.9	4.1	3.5	2.7	3.8	3.3	2.7	3.1	2.9	2.9	3.0	3.0	2.6	2.8	2.7	2.5	2.9	2.7
55-59	1.9	2.2	2.1	2.1	2.2	2.2	1.9	2.3	2.1	2.0	2.8	2.4	2.1	2.6	2.3	2.3	3.1	2.7	2.2	2.9	2.6
60-64	2.4	2.2	2.3	2.1	2.1	2.1	2.1	2.0	2.1	1.8	2.0	1.9	1.7	2.3	2.0	1.4	1.7	1.6	1.5	1.8	1.7
65+	4.0	3.9	4.0	4.3	3.9	4.1	3.9	4.0	3.9	3.9	3.9	3.9	4.3	4.1	4.2	4.6	4.7	4.7	4.7	4.7	4.7
UNKNOWN	0.1	0.3	0.2	0.3	0.3	0.3	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.1

AGE DEPENDENCY RATIOS

Table A2-8 shows age dependency ratios, the ratio of the combined child population (0-14) and aged (65+) population to the population of intermediate age (15-64) and reflects the burden of dependency which the productive population must bear.

Table A2-8: Age Dependency Ratios for Areas I to IV

YEAR	Area I	Age Dependency Ratio Area II	Area III	Area IV
1971	110.5	102.8	104.1	111.9
1972	111.4	104.0	112.3	110.5
1973	116.9	106.6	119.3	115.5
1974	115.0	106.2	127.6	124.1
1975	116.9	112.8	130.0	118.8
1976	120.2	116.4	134.7	122.7
1977	116.9	121.2	140.4	124.2

There are clear variations in these ratios between the different Project areas. There are also considerable fluctuations from year to year with a trend showing rising dependency ratios over time. The increasing proportion of children, rather than 65+ people, is the major factor. In a closed population this would indicate differences in fertility. Since the Project population is highly migratory, either higher fertility and/or in-migration could be contributing factors.

AGE/SEX PYRAMIDS

A very effective and widely used method to graphically depict the age/sex composition of a population is the age/sex pyramid. The basic pyramid consists of bars representing age groups in ascending order, pyramided horizontally on one another. It is often possible to infer a good deal about the demographic history of the area by examining the population's age/sex pyramid, although specific demographic factors which have shaped a pyramid cannot be identified. Figures A2-1 to A2-8 show that 1971-77 pyramids for the

Figure A2-1: POPULATION PYRAMID FOR AREA 1 (1971)

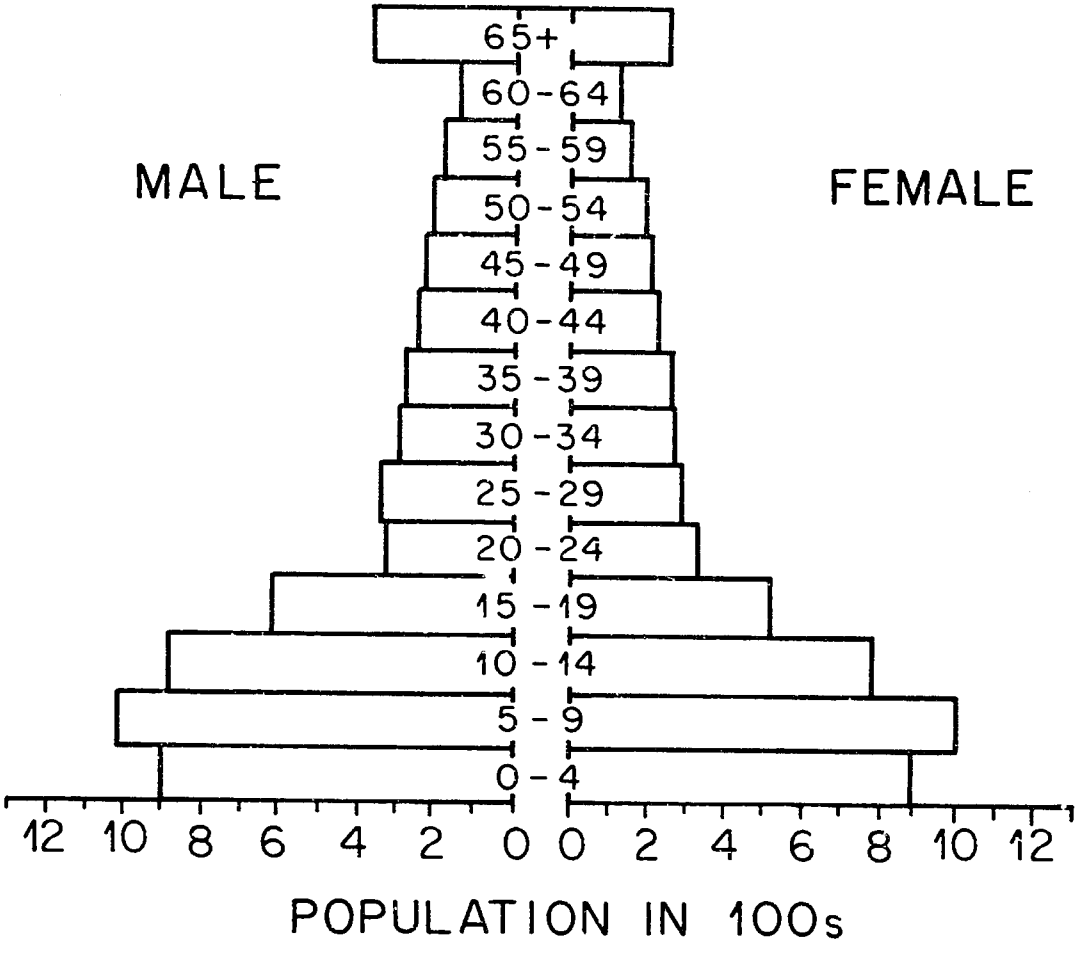


Figure A2-2: POPULATION PYRAMID FOR AREA 1 (1977)

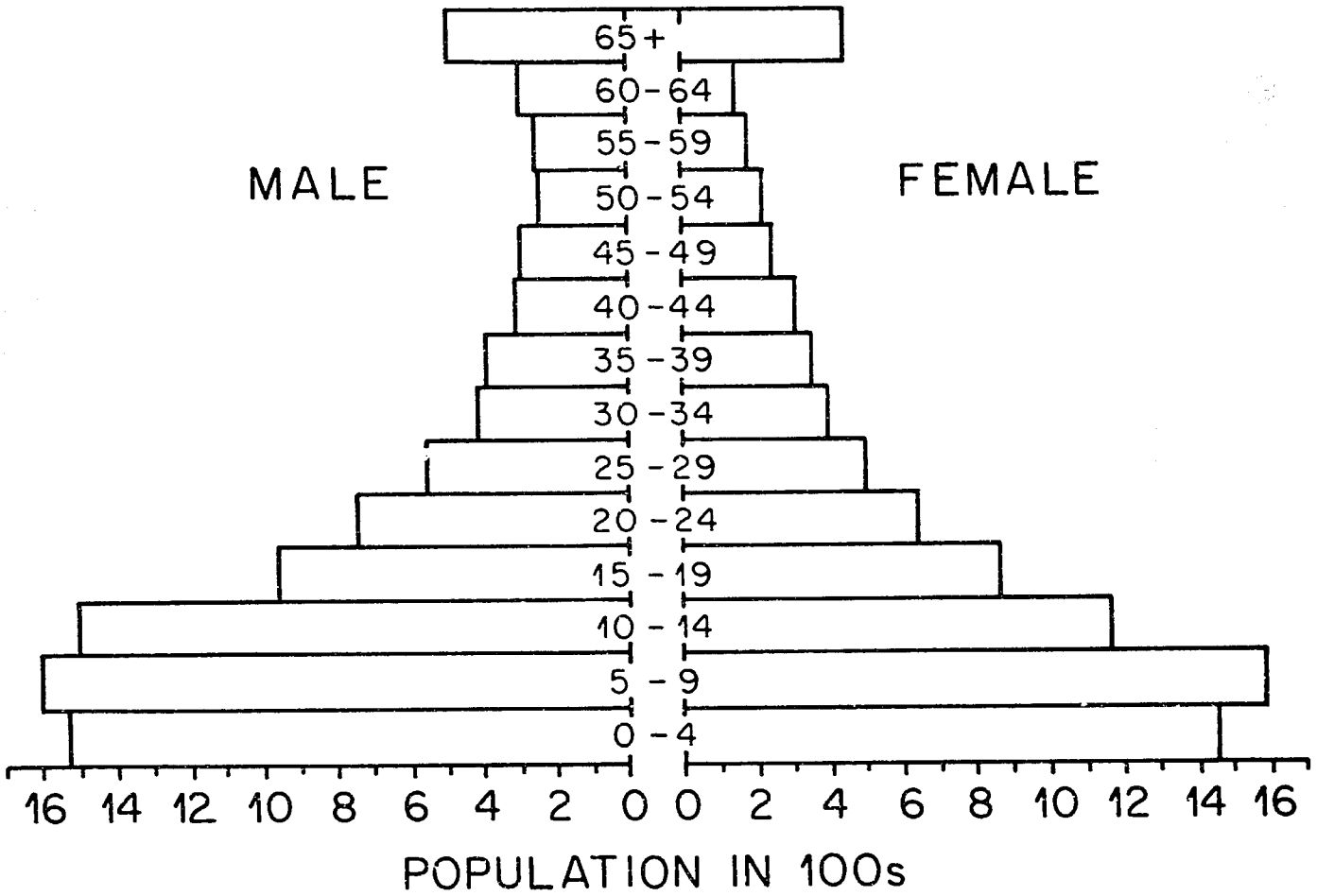


Figure A2-3: POPULATION PYRAMID FOR AREA 2 (1971)

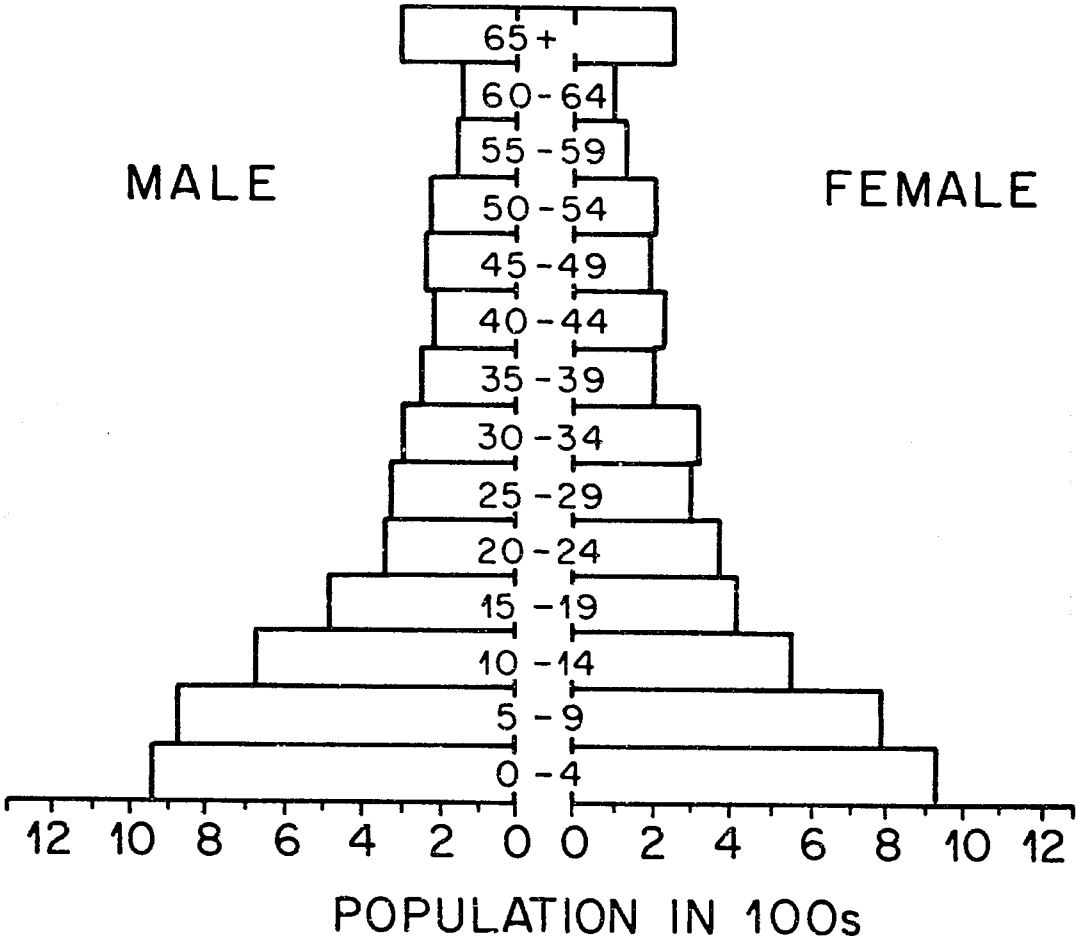


Figure A2-4: POPULATION PYRAMID FOR AREA 2 (1977)

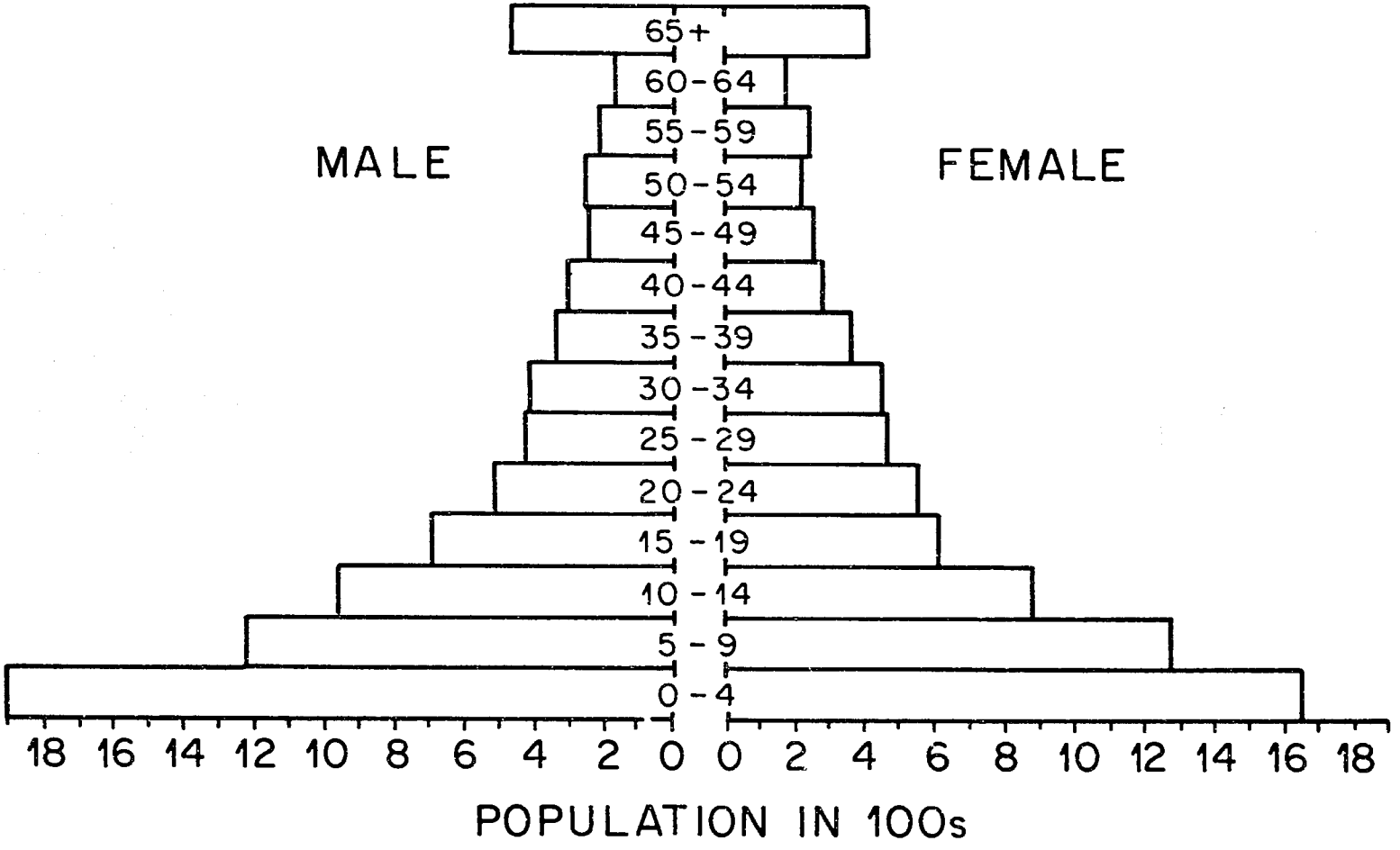


Figure A2-5: POPULATION PYRAMID FOR AREA 3 (1971)

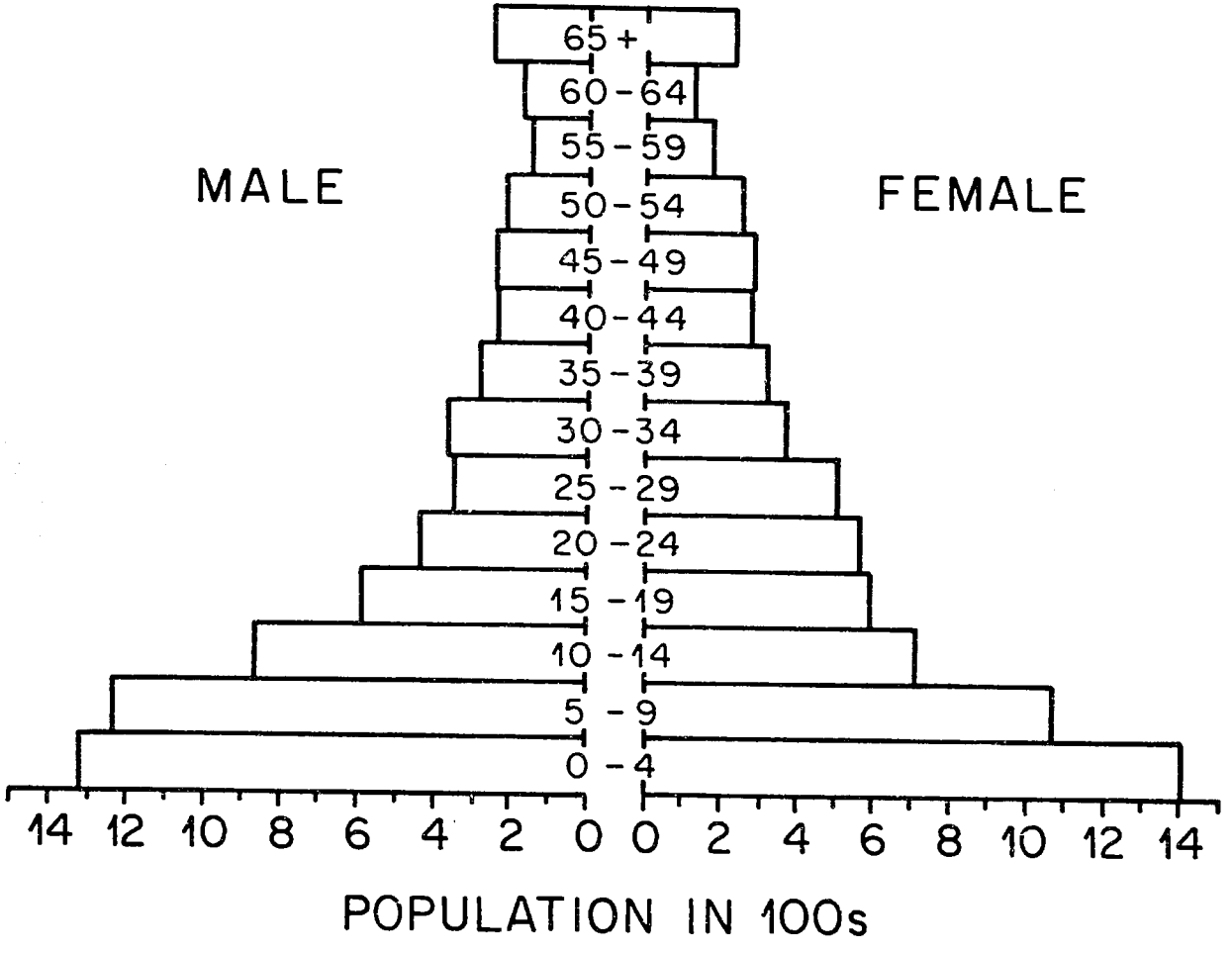


Figure A2-6: POPULATION PYRAMID FOR AREA 3 (1977)

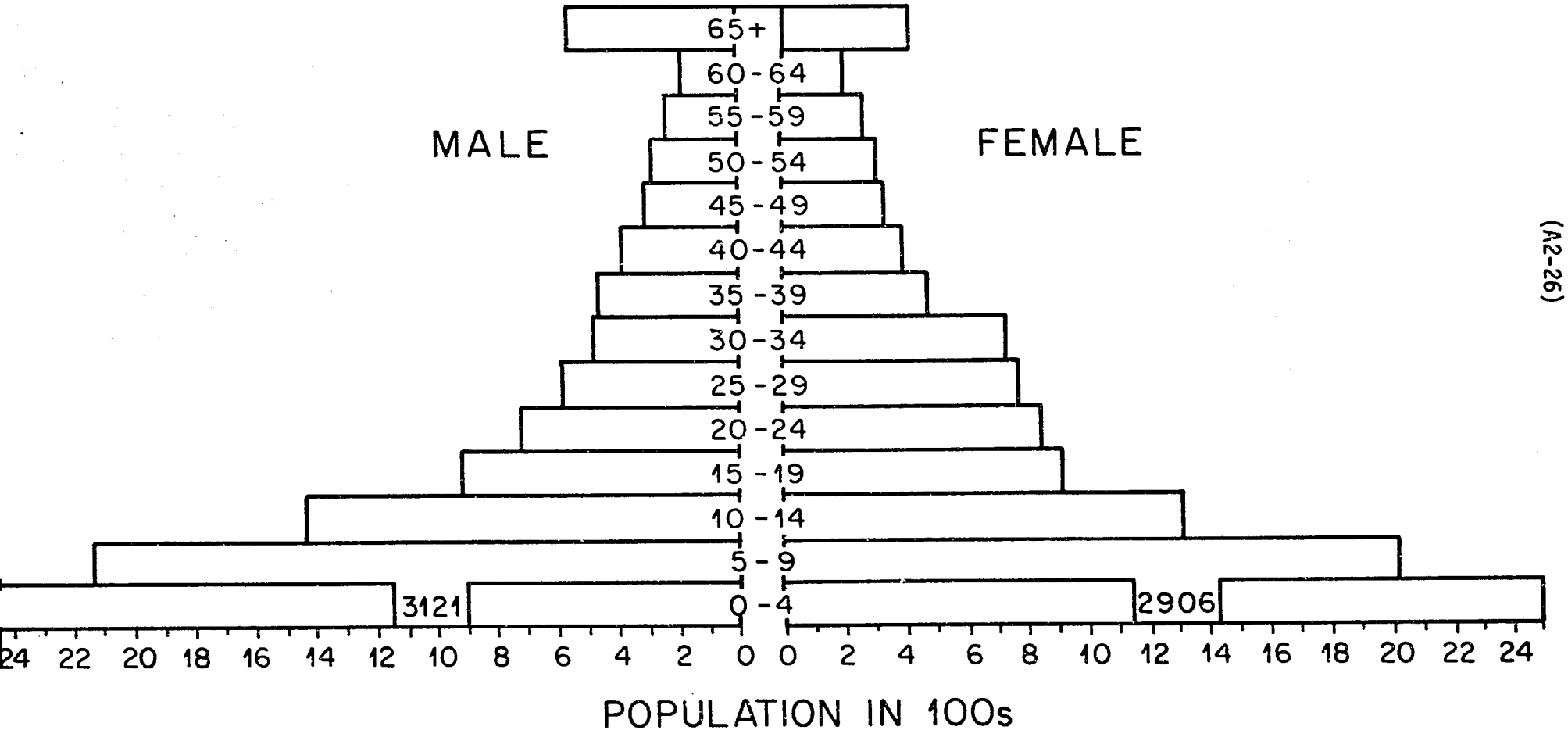


Figure A2-7: POPULATION PYRAMID FOR AREA 4 (1971)

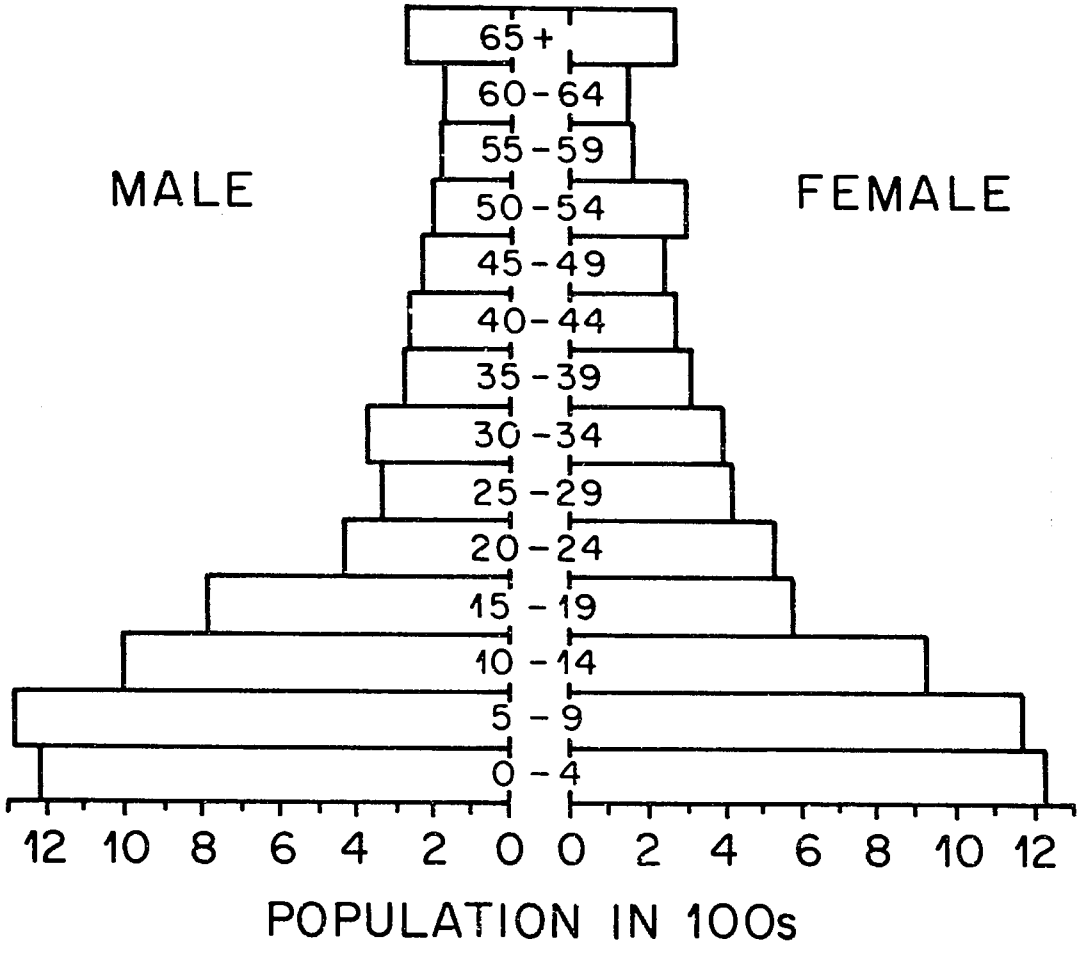
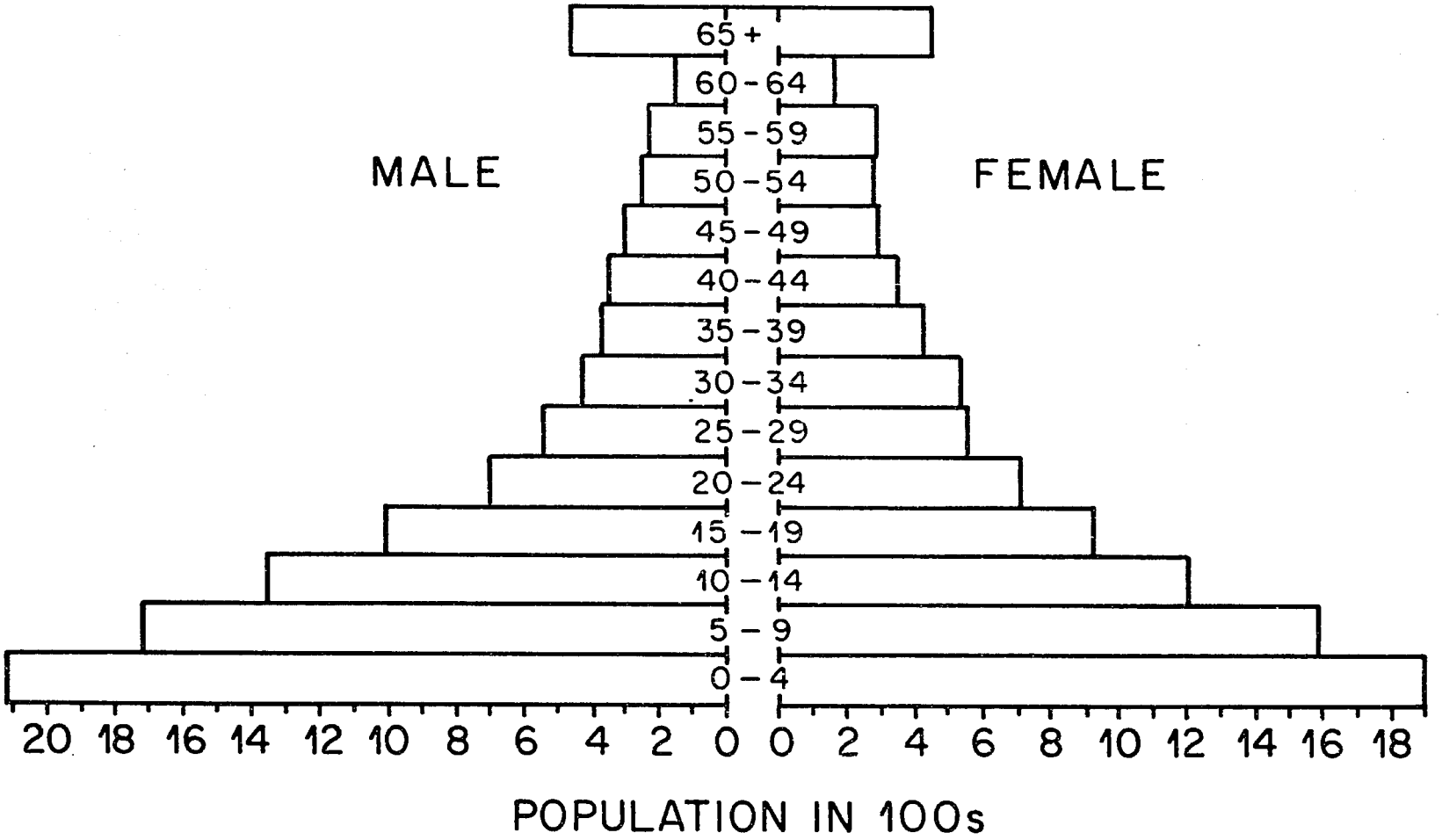


Figure A2-8: POPULATION PYRAMID FOR AREA 4 (1977)



four Project areas have a very broad base which narrows quite rapidly. This illustrates an age/sex structure with a very large number of children, a very small proportion of elderly persons, and a low median age; i.e., a relatively young population. This configuration also suggests a population with a relatively high birth rate in the recent past. The generally triangular shape and concave sides of the pyramids suggest a combination of high birth rates and high death rates.

INDEX OF RELATIVE DIFFERENCE

The magnitude of the differences between any two age distributions, whether for different areas, dates or population sub-groups, may be summarized in a single index from the individual age-specific indexes:

Index of relative difference:

$$\frac{1}{n} \sum \left|\left(\frac{r_i}{r_k} \times 100\right)-100\right|$$

Where n is the number of age groups, r_i is the percentage distribution in a reference standard; r_k is the percentage distribution in a given area. In this example, the age structure for Ghana's 1970 census population was first selected as a base. Each of the combined male and female age distributions of baseline (1971) Project populations for the four areas was referred to the 1970 census, to determine if there were any substantial differences in the patterns of age distribution from area to area.

Table A2-9 shows the baseline de jure population age distribution of all the Project areas, together with the 1970 Ghana age distribution.

The results show a similarity of age structure between Areas III and IV and between Areas I and II, while the age structure of all these areas basically differ in configuration from the 1970 Ghana age structure.

Tables A2-10 to A2-13 compare the age distribution of baseline population in each area with the age distribution of subsequent years.

The age structure of the baseline population is somewhat different from that of subsequent years, particularly for the later year's age distributions (see also Table A2-8).

Table A2-9: Relative Differences in the Age Distribution of Census of Ghana (1970) Census with the Age Distribution of Baseline 1971 Population of Area I to IV

AGE GROUP	r_i GHANA	r_k AREA I[a]	r_k AREA II[a]	r_k AREA III[a]	r_k AREA IV[a]
	1970	1971	1971	1971	1971
Less than 5	18.3	15.4	17.7	19.7	17.5
5-14	28.7	31.8	27.7	28.3	31.3
15-24	17.0	15.5	15.5	16.2	16.6
25-44	23.1	18.9	20.4	19.9	19.0
45-64	9.3	12.4	13.0	11.7	11.4
65+	3.6	5.3	5.3	4.0	4.0
$\frac{1}{n}\sum\left\|\left(\frac{r_i}{r_k} \times 100\right)-100\right\|$		19.6	15.1	10.0	10.9

[a]Percents do not add quite to 100: the difference is "age unknown."

r_i = percentage of population in each age group as reported in census of Ghana 1970.

r_k = percentage of Danfa area baseline population in each group.

Table A2-10: Relative Difference in the Age Distribution of Baseline Population of Area 1 with the Age Distribution of Subsequent Annual Populations

AGE GROUP	r_i		r_k		AREA I		
	1971	1972	1973	1974	1975	1976	1977
Less than 5	15.4	17.1	17.8	18.3	18.6	19.9	16.3
5-14	31.8	31.7	31.2	30.4	30.0	28.9	32.2
15-24	15.5	16.4	16.8	17.4	17.3	17.7	17.6
25-34	10.3	10.0	9.6	9.4	9.6	9.6	10.2
35-44	8.6	8.0	7.9	8.2	8.0	7.7	7.4
45-64	12.4	11.2	10.8	10.7	10.4	10.2	10.1
65+	5.3	4.7	4.9	4.8	5.3	5.4	5.4
$\frac{1}{n}\sum\left\|\left(\frac{r_i}{r_k} \times 100\right)-100\right\|$		7.1	8.9	10.3	9.7	12.5	8.6

r_i = Percentage of baseline population in each age group.

r_k = Percentage of population in each age group of a given subsequent year.

Table A2-11: Relative Difference in the Age Distribution of Baseline Population of Area II with the Age Distribution of Subsequent Annual Populations

AGE GROUP	r_i	r_k			AREA II		
	1971	1972	1973	1974	1975	1976	1977
Less than 5	17.7	18.9	19.1	19.4	21.7	23.1	22.4
5-14	27.7	27.6	27.7	27.1	26.2	25.2	27.0
15-24	15.5	15.6	15.6	16.2	15.4	15.3	14.9
25-34	11.8	11.5	11.9	11.8	11.5	11.4	11.1
35-44	8.6	8.6	8.2	8.5	8.2	7.9	7.9
45-64	13.0	12.3	12.1	12.8	11.5	11.3	11.1
65+	5.3	5.0	4.8	5.0	5.1	5.5	5.4
$\frac{1}{n} \sum \left\lvert \left(\frac{r_i}{r_k} \times 100\right) - 100 \right\rvert$		3.1	4.5	3.4	7.0	9.4	8.8

r_i = Percentage of baseline population in each age group.

r_k = Percentage of population in each age group of a given subsequent year.

Table A2-12: Relative Difference in the Age Distribution of Baseline Population of Area III with the Age Distribution of Subsequent Annual Populations

AGE GROUP	r_i		r_k		AREA III		
	1971	1972	1973	1974	1975	1976	1977
Less than 5	19.7	2.0	22.2	24.0	25.3	27.1	25.4
5-14	28.3	28.8	28.5	27.1	27.4	26.2	29.1
15-24	16.2	15.9	15.7	15.8	15.0	14.5	14.3
25-34	11.6	11.9	11.5	11.6	11.3	11.1	10.8
35-44	8.3	8.1	7.8	7.8	7.6	7.4	7.2
45-64	11.7	11.0	10.3	9.7	9.3	9.2	9.0
65+	4.0	3.7	3.7	3.6	3.8	4.1	3.9
$\frac{1}{n} \sum \left\lvert \left(\frac{r_i}{r_k} \times 100\right) - 100 \right\rvert$		3.8	6.3	9.0	10.9	13.3	13.4

r_i = Percentage of baseline population in each age group.

r_k = Percentage of population in each age group of a given subsequent year.

Table A2-13: Relative Difference in the Age Distribution of Baseline Population of Area IV with the Age Distribution of Subsequent Annual Populations

AGE GROUP	r_i	r_k			AREA IV		
	1971	1972	1973	1974	1975	1976	1977
Less than 5	17.5	17.7	19.0	20.2	21.2	21.6	20.7
5-14	31.3	30.7	30.2	29.5	28.9	28.8	29.9
15-24	16.6	17.1	17.3	16.9	16.5	16.6	16.9
25-34	10.9	10.8	10.7	10.6	10.8	10.3	10.3
35-44	8.1	8.2	8.1	8.3	8.0	7.9	7.6
45-64	11.4	11.1	10.4	10.3	10.3	10.1	10.0
65+	4.1	4.1	3.9	3.9	4.2	4.7	4.7
$\frac{1}{n} \sum \left\lvert \left(\frac{r_i}{r_k} \times 100\right) - 100 \right\rvert$		1.5	4.6	6.0	5.9	8.8	8.7

r_i = Percentage of baseline population in each age group.

r_k = Percentage of population in each age group of a given subsequent year.

A2.6 POPULATION GROWTH IN THE PROJECT AREAS

Table A2-14 shows the annual total rate of population growth (RG) and the natural rate of growth (NRG), births minus deaths, for each Project area. The difference between these two rates represent the net migration. It can be seen from this table that in-migration is a major though varying contribution to the population growth in the Project areas, with minor fluctuations in the natural rate of population growth.

A2.6.1 Components of Population Growth

After the baseline population had been determined, the population for all the subsequent years was updated by the following balancing equation:

$$P_t = P_o + B - D + IM - OM$$

where,

P_t = population at the beginning of reference period t
P_o = population at the beginning of reference period o
B = Births during the reference period
D = Deaths during the reference period
IM = In-migrants during the reference period
OM = Out-migrants during the reference period

The annual rate of population growth was further calculated as:

$$(B-D+IM-OM)/P_o$$

There are wide fluctuations in the rate of population growth from year to year and from area to area. These fluctuations could be due to changes in some or all of the above components.

The three components of population change (fertility, mortality and migration) and their relative contribution to population change in different Project areas are discussed in the following subsections.

A2.6.2 Fertility

Several indices of observed and adjusted fertility such as crude birth rates, standardized birth rates, the general fertility rates, the

Table A2-14: Annual Rate of Growth of Population (1971-1977) for Areas I to IV

	AREA I		AREA II		AREA III		AREA IV	
YEAR	RG	NRG	RG	NRG	RG	NRG	RG	NRG
1971-72	14.1	3.9	1.9	3.3	7.6	3.7	2.9	3.2
1972-73	9.5	3.5	9.4	3.0	17.0	6.2	12.1	4.6
1973-74	6.3	3.2	14.7	2.8	15.2	5.8	6.2	3.7
1974-75	6.5	3.3	5.8	4.9	3.6	4.8	3.2	3.4
1975-76	5.0	3.8	9.5	4.0	7.2	5.2	5.9	3.7
1976-77	6.2	3.4	2.5	4.5	7.4	6.2	5.4	4.1

RG: Total rate of population growth.

NG: Natural rate of population growth.

age specific fertility rates, the relative percentage age specific fertility, the average age at child bearing, the total fertility rates and gross reproduction rates are presented here.

CRUDE BIRTH RATE

The crude birth rate is the total number of live births in a given period per thousand population. The observed and adjusted crude birth rates for all the Project areas from the year 1971-72 to 1976-77 are shown in Table A2-15. The observed rates were obtained by dividing the total live births by the mid-year population. For obtaining the adjusted rates, first the number of estimated births were obtained by using the well known Chandrasekhar-Deming (CD) method, and then these estimated events were divided by the estimated mid-year population. The table reveals fluctuations in both observed and adjusted rates which are partially due to difference in coverage rates and to other factors such as changes in the age and sex composition of the population.

Table A2-15 also shows that while observed rates during the reference year 1976-77 for Areas III and IV are higher as compared with the baseline year 1971-72 and remain the same for Area II, there is approximately a 23% decline in the observed crude birth rates over the life of the Project in Area I. This declining trend in birth rates during the Project is statistically significant for Area I ($r=-.76$; $P<.05$) while no such trend is discernible for the other areas.

The crude adjusted birth rate for Area I at the end of the final measurement year (1976-77) is approximately one-third lower than the base year (1971-72). The declining trend here too is statistically significant ($r=-.86$; $P<.05$). While Areas II and IV also show 21.8% and 11.9% decline respectively over a period of six years, the trend is not linear and statistically significant due to wide fluctuations from year to year. Like observed rates, the 1976-77 adjusted crude birth rates for Area IV are higher than the 1971-72 rates.

A comparison between observed and adjusted birth rates over the 1971-77 period also shows that the differences between the observed and the adjusted rates were largest during the first three years of operation of the vital registration system. This gap narrowed considerably during the last three years when full-time registration assistants took over

Table A2-15: Observed and Adjusted Crude Birth Rates (per 1000)
(Survey and Vital Registration)

CRUDE BIRTH RATES

YEAR	AREA I		AREA II		AREA III		AREA IV	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
1971-72	42.8	50.9	44.7	60.4	51.2	66.1	38.1	45.3
1972-73	39.2	42.1	47.8	53.7	63.1	77.1	50.6	60.1
1973-74	34.7	38.5	41.5	47.0	52.0	61.5	45.1	53.2
1974-75	35.7	36.2	54.7	56.1	54.1	56.8	42.2	44.1
1975-76	38.5	39.0	45.7	46.4	52.1	55.4	43.3	46.9
1976-77	32.9	33.9	44.6	47.2	54.2	58.2	43.2	47.5
STATISTICS								
Constant	145.0	245.7	46.7	219.5	46.4	295.2	42.3	129.8
Slope	-1.4	-2.8	.0	-2.3	.1	-3.1	.0	-1.1
Correletion Coefficient	-.76†	-.87†	.00	-.72	.05	-.72	.00	-.33

† P less than .05

from the part-time registration assistants. The explanation for the differential gaps between the observed and adjusted rates is that the Chandrasekhar-Deming correction is based on the assumption of independence of the two systems of vital events registration which means that the chances of an event being missed by one system are uncorrelated with the chances of its being missed by the other system. In the event of these systems being positively correlated, the correction factor becomes larger.

The large correction factors shown in Table A2-2, indicate the unreliability of the adjusted rates during the initial years of the Project. Since it is unclear whether the decline in the birth rates over a period of time is due to changes in fertility and/or a decline due to less complete coverage, a comparision of the adjusted rates for the earlier years with the latter years of the Project would not be reasonable. However, assuming that the observed rates during the initial Project years, (when the inadequacies in our reporting system did exist) are based on underreporting of births, the drop in crude observed birth rates over the life of the Project particularly in Area I becomes more impressive.

STANDARDIZED BIRTH RATES

Apart from coverage rates, changes in age and sex composition of the population would also contribute to changes in the birth rates. Earlier in this appendix it was shown that the age and sex composition of the population differs in configuration not only between the Project areas but also from year to year, due mainly to migration. Thus, to make the time comparisons more valid, it would be appropriate to standardize the birth rates thereby eliminating the effect of age and sex distribution of the population. For this purpose, the age and sex distribution of the 1970 Ghana census has been taken as a standard. The standardized birth rates are given in Table A2-16 which once again reveals that the drop in birth rates is statistically significant only in Area I ($r=-.78$; $P<.05$), while no such statistically significant relationship exists for any of the other three Project areas.

Table A2-16: Standardized Birth Rates by Period and Area

Period	Area I	Area II	Area III	Area IV
1971-72	59.2	59.1	58.6	48.5
1972-73	53.4	57.9	74.0	64.8
1973-74	49.9	50.0	63.7	57.7
1974-75	49.0	67.0	64.7	55.4
1975-76	53.5	57.7	63.8	56.5
1976-77	46.0	57.6	67.1	56.7
Statistics				
Constant	193.6	39.3	37.8	18.7
Slope	-1.9	2.5	.4	.5
Correlation Coefficient	-.78[a]	.01	.14	.16

[a]P less than .05

GENERAL FERTILITY RATES

The general fertility rate is defined as the total number of live births per 1,000 women aged 15-49. The observed general fertility rates and the adjusted general fertility rates from the dual system estimated by C-D method are presented in Table A2-17.

The general fertility rates shown in this table exhibit period changes fairly similar to those of the crude birth rates, and the comments on the problems of coverage as well as other difficulties of interpretation of crude birth rates also apply to general fertility rates.

Table A2-17: Observed and Adjusted General Fertility Rates (per 1000) (Survey and Vital Registration)

YEAR	GENERAL FERTILITY RATES							
	AREA I		AREA II		AREA III		AREA IV	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
1971-72	226	269	235	298	241	311	191	227
1972-73	206	221	235	265	306	374	253	301
1973-74	184	204	204	231	286	303	227	267
1974-75	192	194	273	280	270	283	213	223
1975-76	208	211	235	239	266	283	221	239
1976-77	178	183	235	249	283	305	222	245
STATISTICS								
Constant	680.1	1214.1	237.6	843.6	117.8	997.4	125.4	548.3
Slope	-6.4	-13.4	-.0	-7.8	-2.1	-9.2	1.3	-4.0
Correlation Coefficient	-.68	-.83[a]	-.03	-.57	.18	-0.51	.12	-.25

[a]P less than .05

Table A2-17 shows that Area I's observed and adjusted general fertility rates decrease 21.2% and 31.9%, respectively, during the 1971-77 period. The trend in decline over time in adjusted rates for this area is statistically significant ($r=-.83$; $p<.05$) and is close to the level of significance in the case of observed rates ($r=-.68$; $P<.10$). For Area IV there was no change in observed rates, and the adjusted rates were 16.4 percent lower, statistically insignificant.

AGE-SPECIFIC FERTILITY RATE

The age-specific fertility rate is the number of children born alive annually to a specified age group of women divided by the number of women in that age group. Since these rates are unaffected by differences between the groups in age-sex composition, a set of age-specific fertility rates is a somewhat more accurate measure of detailed comparison between a given period or population group with corresponding rates for other population periods or groups. However, these rates are affected by age misreporting, time reference errors and coverage errors in the registration of births and the enumeration of the female population in the 15-50 age group. These rates also form the basis for calculating other indices of fertility such as total fertility rate and group reproduction rates discussed below. Both observed and adjusted age specific fertility rates for all four Project areas for the period 1971-72 to 1976-77 are presented in Tables A2-18 to A2-21. The observed rates are based on the live births recorded by the dual record system. For calculating adjusted rates, missing events calculated by the C-D method have been taken into account.

TOTAL FERTILITY RATE

The total fertility rate is the sum of the age specific fertility rates of women over their reproductive span, as observed in a given year. The annual total fertility rates for the four Project areas are shown at the bottom of Tables A2-18 to A2-21. The total fertility rate in Area I for the year 1976-77 is 22.8% lower than that of 1971-72, while the corresponding decline in the adjusted rates works out to be 36.4%. The period trend in decline of total fertility rate, both observed and adjusted, is statistically significant ($r=-.82$ and $-.86$ respectively and $P<.05$).

In Area II the extent of decline in the observed and total fertility rates over the six year Project measurement period is 6.4% and 27.3% respectively. The trend in decline, however, is statistically significant only in the case of adjusted rates. The observed total fertility rate in Area III for 1976-77 is however, higher than 1971-72 while adjusted fertility is 9.5% lower. The trend in decline is statistically insignificant.

Table A2-18: Observed and Adjusted Age Specific and Total Fertility Rates
From Annual Survey and Vital Registration
1971-72 to 1976-77
AREA I

AGE OF WOMAN	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
15-19	.109	.130	.112	.119	.112	.124	.109	.111	.126	.128	.097	.099
20-24	.330	.391	.333	.354	.249	.276	.274	.280	.286	.288	.235	.238
25-29	.341	.407	.308	.352	.271	.300	.238	.243	.304	.311	.287	.297
30-34	.359	.429	.260	.279	.302	.338	.325	.330	.326	.331	.256	.272
35-39	.239	.286	.213	.230	.286	.210	.189	.189	.218	.218	.248	.254
40-44	.139	.165	.123	.131	.072	.079	.127	.127	.122	.122	.078	.031
45-49	.074	.087	.061	.066	.070	.079	.074	.074	.041	.041	.016	.016
TFR (15-49)	7.9	9.9	7.1	7.7	6.8	7.0	6.7	6.8	7.1	7.2	6.1	6.3

† P less than .05

STATISTICS	OBS. TFR	ADJ. TFR
Constant	26.3	40.8
Slope	-0.3	-.4
Correlation Coefficient	-.82†	-.86†

Table A2-19: Observed and Adjusted Age Specific and Total Fertility Rates
From Annual Survey and Vital Registration
1971-72 to 1976-77
AREA II

AGE OF WOMAN	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
15-19	.124	.157	.161	.180	.120	.135	.187	.193	.170	.171	.208	.226
20-24	.387	.493	.380	.427	.321	.366	.410	.429	.330	.343	.361	.384
25-29	.332	.421	.307	.345	.272	.308	.376	.383	.369	.373	.342	.362
30-34	.292	.370	.279	.315	.245	.277	.337	.339	.303	.306	.251	.258
35-39	.197	.250	.200	.225	.167	.188	.270	.276	.189	.189	.180	.188
40-44	.171	.218	.137	.158	.143	.163	.130	.130	.078	.078	.101	.105
45-49	.064	.078	.057	.080	.072	.081	.038	.038	.043	.043	.023	.023
TFR (15-49)	7.8	9.9	7.7	8.6	6.7	7.6	8.7	8.9	7.4	7.5	7.3	7.7

STATISTICS	OBS. TFR	ADJ. TFR
Constant	10.6	36.0
Slope	-0.1	-0.4
Correlation Coefficient	-0.11	-0.73 †

Table A2-20: Observed and Adjusted Age Specific and Total Fertility Rates
From Annual Survey and Vital Registration
1971-72 to 1976-77
AREA III

AGE OF WOMAN	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
15-19	.143	.185	.177	.216	.156	.185	.172	.188	.160	.172	.244	.271
20-24	.279	.361	.357	.436	.323	.387	.399	.428	.408	.439	.344	.365
25-29	.336	.433	.396	.484	.299	.354	.344	.360	.366	.387	.401	.427
30-34	.361	.466	.435	.531	.425	.442	.308	.313	.267	.285	.345	.369
35-39	.227	.263	.366	.449	.269	.317	.280	.287	.314	.323	.267	.286
40-44	.145	.188	.200	.243	.191	.226	.156	.161	.105	.113	.093	.101
45-49	.132	.207	.131	.161	.095	.112	.073	.073	.059	.066	.071	.078
TFR (15-49)	8.1	10.5	10.3	12.6	8.8	10.1	8.7	9.0	8.4	8.9	8.8	9.5

STATISTICS	OBS. TFR	ADJ. TFR
Constant	13.7	46.7
Slope	-0.1	-0.5
Correlation Coefficient	-.16	-.67

Table A2-21: Observed and Adjusted Age Specific and Total Fertility Rates
From Annual Survey and Vital Registration
1971-72 to 1976-77
AREA IV

AGE OF WOMAN	1971-72		1972-73		1973-74		1974-75		1975-76		1976-77	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
15-19	.082	.098	.103	.123	.122	.144	.094	.098	.125	.138	.132	.163
20-24	.236	.281	.360	.427	.382	.450	.398	.420	.381	.432	.404	.451
25-29	.310	.368	.425	.504	.352	.415	.302	.316	.313	.335	.363	.391
30-34	.300	.356	.370	.438	.275	.324	.302	.315	.295	.304	.232	.238
35-39	.236	.280	.263	.312	.207	.243	.184	.192	.222	.232	.167	.174
40-44	.092	.110	.137	.164	.101	.117	.115	.121	.089	.095	.111	.117
45-49	.040	.048	.048	.056	.053	.065	.032	.032	.031	.031	.017	.017
TFR (15-49)	6.5	7.7	8.5	10.1	7.5	8.8	7.1	7.5	7.3	7.8	7.1	7.7

STATISTICS	OBS. TFR	ADJ. TFR
Constant	9.5	25.7
Slope	-0.0	-0.2
Correlation Coefficient	-0.08	-.43

For Area IV the observed total fertility rate for the final year of the Project is higher than that of the initial year of the Project while there is no change in adjusted total fertility for these two years.

THE GROSS REPRODUCTION RATE

The gross reproduction rate (GRR), a special measure of total fertility, represents the number of daughters a cohort of women will have. The total fertility rates can be easily converted to gross reproduction rates by simply multiplying by the sex ratio at birth. This conversion, though mathematically not exact, is nevertheless a very close approximation. In Table A-22 the gross reproduction rates for Area I to IV from 1971-72 to 1976-77 were derived by multiplying the respective total fertility rates by the proportion of female children born during the period. The observed gross reproduction rate for Area I which was 3.9 at the beginning of the Project dropped to 3.0 in 1976-77, showing a 23.9% decline. The drop in the adjusted gross reproduction rates is much steeper during the same period (36.7%). Furthermore, the period trend in decline in both observed and adjusted rates for Area I is statistically significant, the respective correlation coefficient being -.80 and -.83; and $P<.05$. In Area II observed and adjusted gross reproduction rates for the final measurement year are 5.2% and 22.4% lower, when compared with the initial year of the Project, but the trend in decline is significant only in adjusted rates (r-.75, $P<.05$). The 1971-72 observed rates for Area III are slightly higher than 1976-77 rates but adjusted rates show a 9.6% decline during the same period. For Area IV the observed rates shown an increase over the six-year period while the adjusted rates exhibit no change. The statistical tests for period trends for Areas III and IV show no significant changes over time.

RELATIVE PERCENTAGE AGE SPECIFIC FERTILITY DISTRIBUTION

Most of the fertility analysis carried out so far in tropical Africa has been concerned with the estimation of fertility levels and little effort has been made to determine the age structure and patterns of fertility. This information would facilitate a more comprehensive analysis of fertility change needed for evaluation of family planning programs. Therefore, a further analysis of Danfa Project district age

Table A2-22: The Observed and Adjusted Gross Reproduction Rate By Area and Period (Annual Survey and Vital Registration)

PERIOD	AREA I		AREA II		AREA III		AREA IV	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
1971-72	3.9	4.9	3.8	4.9	4.0	5.2	3.2	3.8
1972-73	3.5	3.8	3.8	4.2	5.1	6.2	4.2	5.0
1973-74	3.3	3.4	3.3	3.7	4.3	5.0	3.7	4.3
1974-75	3.3	3.3	4.3	4.2	4.3	4.4	3.5	3.7
1975-76	3.5	3.5	3.6	3.7	4.1	4.4	3.6	3.8
1976-77	3.0	3.1	3.6	3.8	4.3	4.7	3.5	3.8
STATISTICS								
Constant	13.0	24.9	5.0	17.9	7.5	23.1	4.7	5.8
Slope	-.13	-.29	-.02	-1.87	-.04	-.24	-.01	-.02
Correletion Coefficient	-.80 †	-.83 †	-.10	-.75 †	-.21	-.67	-.08	-.20

† P less than .05

specific fertility rates has been completed by determining the percentage age specific fertility distribution for all areas and periods. These are shown in Tables A2-23 to A2-26.

The percentage of the total fertility falling into respective age groups has increased over the years in the younger age groups and decreased in the older age groups. The trend is also reflected in the slight reduction in the mean age of childbearing ($\bar{m}$) over the years. In any population the desired trend would be to increase the concentration of reproduction in the 20-34 year old age group, the ages in which maternal complications are at a minimum.

A2.6.3 Mortality

The indices of mortality discussed below are: crude death rates, standardized death rates, age and sex specific mortality rates, percent distribution of deaths by age, infant mortality rates, child mortality rates and preschool mortality rates.

CRUDE DEATH RATE

The crude death rate is the total number of deaths per thousand population. The observed and adjusted crude death rates for all the Project areas from the reference year 1971-72 to 1976-77 are given in Table A2-27. The procedures used for obtaining these rates are similar to those used for crude birth rates. Because of the difficulties in applying the Chandrasekhar-Deming formula in the early Project years (see Section A2.2 to A2.4), the number of estimated missing events was probably greatly overestimated at the baseline relative to later years. These missing events are used in calculating the adjusted death rates but not in calculating the observed death rates. As a result, the adjusted death rates are particularly unreliable in the early Project years and trends in adjusted death rates cannot be relied upon as reflecting actual changes in the Project areas.

Observed death rates probably underestimate the actual mortality due to a serious underreporting of deaths (a regular problem in African demography). Because there was greater underreporting of deaths in the early Project years, any decline in observed death rates is likely to reflect an actual trend in the Project population. Therefore, the

Table A2-23: Percentage Age Specific Fertility Distribution (Census and Vital Registration) for the Period 1971 Through 1977
AREA I

AGE OF WOMAN	PERCENTAGE AGE SPECIFIC FERTILITY					
	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
15-19	11.8	13.8	15.6	14.6	15.4	14.0
20-24	24.2	28.9	24.8	26.9	27.2	26.4
25-29	21.6	21.5	21.2	17.6	20.2	23.3
30-34	20.3	15.5	19.6	19.9	18.2	16.8
35-39	12.6	11.6	11.5	11.1	11.3	14.4
40-44	6.3	5.9	4.0	6.8	6.2	4.4
45-49	3.2	2.8	3.3	3.1	1.5	0.7
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
$\bar{m}$ (Years)	28.4	27.5	27.2	27.9	27.4	27.3

Table A2-24: Percentage Age Specific Fertility Distribution (Census and Vital Registration) for the Period 1971 Through 1977
AREA II

AGE OF WOMAN	PERCENTAGE AGE SPECIFIC FERTILITY					
	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
15-19	11.0	14.2	12.1	14.3	14.9	18.5
20-24	28.9	28.8	29.5	28.7	26.8	28.6
25-29	22.0	21.3	21.6	22.6	26.5	23.9
30-34	18.5	17.8	17.6	17.4	17.8	15.2
35-39	8.9	8.9	9.3	11.3	9.3	9.2
40-44	8.1	6.2	6.8	4.5	3.1	3.8
45-49	2.6	2.8	3.1	1.2	1.6	0.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
$\bar{m}$ (Years)	28.0	27.4	27.7	27.1	26.8	26.1

Table A2-25: Percentage Age Specific Fertility Distribution (Census and Vital Registration) for the Period 1971 Through 1977
AREA III

AGE OF WOMAN	PERCENTAGE AGE SPECIFIC FERTILITY					
	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
15-19	12.1	11.7	12.6	13.2	12.0	17.4
20-24	22.5	22.9	25.5	29.2	30.3	23.3
25-29	25.5	24.0	21.4	23.6	25.2	25.4
30-34	18.9	18.7	19.4	15.6	14.7	18.9
35-39	10.4	13.2	11.5	11.0	12.5	10.3
40-44	5.5	5.9	6.7	5.3	3.6	2.9
45-49	5.1	3.6	2.9	2.1	1.7	1.8
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
$\bar{m}$ (Years)	28.5	28.5	28.2	27.3	27.1	26.9

Table A2-26: Percentage Age Specific Fertility Distribution (Census and Vital Registration) for the Period 1971 Through 1977
AREA IV

AGE OF WOMAN	PERCENTAGE AGE SPECIFIC FERTILITY					
	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
15-19	9.4	9.6	13.1	10.8	13.9	14.7
20-24	22.2	24.4	27.9	29.9	28.4	32.0
25-29	25.7	27.8	26.5	24.1	23.2	25.2
30-34	21.9	19.6	15.7	18.9	18.0	14.2
35-39	14.1	11.8	10.8	10.1	11.6	8.7
40-44	4.8	5.3	4.1	5.0	3.8	4.6
45-49	1.9	1.5	1.9	1.2	1.1	0.6
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
$\bar{m}$ (Years)	28.5	28.1	27.2	27.4	27.0	26.3

Table A2-27: Observed and Adjusted Crude Death Rates by Period and Area From Survey and Vital Registration

PERIOD	AREA I		AREA II		AREA III		AREA IV	
	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.	OBS.	ADJ.
1971-72	12.4	14.8	13.7	28.0	15.0	30.9	9.8	13.3
1972-73	9.5	11.7	13.4	24.1	13.1	22.1	12.1	16.4
1973-74	9.2	11.6	15.0	21.5	9.7	14.4	13.3	19.8
1974-75	9.0	9.4	13.3	14.9	16.9	19.4	11.4	13.2
1975-76	8.3	9.0	12.0	13.8	13.1	14.8	11.3	13.6
1976-77	6.2	7.3	9.9	11.3	9.1	10.9	9.4	11.3
STATISTICS								
Constant	83.2	112.4	65.9	276.5	60.3	264.2	28.3	67.8
Slope	-1.0	-1.4	-.7	-3.5	-.64	-3.3	-.2	-.7
Correlation Coefficient	-.93[a]	-.97[a]	-.76[a]	-.98[a]	-.40	-.87[a]	-.27	-.44

[a] P less than .05

Project has used observed, rather than adjusted, death rates as the more reliable indicator of changes in population death rates. Table A2-27 shows that there was a definite period decline in observed death rates in Area I and Area II from 1971-72 to 1976-77, which is statistically significant. However, the decline in Area II was not statistically significant from 1971-72 to 1975-76, and, since the rate in 1976-77 may be underestimated more than 1975-76, the decline in Area II is more questionable than that in Area I. In Area I, the decline was statistically significant, both for the period 1971-72 to 1975-76, and for the period 1971-72 to 1976-77. There was no statistically significant decline in observed death rates in Areas III or IV. There were statistically significant declines in adjusted death rates in Areas I, II and III but, for reasons mentioned previously, these cannot be considered reliable.

STANDARDIZED DEATH RATES

Crude death rates are also affected by the age and sex distribution of the population. Since the age and sex distribution of the population for the Project areas was constantly changing due to migration, the rates were standardized to see if the rates were basically different than those shown above. The standardized death rates shown in Table A2-28 are based on the 1960 census of Ghana age and sex distribution of population and the adjusted age and sex mortality rates for the Project areas presented in Tables A2-29 to A2-32. Table A2-28 shows that these rates are not very different from the adjusted rates shown in Table A2-27. Again, because these standardized rates are based on adjusted death rates, the trends cannot be considered reliable.

AGE AND SEX SPECIFIC MORTALITY RATES

The age and sex specific mortality rates for each area are shown in Tables A2-29 to A2-32. These are adjusted rates based on the C-D correction and have been derived by dividing the estimated number of deaths in a given age group during the reference year by the estimated midyear population of the corresponding age group. The sex differentials in mortality are apparent from these tables, with female age specific death rates generally lower than the male death rates. In most developing countries the 15-49 year old female mortality is usually higher than

that found in the corresponding age group for males because of additional risks of childbearing. Although there is considerable period and area variability, there is no substantial evidence from the data that the female mortality in the age group 15-49 is higher than that of males in the same age group.

Table A2-28: Standardized Death Rates (per 1000) by Period and Area (Based on Adjusted Survey and Vital Registration)

PERIOD	AREA I	AREA II	AREA III	AREA IV
1971-72	14.2	25.9	29.9	13.3
1972-73	11.4	21.7	20.8	16.7
1973-74	11.0	19.8	11.8	19.2
1974-75	8.7	15.2	16.9	16.2
1975-76	8.3	11.9	12.1	12.4
1976-77	7.3	9.5	9.2	10.7
STATISTICS				
Constant	108.3	264.2	281.8	76.3
Slope	-1.3	-3.3	-3.5	-.8
Correlation Coefficient	-.97[a]	-.99[a]	-.87[a]	-.49

[a]P less than .05

Table A2-29: Age and Sex Specific Mortality Rates
Based on Adjusted Survey and Vital Registration Data (1971-1977)
AREA I

	1971-72			1972-73			1973-74			1974-75			1975-76			1976-77		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Less than 1	88	42	65	100	34	67	92	68	80	85	93	89	65	124	95	147	67	107
1	45	29	37	15	29	22	19	14	17	4	8	6	7	16	12	12	8	10
2	36	0	18	20	15	18	0	26	13	11	5	8	11	4	8	0	0	0
3	26	10	18	5	5	5	5	19	12	12	6	9	5	0	2	7	7	7
4	0	9	5	9	0	5	9	0	5	4	0	2	3	3	3	0	8	4
0-4	39	19	29	34	19	26	25	26	25	23	20	22	17	25	21	30	18	24
5-9	6	8	7	6	3	5	4	2	3	2	2	2	2	2	2	1	1	1
10-14	0	1	1	1	2	2	4	2	3	2	1	2	5	2	3	1	2	1
15-49	10	3	7	7	4	6	5	4	5	5	5	5	5	3	4	1	4	3
50-64	25	28	26	19	10	15	28	2	15	5	14	9	16	9	13	9	3	6
65 and over	86	80	84	61	48	55	74	64	69	42	26	34	48	18	33	19	23	21
ALL AGES	17	11	14	14	9	11	13	9	11	10	9	9	10	8	9	8	6	7

Table A2-30: Age and Sex Specific Mortality Rates for Years 1971-1977, Based on Adjusted Survey and Vital Registration Data

AREA II

Deaths per 1000 Population

Age Group	1971-72			1972-73			1973-74			1974-75			1975-76			1976-77		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
0	189.1	144.1	166.6	103.6	115.5	109.6	137.9	56.7	97.3	82.2	87.9	85.2	107.2	107.4	107.3	50.8	58.8	54.8
1	121.0	0	60.5	72.2	38.1	55.2	40.3	55.4	47.9	15.7	23.5	19.6	27.3	15.7	21.5	32.0	57.5	44.8
2	62.0	52.9	57.5	12.3	85.9	49.1	75.1	27.9	51.5	24.8	21.6	23.2	17.2	18.4	17.8	26.9	12.3	19.6
3	0	19.2	9.6	35.9	10.1	23.0	40.2	21.4	30.8	21.5	7.3	14.4	2.8	2.8	2.8	0	11.3	5.7
4	9.9	0	4.9	19.6	9.9	14.8	50.5	4.8	27.7	32.6	14.5	23.6	10.9	3.3	7.1	2.4	10.7	6.6
0-4	74.3	47.0	60.7	54.2	55.7	54.7	72.5	36.4	54.5	37.6	31.1	43.4	34.4	29.6	32.0	21.6	28.9	25.3
5-9	9.2	0	4.6	4.4	2.3	3.4	6.0	4.1	5.1	9.5	1.9	5.7	4.7	7.7	6.2	6.1	0.9	3.5
10-14	6.1	0	3.1	2.9	8.2	5.6	2.6	0	1.3	4.8	0	2.4	5.5	3.8	4.7	5.2	1.2	3.2
15-49	21.2	5.6	13.4	12.6	5.1	8.9	9.1	7.0	8.1	9.8	2.2	6.0	4.3	6.2	5.3	5.4	1.3	3.4
50-64	83.2	59.2	72.1	39.4	22.4	30.9	17.2	17.0	17.1	32.7	12.4	22.6	19.4	8.3	13.9	9.6	11.1	10.4
65+	71.4	96.9	84.2	139.9	119.7	129.8	134.4	94.9	114.7	75.2	24.1	49.7	21.4	40.8	31.1	53.5	42.8	48.2
All Ages	35.0	21.1	28.0	26.5	21.8	24.1	26.7	16.4	21.5	20.1	9.8	14.9	14.0	13.6	13.8	12.5	10.2	11.3

Table A2-31: Age and Sex Specific Mortality Rates for Years 1971-1977, Based on Adjusted Survey and Vital Registration Data

AREA III

Deaths per 1000 Population

Age Group	1971-72			1972-73			1973-74			1974-75			1975-76			1976-77		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Less than 1	153.4	259.1	206.3	120.8	106.9	113.9	73.2	64.3	68.8	112.7	124.8	118.8	96.8	91.4	94.1	65.1	69.8	67.5
1	55.3	99.3	77.3	87.0	56.2	71.6	22.3	22.2	22.3	43.4	48.1	45.8	14.1	37.3	25.7	26.3	40.5	33.4
2	35.5	42.7	39.1	76.6	26.2	38.3	15.0	30.0	22.5	38.4	29.1	33.8	20.8	24.8	22.8	31.3	19.3	25.3
3	60.5	43.3	51.9	26.5	6.7	16.6	41.5	0	20.8	25.6	6.7	16.2	24.4	11.1	17.8	13.6	1.7	7.7
4	22.1	20.2	21.2	27.0	6.9	17.0	0.0	18.1	9.1	22.7	8.2	15.5	5.8	17.1	11.5	2.7	1.5	2.1
0-4	69.6	97.6	83.6	74.4	49.0	61.7	33.7	30.4	32.1	51.7	46.2	48.9	32.0	35.6	33.8	26.3	26.0	26.2
5-9	6.4	8.7	7.6	7.3	7.6	7.5	7.9	0.0	3.9	6.8	8.7	7.8	6.3	6.6	6.5	2.2	4.8	3.5
10-14	8.9	0.0	4.5	3.0	0	1.5	0.0	0.0	0.0	6.5	1.8	4.2	3.8	5.2	4.5	2.2	0.8	1.5
15-49	20.6	9.2	14.9	7.3	11.2	9.3	12.7	1.6	7.2	8.6	6.4	7.5	4.2	4.1	4.2	5.9	2.9	4.4
50-64	19.3	44.4	31.9	9.0	16.3	12.7	39.1	0	19.6	20.2	11.3	15.8	20.8	15.1	17.9	14.3	6.4	10.4
65+	88.8	125.0	106.9	81.8	76.9	79.4	114.4	19.1	16.7	57.2	34.2	45.7	26.2	44.3	35.3	29.8	21.6	25.7
All Ages	28.9	32.6	30.9	24.4	19.9	22.1	20.9	8.0	14.4	21.8	16.9	19.4	14.8	14.9	14.8	12.4	9.5	10.9

Table A2-32: Age and Sex Specific Mortality Rates for Years 1971-1977, Based on Adjusted Survey and Vital Registration Data

AREA IV

Deaths per 1000 Population

Age Group	1971-72			1972-72			1973-74			1974-75			1975-76			1976-77		
	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Less than 1	88.4	49.8	69.1	97.1	104.2	100.6	93.7	111.4	102.5	105.3	99.2	102.3	124.4	95.2	109.8	139.9	37.9	88.9
1	29.5	37.7	33.6	33.2	35.7	34.0	30.6	42.4	36.5	14.0	14.7	14.3	18.7	28.1	23.4	12.8	28.2	20.5
2	9.0	8.5	8.8	40.0	31.6	35.8	36.1	58.4	47.3	27.0	24.4	25.7	9.2	22.0	15.6	18.6	14.1	10.4
3	56.7	8.2	32.5	17.5	4.1	10.8	14.5	48.9	31.7	22.0	9.1	15.6	6.9	12.7	9.8	11.1	11.9	11.5
4	8.0	8.1	8.1	26.5	15.3	20.9	24.4	11.6	18.0	14.1	3.6	8.8	0.0	8.5	4.3	10.7	0.0	5.4
0-4	40.8	23.2	32.0	47.8	43.1	45.5	44.3	59.4	51.9	37.1	31.6	34.4	30.7	32.7	31.7	38.8	18.0	28.4
5-9	3.9	0.0	1.9	5.2	5.6	5.4	7.1	7.5	7.3	5.6	3.0	29.5	6.3	5.2	5.7	1.2	0.0	0.6
10-14	11.0	5.3	8.2	1.0	1.0	1.0	3.5	1.8	2.7	5.9	2.6	4.3	1.6	1.7	1.7	3.7	1.7	2.7
15-49	8.0	7.1	7.6	12.2	6.6	9.4	9.7	7.3	8.5	5.8	4.9	5.4	6.6	4.5	5.5	5.7	4.6	5.2
50-64	17.9	11.5	14.7	17.2	14.3	15.8	42.0	9.0	25.5	12.2	7.3	9.8	17.4	9.9	13.7	29.7	9.5	19.6
65+	30.7	71.7	51.2	61.3	46.4	53.9	89.5	57.6	73.6	56.0	45.5	50.8	68.8	47.0	57.9	40.0	42.1	41.1
All Ages	15.1	11.4	13.3	18.4	14.5	16.4	20.8	18.6	19.8	15.0	11.5	13.2	14.8	12.3	13.6	14.1	8.4	11.3

PERCENTAGE DISTRIBUTION OF DEATHS BY AGE

The percentage distribution of deaths by age group is useful in studying patterns of mortality. Inferences about causes of death can be made if there are high infant and preschool mortality rates. The percentage distribution of deaths, based on adjusted data, for the four Project areas is presented in Tables A2-33 to A2-36. The proportion of deaths under one year vary rather widely. Thus, in Area I the percentage of deaths under one year of age in the first year of operation was 16.3%; in Area II, 23.8%; in Area III, 31.6%; and in Area IV, 21.3%. By 1977 the percentages of deaths under one year of age in Areas I, II, III and IV are 47.7%, 20.7%, 32.5% and 35.8%, respectively. Similarly, the proportions under five years in the first year of operation in Areas I, II, III and IV are 58.5%, 50.3%, 63.0% and 55.1%, respectively. For all areas, deaths under age 15 constitute 40%-70% of all deaths.

The percentage of deaths in people 65 years and older constituted 28.3% in Area I during the first year of operation, 15.4%, 13.0% and 15.4% for Areas II, III and IV, respectively. In the terminal year of operation the proportions were 15.4%, 23.5%, 9.6% and 12.4% for Areas I, II, III and IV. The percentages falling into the older age groups (65 and above) may be seriously affected by misreporting. In addition, since these tables are based on adjusted mortality data, there may be fluctuations because of false estimates of missing events in the early Project years.

INFANT MORTALITY RATES

The observed infant mortality rates shown in Table A2-37 show a considerable underreporting of infant deaths. These rates, like the adjusted infant mortality rates given in Tables A2-29 to A2-32, fluctuate markedly and no reasonable conclusions about period changes could be drawn from these data. The high degree of variability is probably due to reporting problems which are compounded by a large annual turnover among the women in the reproductive age groups who generally move with their children.

PRESCHOOL MORTALITY RATES

Because infant mortality fluctuated considerably, preschool mortality was also examined. The observed preschool mortality rates

Table A2-33: Percent Distribution of Deaths by Age, Based on Adjusted Survey and Vital Registration Data AREA I

AGE	YEAR 1972	1973	1974	1975	1976	1977
Less than 1	16.3	26.1	24.9	34.3	35.8	47.7
1	7.1	7.6	6.4	2.1	4.0	4.6
2	3.8	4.5	4.6	4.3	2.6	0.0
3	3.8	1.3	2.9	4.3	1.3	3.1
4	1.1	1.3	1.2	0.7	1.3	3.1
0-4	32.1	40.8	40.0	41.4	45.0	58.5
5-9	8.1	6.4	4.1	3.6	3.3	3.1
10-14	0.5	1.9	3.5	2.9	5.3	3.1
15-19	2.2	2.5	0.6	3.6	3.3	3.1
20-24	1.1	2.5	2.3	2.9	1.3	1.5
25-29	0.5	3.2	0.6	2.1	1.3	1.5
30-34	4.4	1.9	1.2	3.6	2.0	0.0
35-39	1.1	1.9	3.5	1.4	2.0	0.0
40-44	4.9	3.8	3.5	2.1	2.0	6.2
45-49	2.2	1.9	2.3	4.3	4.0	1.5
50-54	3.8	1.9	1.7	2.9	5.3	1.5
55-59	3.3	5.1	4.0	1.4	1.3	3.1
60-64	7.6	2.6	4.0	3.6	3.3	1.5
65+	28.3	23.6	28.9	20.0	20.5	15.4
Estimated total deaths	184	162	173	150	151	130

Table A2-34: Percent Distribution of Deaths by Age, Based on Adjusted Survey and Vital Registration Data AREA II

AGE	YEAR 1972	1973	1974	1975	1976	1977
Less than 1	23.8	23.3	20.8	27.3	37.7	20.7
1	6.4	8.5	10.8	5.9	7.5	16.8
2	7.4	5.9	8.6	6.3	6.0	7.8
3	1.3	3.3	4.1	3.4	1.0	2.2
4	0.7	2.2	4.1	4.4	1.5	2.8
0-4	39.6	43.2	48.4	47.3	53.7	50.3
5-9	2.7	2.2	3.7	5.9	6.5	4.5
10-14	1.3	2.6	0.7	2.0	4.0	3.4
15-19	2.0	0.0	1.1	0.0	1.0	1.1
20-24	3.4	4.1	2.2	1.0	3.0	1.7
25-29	1.3	1.5	1.1	3.9	1.5	0.6
30-34	2.7	1.9	3.3	3.9	3.5	0.6
35-39	0.7	2.6	1.9	3.4	1.5	3.9
40-44	4.0	1.9	3.7	2.0	1.5	1.7
45-49	4.7	2.2	1.1	1.5	3.0	1.7
50-54	8.1	4.4	2.2	4.9	2.5	3.4
55-59	8.1	2.6	1.9	0.5	1.5	1.7
60-64	6.0	4.1	3.0	6.8	4.5	2.2
65+	15.4	26.7	25.7	17.1	12.1	23.5
Estimated total deaths	298	270	269	205	205	179

Table A2-35: Percent Distribution of Deaths by Age, Based on Adjusted Survey and Vital Registration Data AREA III

AGE	YEAR 1972	1973	1974	1975	1976	1977
Less than 1	31.6	32.5	28.4	32.4	32.5	32.5
1	9.1	13.8	9.0	13.5	8.5	14.5
2	5.0	7.6	6.7	10.2	8.8	10.8
3	6.6	2.8	4.5	3.8	7.6	4.0
4	2.7	2.8	2.2	2.6	3.8	1.2
0-4	55.0	59.5	50.8	62.5	61.2	63.0
5-9	4.1	5.6	4.5	6.4	6.6	5.2
10-14	1.8	0.8	0.0	2.6	3.5	1.6
15-19	4.1	0.8	2.2	1.3	1.3	4.4
20-24	1.8	2.0	2.2	2.0	0.9	3.2
25-29	4.5	2.5	2.2	2.3	0.6	1.6
30-34	0.9	3.4	4.5	3.6	1.9	0.0
35-39	0.5	2.0	0.0	2.8	1.6	1.6
40-44	4.1	3.4	2.2	1.3	1.9	2.4
45-49	2.3	2.3	4.5	1.0	1.9	1.2
50-54	1.4	0.6	4.5	3.1	3.5	2.8
55-59	1.4	1.7	2.2	0.8	1.3	2.8
60-64	5.2	2.0	2.2	1.5	3.2	0.4
65+	13.0	13.3	1.79	8.9	10.7	9.6
Estimated total deaths	440	354	268	392	317	249

Table A2-36: Percent Distribution of Deaths by Age, Based on Adjusted Survey and Vital Registration Data AREA IV

AGE	YEAR 1972	1973	1974	1975	1976	1977
Less than 1	21.3	29.5	26.7	31.4	33.2	35.8
1	8.5	8.0	8.2	5.2	6.9	6.9
2	2.1	7.2	9.1	8.7	5.3	5.5
3	8.5	2.0	5.2	4.8	3.2	4.6
4	2.1	4.4	2.7	5.2	1.2	2.3
0-4	42.5	51.1	51.9	55.3	49.8	55.1
5-9	2.7	5.6	6.1	5.2	6.5	0.9
10-14	8.5	0.8	1.8	4.4	1.6	3.2
15-19	5.3	7.2	2.4	3.5	1.2	3.2
20-24	2.7	3.6	1.5	3.5	2.4	2.3
25-29	3.7	2.4	3.0	1.7	2.8	1.8
30-34	5.3	1.2	2.4	2.2	2.4	2.3
35-39	2.7	0.4	1.2	1.7	2.0	4.1
40-44	0.0	4.0	3.3	1.3	2.0	3.2
45-49	2.7	3.6	2.4	1.7	2.4	0.0
50-54	3.7	3.6	3.0	1.7	1.6	4.6
55-59	1.1	2.0	3.0	2.2	2.0	4.6
60-64	3.7	1.6	2.7	1.3	4.0	2.3
65+	15.4	13.1	15.2	14.0	19.0	12.4
Estimated total deaths	188	251	330	229	247	218

Table A2-37: Observed Infant Mortality Rates by Period and Area

PERIOD	AREA I	AREA II	AREA III	AREA IV
1971-72	54	79	99	59
1972-73	57	61	66	74
1973-74	64	68	69	69
1974-75	83	74	101	69
1975-76	70	86	83	76
1976-77	71	44	54	50

Table A2-38: Observed Preschool (Ages 1-4) Mortality Rates by Period and Area

PERIOD	AREA I	AREA II	AREA III	AREA IV
1971-72	16.0	17.0	22.8	16.1
1972-73	11.1	19.3	23.7	18.8
1973-74	9.7	28.3	12.6	23.0
1974-75	6.3	16.6	25.4	15.4
1975-76	5.3	10.6	16.8	11.1
1976-77	5.3	14.1	10.8	12.7
STATISTICS				
Constant	167.1	129.0	163.2	117.7
Slope	-2.1	-1.5	-1.9	-1.4
Correlation Coefficient	-.94[a]	-.47	-.59	-.60

[a]p less than .05

for all Project areas from 1971-72 to 1976-77 are presented in Table A2-38. The decline in preschool mortality rates during the various years of Project life is linear and statistically significant ($r = -.94$; $P < .05$) for Area I. Again, since this is a decline in an observed rate, it is more likely to represent a real trend. In other areas these rates are highly variable and no such declining trend is discernible.

A2.6.4 Migration

Migration is an important demographic factor which may contribute to the growth and decline of the population and may also influence other demographic characteristics such as fertility and mortality by changing the age and sex composition of the population. Migration data, the number and characteristics of persons entering and leaving the area, is required together with census data and vital statistics for analysis of changes in the structure of an area and for assessment of basic population characteristics.

Two components of population growth and redistribution, namely the net migration and natural increase, may be used together in analyzing population changes. However, their effects are not mutually exclusive, nor are they always synchronous. In Africa and most developing countries the contribution of natural change to area growth is usually positive and the contribution of migration may either be positive or negative. Numerous other modifications in the structure of the population may result from migration and changes in the patterns of natural increase.

In view of a significant interaction between population change and natural change, it was decided at the outset of the Danfa Project that migration data would be collected. Thus, in the repeated annual census, information was collected on the movement of persons into and out of Project areas between surveys. This information constitutes one of the principle sources of data on migration. According to this method, persons who are reported to be in the Project area at one survey are found no longer there at the next survey, or persons are found at a later survey who were not there at the previous survey. This method constitutes an effective means of obtaining data on out-migration, particularly where whole households, not just individuals are involved.

This unique system of collecting migration data provides information which is a potential source of reference for a variety of purposes: for demographers studying migration, for administrators concerned with community planning, for giving direction to health and social welfare programs, and for use as baseline control data for planning epidemiological studies.

The patterns of population change and the contribution of natural increase and migration to this change are already discussed earlier. The rates of in-migration, out-migration, gross migration and net migration sex distribution for the various Project areas during the years 1971-72 to 1975-76 are shown in Table A2-39. The proportion of people who moved in or out of Area I during the various years of the Project ranged between 25.8% and 32.9% from 1971 to 1976. The percentages for Areas II, III and IV are 19.2%-24.4%, 16.7%-24.6% and 7.4%-29.6%, respectively. Therefore, the magnitude of migration in each Project area is quite high, with nearly one-third of the population moving each year. The cumulative effect of this migration over a number of years could be significant. Furthermore, but for a few minor variations, most of the Project areas are net in-migration areas and gained in population through mobility during the various years of the Project.

Since the propensity to migrate varies sharply with age and is likely to differ considerably with sex, it is desirable to examine rates for the characteristics of age/sex as well. The patterns of net migration by age/sex show that the highest rates of gross migration (turnover) are among the younger age groups 0-34, with high migration rates among the 0-4 age group. There does not seem to be any variation in the migration rates between the two sexes, both males and females have been found to be equally mobile; adults usually move with their families.

A2.7 CONCLUSIONS

In this appendix an attempt has been made to describe the organization for the collection of demographic data, methods of analysis and some of the findings. The non-sampling problems of accurate collection of census and vital statistics in Africa are formidable and have been widely discussed in the demographic literature. These problems encompass a wide range of difficulties--conceptual, operational and analytical.

Table A2-39: Migrants per 1000 Population by Period and Area

		AREA I					AREA II					AREA III					AREA IV				
		71-72	72-73	73-74	74-75	75-76	71-72	72-73	73-74	74-75	75-76	71-72	72-73	73-74	74-75	75-76	71-72	72-73	73-74	74-75	75-76
	M	209	153	177	139	130	84	121	176	115	132	97	149	157	82	85	33	168	125	97	89
IM	F	216	154	157	145	129	95	126	180	122	143	108	165	165	98	102	38	186	143	116	108
	T	212	154	167	142	130	89	124	178	118	137	103	157	161	90	94	36	177	134	106	98
	M	118	110	144	113	118	101	96	82	121	82	63	73	81	110	81	36	109	113	116	75
OM	F	115	111	154	124	139	105	98	89	138	100	66	83	89	121	89	41	124	130	130	98
	T	117	111	149	119	128	103	97	86	130	91	64	78	85	115	85	38	116	122	123	87
	M	327	263	321	252	248	185	217	258	236	214	160	222	238	192	166	69	277	238	213	164
GM	F	331	265	311	269	268	200	224	269	260	243	174	248	254	219	191	79	310	273	246	206
	T	329	265	316	261	258	192	221	264	248	228	167	235	246	205	179	74	293	256	229	185
	M	91	43	33	26	12	-17	25	94	-6	50	34	76	76	-28	4	-3	59	12	-19	14
NM	F	101	43	3	21	-10	-10	28	91	-16	43	42	82	76	-23	13	-3	62	13	-14	10
	T	95	43	18	23	-2	-14	27	92	-12	46	39	79	76	-25	9	-3	61	12	-17	11

IM = In Migration
OM = Out Migration
GM = Gross Migration (total turnover)
NM = Net Migration

Accurate estimation of vital events over the life of the Project was essential to evaluating the objectives of the Project. Therefore a dual record system involving both collection of vital events by periodic surveys and ongoing vital registration systems was used. This permitted use of the well-known Chandrasekhar-Deming methods to adjust for the unavoidable underreporting of events particularly deaths, in developing countries. To maintain a dual system for a long period is expensive and requires efficient organization, management, perseverance and dedication on the part of the workers, and sustained cooperation from the people. In the beginning years the Project used part-time registrars to gain experience with an approach which could be replicated. Since the system did not prove to be very effective, the vital data collection system was reorganized and full-time registrars were appointed.

Analysis of early registration data by the Chandrasekhar-Deming method clearly demonstrates the inadequacies of our data during the initial period of the Project. The gap between the observed (recorded) and adjusted events is much wider in the first three years of operation of the Project but then narrows down considerably. This clearly demonstrates considerable improvement and efficiency in our vital data collection during the latter years of the Project.

Besides the extent of the underreporting, the adjusted rate would also depend on the fulfillment of assumptions of the C-D method. Any large scale violation of these assumptions would cause a variation in the adjusted rates. One of the important assumptions of this technique is the independence of the two systems. During the first three years of the Project, personnel and logistics problems made it difficult to keep these two systems independent, which might have caused fluctuations in our rates. Thus, the adjusted rate during the initial years may not be truly comparable with those of the later years. But since the observed rates during the last three years of the Project are very close to the adjusted rates, these could (for comparative purposes) be considered as close approximations of the true rates.

The population of all four Project areas was 49,873 in the initial year of operation and increased to 77,761 at the end of the terminal year, representing a 56% growth rate over a six-year period. Some variations in the overall rate of population growth have been found

between different areas--the rate being highest in Area III and lowest in Area IV. An analysis of data on the components of population growth shows that there is considerable migration in the Project areas and the mobility of population contribute greatly to the overall rate of population growth. The excessive mobility not only creates difficulties in the recording of accurate vital events but introduces many complexities in the analysis and estimation of rates. Many of the techniques of estimation based on stable population models which have been frequently used in many developing countries would simply not be appropriate in a population which is highly mobile. Our analysis has shown that age selective migration affects the age distribution of the population which varies in configuration from year to year.

Statistical analysis of time changes in vital rates have also been carried out. Different indicators of fertility such as crude birth rates, general fertility rates, total fertility rates and gross reproduction rates all reveal a significant declining trend in Area I, while no such change is discernible in the other three areas. There was a statistically significant decline in observed crude death rates in Areas I and II and in the preschool mortality rate in Area I only.

Because of the particular location of the Danfa Project district, the rates presented may differ considerably from those for Ghana as a whole. The difficulties of demographic data collection and estimation have been experienced by many research projects in developing countries but the Danfa Project data collection was further hindered by excessive mobility of the Project population. Therefore, the data presented here undoubtedly differs to some degree from the actual rates experienced even in the Danfa Project district. The major objective, however, has been to examine changes in fertility or mortality, despite the data limitations. If one assumes that the problems and limitations of data collection were the same in all Project areas, then the differential changes in the vital rates between the Project areas become quite apparent.

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APPENDIX 3: LONGITUDINAL KAP SURVEYS

	LONGITUDINAL KAP SURVEYS	(A3-1)
A3.1	Design and Sampling of the Longitudinal KAP Surveys	(A3-1)
A3.2	Methodology of the Longitudinal Surveys	(A3-3)
A3.3	Maternal Health Practices Survey	(A3-5)
A3.4	Child Health Practices Survey	(A3-10)
A3.5	Male and Female Family Planning KAP	(A3-19)
A3.5	Male and Female Planning KAP	(A3-19)
A3.6	Morbidity Survey	(A3-24)
A3.7	Fertility Survey	(A3-24)

APPENDIX 3: LONGITUDINAL KAP SURVEYS

An important objective of the Danfa Comprehensive Rural Health and Family Planning Program was to change the knowledge, attitudes and practices (KAP) of the rural population served. One of the methods used to measure this change was a series of longitudinal KAP surveys of a sample of the population in each of the four research areas. The Project designers were well aware of the limitations of KAP surveys. Nevertheless, it was decided that these surveys would especially be useful to help gauge the level of knowledge and attitudes and to make comparisons with KAP surveys done elsewhere in the world.

There were five different KAP surveys plus a fertility questionnaire survey carried out at the same time in 1972, 1975 and 1977. These included:

- Child Health KAP Surveys
- Maternal Health Practices Survey
- Survey of Family Planning KAP-Female
- Survey of Family Planning KAP-Male
- Morbidity Survey
- Fertility survey

A3.1 DESIGN AND SAMPLING OF THE LONGITUDINAL KAP SURVEYS

The sampling frame for six surveys was designed to use the individual respondent as the sampling unit while simultaneously maximizing the number of household linkages in the sample between various survey categories. The technique was essentially one of randomized cluster sampling on households.

Samples were stratified by village size (in terms of number of households) and household size. For stratification, village size was classified in terms of "large" and "small" on the basis of the number of households they contained. Approximately 80% of the villages had fewer than 60 households. We adopted 60 as our line of demarcation; thus, villages containing 59 or fewer households were considered "small," those containing 60 or more, "large." Stratification of villages by size was important,

since "large" villages appear more likely to receive inputs of new ideas.

Baseline data for Areas I, II, III and IV indicated that, excluding one person households, the median size of households was slightly more than 6 persons. A "small" household, therefore, was defined for sampling purposes as one comprised of 2-6 persons, a "large" household, 7 or more.

The sample selection for each area, thus, was a straightforward four-cell design, as shown in Figure A3-1. The sampling fractions, f_i, shown in each cell followed from the 80/20 distribution of village size and the 50/50 distribution of household size. Selection of actual samples of households in each area was done by listing all eligible household numbers (i.e., those which contain at least one fertile female) in each cell--obviously a machine task--and then having the computer, by means of a random number generator, recompile them in random order within each cell.

Figure A3-1: Design for Sample Selection

Household Size	Village Size: < 60	Village Size: 60 +
2-6	f_I = 40% I	II f_{II} = 10%
7 +	f_{IV} = 40% IV	III f_{III} = 10%

f_i = cell sampling size

For the basic longitudinal studies of morbidity, fertility, maternal health, child health and family planning KAP, the initial samples contained some 500 households in each area. The numbers interviewed for each survey are shown in Table A3-1.

Table A3-1: Numbers Interviewed for Each KAP Survey, 1972 and 1977 by Area

	Area I 1972-1977	Area II 1972-1977	Area III 1972-1977	Area IV 1972-1977
Child Practices	438-206	432-252	476-253	446-201
Maternal Practices	525-271	512-295	556-298	564-247
Female FP KAP	593-331	645-352	681-339	706-302
Male FP KAP	519-244	451-238	490-246	513-242
Fertility	691-330	644-351	502-339	511-302

A3.2 METHODOLOGY OF THE LONGITUDINAL SURVEYS

A3.2.1 Description of the Surveys

CHILD HEALTH KAP SURVEY

The Child Health KAP Survey examined the respondents' knowledge, attitudes, and practices concerning the care of young children. Beliefs about the causes of childhood illness and adult responses to overt signs of illness in children were explored; beliefs and practices regarding the child nutrition were probed in depth. Only women caring for children under five were interviewed.

MATERNAL HEALTH PRACTICES SURVEY

The Maternal Health Practices Survey was closely related to the Child Health Practices Survey. It contained questions dealing with the feeding of infants and women's concepts and practices in caring for themselves during pregnancy. Our sample for this study included only women of child-bearing age who had at least one pregnancy (although not necessarily one which resulted in a birth).

SURVEY OF FAMILY PLANNING KNOWLEDGE, ATTITUDES AND PRACTICES--FEMALE

The Family Planning KAP Study among women obtained information concerning the respondent's attitude toward family size, and her knowledge of, attitude toward, and use of family planning techniques and materials. It

also probed into the means by which information about family planning is communicated. Its function was to provide one group of effectiveness measurements in the evaluation of the family planning program. The survey target population is the same as that of the Fertility Survey.

SURVEY OF FAMILY PLANNING KNOWLEDGE, ATTITUDES, AND PRACTICES--MALE

The Family Planning KAP Study among men was the counterpart of the study described above taken from the male viewpoint. The survey population included men in the age range 15-64.

MORBIDITY SURVEY

The Morbidity Survey consisted of a series of questions about health problems experienced by the respondent in the preceding two weeks. The questions dealt with the nature of the illness, its duration, resultant restriction of normal activity, type of help sought, distance traveled (to health care provider), and expenses incurred.

Although the baseline survey produced some useful morbidity information, comparisons of Village Health Survey examinations with simultaneously administered morbidity questionnaires revealed poor correlation between the two. For this reason no morbidity survey was carried out in 1977.

FERTILITY SURVEY

The Fertility Survey gathered data concerning number of children born to the respondent, number of pregnancies, pregnancy spacing, outcomes of pregnancies, and various categories of parental relationships (e.g., marriage by type, unmarried). These data were used to compute birth and fertility rates, fetal wastage, and perinatal, infant, and child mortality rates. The survey population encompassed women in the age range of 15-44. The upper limit of 44 was chosen instead of the more conventional 49 so that none of the women in the longitudinal study would "graduate" out of the fertile range over the five-year life of the study.

A3.2.2 Interviewer Training

Field interviewers possessed a "school leaving certificate" and could read and write English and at least one of the local languages. They were trained by senior Project staff and by field supervisors. Survey instruments were pretested and responses discussed. Sample checks of interviewee responses were carried out regularly.

A3.2.3 Data Processing

Questionnaires were edited, coded, keypunched in Ghana and the data stored on magnetic tape. At the end of the surveys a combined tape was produced containing the responses to all three surveys in sequence for each interviewee.

A3.3 MATERNAL HEALTH PRACTICES

Of those women surveyed, their understanding of the relationships between maternal health, pregnancy and the newborn appears to be fairly sound. In addition, their reported maternal health practices are, for the most part, beneficial. Findings are summarized in Tables A3-2 and A3-3. Briefly, the outstanding findings were that:

(a) Women sought antenatal care early in pregnancy, a third by the end of the first trimester and 80-90% by six months of pregnancy.
(b) There was a definite trend to seek antenatal advice and care for preventive reasons rather than curative reasons.
(c) The majority of infants were delivered at home by a midwife or traditional birth attendant or in a clinic or maternity home by a trained nurse midwife. TBA deliveries were particularly evident in Area I where the TBA program training took place.
(d) Umbilical cord handling and care appeared to be done with increasing safety.
(e) A majority of infants were breast fed with the reason of pregnancy or the child growing up the main reason for not breastfeeding at the time of interview.
(f) Solids were introduced early in life under six months of age.
(g) The use of commercial milks appeared to be negligible.

A3.3.1 Antenatal Care

In all four areas in 1972, about 29% sought antenatal care by the end of the first trimester, increasing to 35% by 1977 with particular improvement in Areas II and III. Over 80% of women in 1972, and over 90% of women by 1977 had sought antenatal care by the sixth month of pregnancy.

In 1972, 81-94% of women sought out a trained nurse midwife for antenatal advice or care in all areas. Later, this high percentage was maintained and even increased slightly in Areas II and III. Also, those surveyed considered the advice of a trained nurse midwife to be the most helpful.

Traditional Birth Attendants (TBAs) were approached for antenatal care by only 3-6% of respondents in 1972. By 1977, this increased threefold in Areas I and IV. Other traditional healers provided antenatal care to 8-20% of women surveyed, the lowest percent in Area I, the highest in Area IV. This category decreased in all areas by 1977. Those 5-7% who reportedly sought help from relatives declined over time as well.

The stated reasons for seeking antenatal advice or care were dichotomized: either preventive (for the health or welfare of the mother or infant) or therapeutic (for symptoms or illness arising during pregnancy). Preventive health reasons were especially high in Area I, 66%, versus 50% in the other areas in 1972. Women seeking help for preventive reasons affecting their own welfare was highest in Area I initially and remained so, surpassing reasons affecting their infants' welfare. The combination of seeking help to safeguard the welfare of either mother or infant increased over time in all areas. Seeking symptomatic treatment remained fairly high throughout and tended to increase slightly in Areas III and IV. A slight decrease in this category in Area I may reflect the improved antenatal care and an increased awareness of the preventive benefits of this care.

A3.3.2 Deliveries

The majority of respondents reported that their most recent delivery occurred in their own home. Home deliveries were the least common in Area I and the greatest in Areas III and IV. Clinic deliveries were most numerous in Areas I and IV and increased slightly in Areas II and III over

time. Hospital deliveries showed a slight increase in Areas I and IV.

Deliveries performed by trained personnel (nurse and midwives, TBAs and physicians) increased over time in all areas but one, although deliveries by physicians were negligible. Area I had the smallest percent of deliveries by relatives and self-deliveries and Area III the highest percent of these reported. It appears that Area III has the least accessible obstetrical services. A decrease in deliveries by untrained personnel did occur over time in all areas, with Area I having the lowest percentage and Area III having the highest percentage.

Traditional birth attendants delivered 16-22% of infants in all areas in 1972, with Area I having a higher percentage than other areas. By 1977, all areas showed an increase in TBA deliveries, particularly Area I where 34% of women reported their last child was delivered by a TBA. This increase is due most likely to the TBA training program in Area I. Deliveries by trained nurse midwives were reported for 31% of all deliveries in Area I in 1972 and for slightly fewer in the other areas, there was little change in 1977.

In the baseline survey, when asked about their last pregnancy, 1-3% reported stillbirths, and 6-8% reported miscarriages. Over time there was a slight improvement in these figures.

Reported practices of umbilical cord care were encouraging. A special birth questionnaire administered by the Vital Events Registrars to women who had recently delivered showed that TBAs in Area I were using sterile razor blades to cut the cord in at least 68% of their deliveries and that in 50% of deliveries they were using gentian violet as the cord dressing. The TBAs themselves reported that they were using sterile razors to cut the cord and gentian violet as the cord dressing on nearly all deliveries.

In the 1972 Maternal Health Practices Survey, most umbilical cords reportedly were cut with razors, knives and scissors. It is not known if these were sterile. By 1977, the use of knives decreased and razor blade use greatly increased in all areas. Glass or sharpened bamboo was used by 2-13% in all areas, with little change in these surveys. Up to 13% of women did not know how the cord of their infant was cut or dressed during their previous delivery. This did not change over time.

In 1972, herbs were used for 30-49% of deliveries; by 1977, this practice decreased in Area I, but not in the other areas. Powders (usually scented talcum) were used in 5-21% of deliveries in all areas, the highest in Area I. Penicillin ointment or clinic dressings were reportedly used mainly in Area I and II initially, and least often in Areas III and IV. Salt dressing applications appeared to be quite prevalent in Areas II and III where 26% reported its use. The respondents did not report any use of gentian violet, per se. Few reported the use of indigenous practices such as the application of palm kernels or ash.

A3.3.3 Infant Feeding

Questions about feeding practices for the youngest child revealed that breastfeeding was the predominant mode of feeding and was generally high throughout the Project areas. Throughout the surveys, the mean duration of breastfeeding was 16-17 months in all areas, with the exception that in Area I in 1972, the mean duration was 14 months.

The main reasons stated for not breastfeeding were that the child had grown old enough to be weaned or that the mother was pregnant. In 1972 in all areas 10-28% of respondents gave pregnancy as the reason for weaning. Area I women stated this reason least often in 1972 and not at all by 1977. Areas III and IV also showed a decrease in this response by 1977. Weaning a young child because of pregnancy is a widespread and potentially dangerous custom because it can lead to protein calorie malnutrition in a young child.

The feeding of solids or regular food to infants was investigated. Few were given solid foods before three months, by 3-5 months of age, 45% were eating solids. At eight months, three fourths were eating solids. The most common foods introduced were akasa (a corn porridge), kenkey (fermented cornmeal) and rice. Only 4-5% of infants consumed eggs or commercial milk products.

Table A3-2: Maternal Health Practices: Pregnancy and Delivery

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	271	271	295	295	298	298	247	247
Sought advice when pregnant	86%	87%	71%	75%	54%	74%	83%	93%
Consulted (one or more)								
Nurse-midwife	94	87	81	85	81	87	94	91
Traditional healer	8	3	9	8	11	6	20	8
Traditional birth attendant	3	9	6	4	4	4	4	12
Relative	5	5	7	5	7	5	5	3
Help sought because								
Preventive - mother	35	22	23	15	15	8	22	6
Preventive - infant	22	5	10	1	14	2	16	5
Preventive - both	9	45	14	29	16	36	20	45
Curative/symptomatic	34	28	48	54	54	54	40	44
Other	0	0	5	1	1	0	2	0
During pregnancy advice/help sought (cumulative)								
By 3 mos.	32	41	24	34	29	34	31	31
6 mos.	91	94	80	89	85	88	88	92
8 mos.	98	100	97	99	92	99	88	100
Last delivery occurred at								
Own home	55	47	67	56	83	71	78	66
Clinic	13	13	8	15	3	9	9	9
Hospital	17	19	14	6	4	3	5	8
Other	15	21	11	23	10	17	8	17
Last infant delivered by								
Nurse-midwife	31	33	22	19	8	11	17	19
TBA	22	34	18	27	16	21	20	24
MD	2	1	2	4	0	1	1	2
Self	12	12	19	15	28	26	18	20
Relative	29	13	35	26	43	29	39	25
Other	4	7	4	9	5	12	5	10
Last pregnancy								
Born alive	91	95	92	97	91	99	91	96
Miscarriage	6	4	6	1	8	1	8	2
Stillbirth	3	1	2	2	1	0	1	2
Cord cut with								
Knife	19	8	17	14	21	12	24	15
Razor	45	53	30	44	51	65	44	61
Scissor	16	17	14	13	4	5	11	11
Glass	2	2	12	9	10	3	2	1
Palm or bamboo	0	0	1	3	3	1	3	2
Do not know	18	20	26	17	11	14	16	10
Cord dressing used								
Herbal medicine	30	25	26	40	38	51	49	61
Powder	21	34	13	17	5	[illegible]	10	15
Penicillin dressing	24	9	18	16	9	[illegible]	11	2
Salt	12	6	26	3	26	12	19	19
Hot water	1	8	1	3	1	1	1	2
Palm kernel	5	3	6	7	5	2	4	0
Ash	1	1	1	1	3	1	0	1
Other/do not know	6	14	9	13	13	17	6	0

Table A3-3: Maternal Health Practices: Infant Feeding

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of respondents	271	271	295	295	298	298	247	247
Youngest child being breastfed	71%	73%	70%	68%	72%	72%	63%	65%
Mean duration of breastfeeding	14 mos.	16 mos.	17 mos.	16 mos.	17 mos.	17 mos.	16 mos.	17 mos.
Reasons for not breastfeeding								
Grown - ready for weaning	46%	54%	49%	42%	54%	62%	44%	11%
Mother pregnant	10	0	12	16	28	18	18	10
Child refuses	7	0	12	9	6	7	7	5
Other/do not know	37	46	27	33	12	13	31	74
Regular food given daily to the youngest child (cumulative)								
0-2 mos.	6	6	8	11	10	10	7	2
3-5 mos.	39	48	52	53	45	62	43	50
6-8 mos.	70	76	75	76	67	85	75	77
9-11 mos.	77	80	83	80	70	91	79	78
12 mos.	91	88	89	83	79	97	85	80
12+ mos.	100	100	100	100	100	100	100	100

A3.4 CHILD HEALTH PRACTICES SURVEY

The important childhood illnesses contributing most to morbidity and mortality were examined in terms of knowledge about causation and attitudes about type and source of treatment. The conditions studied were thinness or poor growth, fever, diarrhea, measles, convulsions, worms and vomiting. Although three rounds of the survey were carried out in 1972, 1975 and 1977, changes are compared only between the first and last surveys. In most cases the 1975 survey results showed changes in the same directions as did 1977 results. Because it was possible to trace how individuals responded both in 1972 and 1977 it could be seen which respondents were consistent over time and those who changed their responses to a given question. In general, there appeared to be an increase in the understanding of problems and an increase in responses that indicated that sound and helpful practices would be used.

Although there were many questions having to do with foods given or withheld under particular circumstances of illness, these food surveys often were not carried out longitudinally or were repeated only on a small

sample. Only those questions with a sizeable number of respondents in the 1972 and 1977 surveys are included in this analysis.

Changes in the child health practices over time may reflect either the direct effect of health education, or may reflect increasing contact with Danfa Project staff and activities, particularly with the satellite clinics and outreach efforts. In Areas I and II the health education input was maximal and the changes in child health KAP should have been most evident in these areas. Changes in Areas III and IV may have resulted from the overall improvement in the usual Government of Ghana Health Services in these areas, or as an indirect effect of the proximity of the Danfa Project activities in the other two areas. Also repeat KAP questionnaires may educate people as to what the expected or desired responses ought to be. Although not presented above, a moderate number of respondents changed their opinions from one survey to the other in response to the same question. This, of course, would be desirable if an undesirable belief was replaced by a desirable one, but of course, the converse was true as well.

The goals of the child health education program were to impart an improved understanding of the major causes of illness, to improve the practice of preventive measures, including healthful feeding practices, to educate parents to seek appropriate medical care and promote the use of appropriate medications and home nursing practices which are supportive and effective, rather than detrimental to the child's health. The KAP survey despite its limitations did, to a certain extent reflect a positive program impact on several beliefs and practices relevant to child health.

A3.4.1 Fever

Table A3-4 shows that about half of all respondents in all four areas associated fever with overheating from the sun. This idea persisted and increased in all areas over time. Sickness in general as a cause of fever accounted for 27% of responses in Area I and 7-19% of responses in the other areas. The category "I don't know" was used by 20-25% of respondents, with a slight decrease over time except in Area IV where there was an increase. Area I had the highest percent of responses that associated fever with mosquitoes as a primary cause with 18% in 1972 and 24% in 1977 making this association.

Table A3-4: Child Health Practices: Fever

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	206	206	252	252	253	253	201	201
Cause of fever								
Sun/hot weather	36%	45%	51%	57%	39%	65%	46%	53%
Sickness	27	30	15	18	15	7	16	19
Mosquitoes[a]	18	24	15	12	8	0	6	13
Mosquitoes[b]	16	18	5	15	14	33	17	26
Teething	5	1	3	2	3	1	3	2
Don't know	21	18	18	13	26	23	13	20
What is done for fever at home? (one or more)								
Give antimalarials	9	5	10	4	13	1	21	8
Give APC-aspirin	18	16	26	14	44	22	44	18
Local medicines	7	11	7	15	10	13	8	22
Sponge/bathe	29	51	16	31	7	22	4	20
Enemas	13	7	21	16	20	23	20	23
Traditional Rx	0	0	0	1	0	1	0	0
Other	2	4	2	5	2	0	3	0
Nothing	25	3	21	13	13	18	10	17
Source of medical care								
Hospital	21	9	21	13	29	1	68	44
Clinic	78	89	78	85	66	93	29	52
Traditional healer	0	0	0	0	3	3	4	4

[a]First cause stated.

[b]Second cause stated.

Appropriate responses were obtained concerning treatment of fever. Most respondents in all areas and in both surveys said they would give some type of medication. The majority stated they would give Western medications such as analgesics, antipyretics, and to a lesser extent, antimalarials. Antibiotics and traditional medications such as herbs were not commonly mentioned.

Less than 4% of respondents mentioned the traditional healer as the source of treatment for a febrile child. Hospitals as a source of treatment for all the illnesses studied diminished over time as clinic use increased in a consistent trend. Initially Area I had the indicated highest clinic use and Area IV the lowest. The highest preference for hospitals was consistently in Area IV which was near a government hospital.

Home nursing techniques such as sponging and bathing for fever showed an increase in all areas but particularly in Areas I and II. This may be the result of the health education programs in these areas.

A3.4.2 Diarrheal Disease

Table A3-5 shows that although there were various opinions about the causes of diarrhea, most were plausible such as eating the wrong amount of food, illness in general, bad food, pain in the stomach, or ingested dirt. Germs were rarely mentioned as a cause. Sickness in general as a cause of diarrhea increased over time in all areas. Teething as a cause was fairly prevalent and was mentioned by 10-30% of all respondents and decreased only slightly over time. Overeating as a cause of diarrhea was stated fairly often.

In all areas in 1977, a lower percentage said that they would give medition for diarrhea than in 1972. All areas showed about 20% decrease over time from 66-76% in 1972 to 42-56% in 1977. It was stated that traditional and indigenous medications would be used more often than Western medications such as analgesics, laxatives, antacids or antibiotics.

The use of herbal preparations as treatment for diarrhea was popular in all areas in 1972 with a four to sixfold decrease by 1977. Enemas as a form of treatment was initially widespread in Areas II, III and IV but diminished rapidly to 0-1% by 1977 in all areas. Only a small percent of

Table A3-5: Child Health Practices: Diarrhea

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	206	206	252	252	253	253	201	201
Cause of Diarrhea (one or more)								
Related to stomach	13%	13%	21%	11%	30%	15%	35%	9%
Sickness in general	24	25	15	31	14	28	26	38
Teething	21	21	10	25	8	21	18	30
Eats wrong amount of food	12	12	11	17	11	17	5	10
Eats bad food	23	23	23	20	13	12	23	17
Don't know	17	17	22	16	27	22	13	16
Give medications (one or more)	66	42	66	44	68	50	76	56
Western:								
Analgesics/antipyretics	12	19	7	19	6	10	1	3
Vitamin minerals	1	6	5	10	7	4	9	7
Diarrhea mixture	1	4	4	10	6	4	8	7
Laxatives/antacids	8	4	6	4	8	3	4	4
Anti-infective drugs	10	19	7	17	8	45	25	37
Traditional:								
Herbs	49	8	34	15	39	8	25	6
Vinegar	3	0	1	2	--	--	2	1
Other traditional medication	1	21	2	17	1	19	--	38
Enemas	8	0	36	1	26	1	26	1
Other medicines	--	--	--	--	--	--	--	38
Source of medical care								
Hospital	10	10	19	21	30	5	69	44
Clinic	87	87	79	84	65	68	29	52
Traditional healer	3	3	1	1	3	1	1	0

respondents stated that they would take the child to a traditional healer. A similar pattern of hospital versus clinic use was reported as was described for fever, with diminishing use of the hospital, particularly in Area IV.

A3.4.3 Measles

Table A3-6 suggests that ideas about the causation of measles were not well established, 51-70% of respondents stating initially that they did not know what caused measles. This category decreased to 41-47% over time. A widespread and persistent belief was that the cause of measles is related to the sun, heat or hot weather. Under 10% believed that measles is related to fever. Supernatural causes were mentioned by only 1-4% of respondents.

In the management and treatment of measles, 20-36% of respondents stated that they would use local medications with no significant change over time. The mention of modern medications declined from 12-18% in 1972 to only 2-3% in all areas by 1977. Forty percent in 1972 said that they would do nothing in the way of treatment at home, but this category decreased over time. The use of enemas and purges remained consistently between 8-14% in Areas II, III and IV. In Area I their use was the lowest initially and decreased even further by 1977.

In 1972, bathing of children with measles was reported by only 6-10% of respondents in all areas, increasing to 18-28% in 1977. In Area IV however, 82% of respondents still reported in 1977 that they would not bathe a child with measles. The main reason given for bathing the child was to reduce the rash. This was stated by 2-21% of respondents in all areas. The main reason stated for not bathing children with measles was that it would make the measles enter the body, a very prevalent belief, 70-82% of respondents stating this, in 1972. By 1977, 57-69% stated this reason for not bathing a child with measles. Also the advice of elders, not to bathe children with measles, was taken very seriously and was stated by 10-20% of all respondents in 1972, but decreased over time.

Over half of the respondents would give medication for the treatment of measles although this decreased over time. The use of traditional herbal medicines were mentioned with higher frequency in all areas than Western medications, but this decreased by 1977.

Table A3-6: Child Health Practices: Measles

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	206	206	252	252	253	253	201	201
What causes measles?								
Sun/heat/hot weather	37%	32%	36%	34%	22%	31%	19%	36%
Related to illness-fever	8	8	7	11	3	5	4	7
Supernatural	0	1	2	1	3	4	1	0
Other	4	12	4	11	12	19	6	11
Don't know	51	47	51	43	60	41	70	46
What is done for measles at home? (one or more)								
Modern medicines	12	3	7	2	14	2	18	2
Local medicines	21	22	36	33	25	25	25	31
Enemas	5	3	9	10	8	9	8	14
Topical medications	12	4	13	1	10	0	5	6
Traditional practice	--	17	--	15	--	6	5	15
Other	10	24	5	21	7	25	0	7
Nothing	40	27	30	18	36	33	43	25
Is the child bathed?								
Yes	10	28	6	25	8	23	6	18
No	90	72	94	75	92	77	94	82
Reason for bathing--reduce rash	4	16	2	5	3	21	2	9
Reason for not bathing								
Measles enters body	73	60	80	57	70	67	82	69
Elders say "don't bathe"	12	5	7	11	20	5	10	9
Give medications (one or more)	55	51	59	53	58	41	67	50
Western:								
Analgesics-antipyretics	1	10	1	5	1	5	3	8
Topical ointments	8	6	4	12	10	22	25	30
Laxatives	4	4	3	1	2	3	7	9
Antibiotics	--	4	--	2	--	7	--	5
Antimalarials	2	2	2	1	1	1	1	1
Traditional:								
Herbal mixture	39	25	49	41	44	17	44	15
Alcoholic beverage	10	3	13	5	19	3	6	1
Vinegar	27	29	15	13	11	16	7	5
Unspec. traditional medicine	8	16	9	21	11	26	11	35
Source of medical care								
Hospital	23	9	23	13	33	5	72	44
Clinic	75	89	76	82	63	88	27	55
Traditional healer	1	0	0	1	3	4	1	0

Table A3-7: Child Health Practices: Convulsions

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	206	206	252	252	253	253	201	201
What causes convlusions? (one or more)								
Sickness-fever	27%	34%	24%	19%	23%	7%	24%	21%
Related to stomach	8	2	3	1	2	2	13	4
Related to sun/heat	12	22	9	20	6	17	4	14
Atmosphere, lightening	1	1	7	2	2	6	6	2
Witchcraft, Jujuman	9	6	10	11	15	13	12	16
Other	0	8	4	7	4	1	5	0
Don't know	37	27	43	40	48	54	36	38
Medications given:	51	17	55	22	47	24	57	79
Western:								
Analgesics/antipyretics	0	32	2	4	0	2	0	3
Antimalarials	1	5	1	2	1	0	0	0
Topical medicines	1	6	1	2	0	0	0	0
Traditional:								
Herbs	59	5	46	16	56	7	54	5
Sugars	6	9	17	21	13	27	7	18
Other indigenous treatment	16	39	10	46	3	58	2	71
Enemas	7	0	5	4	5	2	4	0
Source of medical care								
Hospital	18	10	26	13	24	1	24	50
Clinic	60	52	38	39	39	43	43	27
Traditional healer	20	33	34	45	34	48	39	2

The traditional healer would rarely be consulted. The hospital as a source of treatment was generally low in all areas, except Area IV, with a further diminution of use and an increased clinic use over time.

A3.4.4 Convulsions

Table A3-7 shows that about 25% of respondents in 1972 attributed convulsions to sickness, especially those with high fevers. Sun, heat, hot weather were the next most commonly stated causes of fever. Beliefs in supernatural causes due to the Juju man or witchcraft were consistently expressed by 10-15% of all respondents in all areas. Only a small percentage in Area I attributed convulsions to worms or mosquitoes (appropos of cerebral malaria). The category "I do not know" was large, 37-48% of all respondents in all areas. There was a decrease in this category over time in Areas I and II.

For the treatment of convulsions about half of the respondents stated that "local" medications would be used, few said they would use Western medication. In over half of the group mainly traditional medications, such as herb mixtures were mentioned in 1972, however this form of treatment declined sharply over time, as did the use of medication in general. Sugar would be given by 6-17% of respondents and its intended use increased two to threefold over time.

A3.4.5 Worms and Vomiting

Although the question about worms and vomiting were combined, most of the responses were directed to worms. Table A3-8 shows that ideas about causation of worms and vomiting seemed clearly appropriate in Areas I and II, eating bad or dirty food cited as the leading cause in 27-38% of respondents. Eating and playing in dirt and eating the wrong food made up a relatively large category and increased over time, particularly in Area I. In general, ideas about causation were generally appropriate and not attributed to supernatural causes.

Except in Area I, over half of the respondents indicated that they would use medications to treat worms, particularly in Areas III and IV. Antepar and other worm expellers were the chief medications mentioned, in all areas with 32-48% of respondents indicating Antepar and 36-48%

Table A3-8: Child Health Practices: Worms and Vomiting

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	206	206	252	252	253	253	201	201
What causes worms and vomiting? (one or more)								
Eats bad (dirty) food	27%	37%	38%	32%	14%	12%	18%	36%
Wrong amount of food (overeats)	9	19	12	28	14	36	15	24
Too many sweets	8	10	4	10	5	10	2	5
Playing in or eating dirt, not washing hands	29	29	10	24	14	30	14	33
Related to stomach	3	1	5	2	4	1	12	2
Other	22	0	31	4	49	1	39	0
Give medications								
Western (one or more)	42	46	52	51	64	65	71	62
Analgesics-antipyretics	2	6	1	1	1	1	0	1
Laxatives/antacids	7	8	4	4	3	3	2	4
Antepar	35	36	43	33	32	40	48	34
Other worm expeller	36	39	36	56	49	51	48	53
Traditional								
Herb mixture	11	1	6	1	8	0	4	2
Other indigenous mixture	1	1	0	4	0	3	0	6
Enemas	1	0	5	1	4	0	1	0

indicating that they would use other worm expellers. Herbal mixtures and other indigenous medications were reported by 6-11% of respondents initially, decreasing to only a few percent by 1977. The use of enemas was reported in all areas, but diminished by 1977.

A3.5 MALE AND FEMALE FAMILY PLANNING KAP

The major findings of these surveys have been presented in Sections 7.4 and 8.10. Further results are shown in Tables A3-9 to A3-10.

Table A3-9: Selected Results of the Female Family Planning KAP Survey Not Presented in Sections 7 and 8

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	331	331	352	352	339	339	302	302
Approve of family planning?								
Yes	70%	89%	69%	86%	70%	85%	76%	88%
No	26	7	27	9	27	7	17	4
Uncertain	4	4	4	5	4	8	7	8
Have heard of the following family planning methods (prompted response)								
Abstinence	83	89	86	97	84	98	91	98
Breastfeeding	43	55	54	63	53	73	60	67
Rhythm	75	81	82	91	72	91	82	97
Withdrawal	51	67	50	68	38	70	56	74
Condom	62	84	64	80	46	72	59	71
Foam	31	69	34	65	17	51	32	48
Diaphragm		37		39		32		30
Pills	72	92	72	91	50	80	64	86
I.U.D.	57	90	62	91	48	80	57	79
Female sterilization	80	80	86	91	75	89	86	89
Male sterilization	NA[a]	17	NA	19	NA	21	NA	9
Self or partner ever used any of the following F.P. methods (including current use)								
Abstinence	1	5	7	8	6	7	10	6
Breastfeeding	1	0	1	1	0	0	0	1
Rhythm	3	5	6	5	2	5	1	5
Withdrawal	1	2	5	1	1	0	3	0
Condom	3	5	1	2	1	2	2	0
Foam	2	5	1	3	0	2	1	3
Diaphragm		0		1		0		0
Pills	5	21	3	16	1	5	4	5
I.U.D.	1	5	0	1	0	1	0	0
Female sterilization	1	2	1	1	0	0	0	1
Male sterilization	NA	0	NA	--	NA	0	NA	0
Sources of services for those ever using a modern method								
Danfa F.P. clinics	NA	70	NA	66	NA	50	NA	7
Government clinic	NA	17	NA	22	NA	38	NA	60
Private clinic	NA	0	NA	16	NA	0	NA	7
Commercial source	NA	5	NA	3	NA	0	NA	20
Friend or relative	NA	7	NA	3	NA	12	NA	6
TBA or volunteer	NA	0	NA	0	NA	0	NA	0
Other	NA	1	NA	0	NA	0	NA	0

Table A3-9: Selected Results of the Female Family Planning KAP Survey Not Presented in Sections 7 and 8 -- Cont'd.

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
Source of information about family planning								
HEA	NA	13%	NA	7%	NA	0%	NA	0%
F.P. team		29		34		28		9
H.C. team		23		5		4		11
Spouse		0		1		1		1
TBA		0		0		0		0
Radio/TV		2		3		2		6
Newspaper/magazine		0		1		1		1
Friend/relative		31		40		55		63
Other		3		8		7		9
Don't remember		0		1		2		0
Are self or partner now using any of the following methods?								
Abstinence	NA	0	NA	1	NA	0	NA	0
Breastfeeding	NA	0	NA	0	NA	0	NA	0
Rhythm	NA	1	NA	1	NA	0	NA	0
Withdrawal	NA	0	NA	0	NA	0	NA	0
Condom	NA	3	NA	1	NA	1	NA	0
Foam	NA	2	NA	1	NA	1	NA	0
Diaphragm	NA	1	NA	0	NA	0	NA	4
Pills	NA	13	NA	7	NA	2	NA	0
I.U.D.	NA	2	NA	1	NA	0	NA	1
Female sterilization	NA	2	NA	1	NA	0	NA	0
Male sterilization	NA	0	NA	0	NA	0	NA	0
Summary of F.P. use								
% ever using modern method[b]	11	34	7	21	2	8	8	9
% now using modern method[b]	NA	18	NA	9	NA	2	NA	5

[a]NA = not asked.

[b]Modern method includes condom, foam, diaphragm, pills, I.U.D. or sterilization.

Table A3-10: Selected Results of the Male Family Planning KAP Survey Not Presented in Sections 7 and 8

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
No. of Respondents	244	244	238	238	246	246	242	242
Approve of family planning?								
Yes	63%	86%	65%	90%	65%	88%	70%	94%
No	36	11	31	7	33	6	24	7
Uncertain	2	3	4	3	2	6	14	7
Have heard of the following family planning methods (prompted response)								
Abstinence	86	86	85	96	85	96	90	98
Breastfeeding	47	49	45	60	53	71	62	67
Rhythm	76	80	82	89	83	93	79	94
Withdrawal	66	71	63	80	61	75	69	84
Condom	78	89	77	92	61	81	75	84
Foam	31	58	37	67	23	60	34	60
Diaphragm		28		37		28		37
Pills	68	88	69	88	55	82	64	85
I.U.D.	59	84	56	84	49	79	54	78
Female sterilization	85	80	83	86	75	85	87	84
Male sterilization	NA[a]	26	NA	27	NA	26	NA	15
Self or partner ever used any of the following F.P. methods (including current use)								
Abstinence	7	7	10	8	14	6	17	6
Breastfeeding	0	2	2	0	1	0	0	0
Rhythm	7	4	9	3	6	4	5	3
Withdrawal	7	1	3	2	5	2	5	1
Condom	7	15	6	11	2	7	4	4
Foam	2	9	2	8	0	6	2	4
Diaphragm		0		0		0		0
Pills	5	10	2	7	1	2	2	2
I.U.D.	0	3	0	0	1	0	0	0
Female sterilization	1	1	1	0	0	0	0	0
Male sterilization	NA	0	NA	0	NA	0	NA	0
Source of services for those ever using a modern method								
Danfa F.P. Clinics	NA	73	NA	63	NA	64	NA	0
Government clinic	NA	9	NA	11	NA	14	NA	55
Private clinic	NA	3	NA	5	NA	0	NA	0
Commercial source	NA	9	NA	16	NA	22	NA	45
Friend or relative	NA	6	NA	5	NA	0	NA	0
TBA or volunteer	NA	0	NA	0	NA	0	NA	0
Other	NA	0	NA	0	NA	0	NA	0

Table A3-10: Selected Results of the Male Family Planning KAP Survey Not Presented in Sections 7 and 8 -- Cont'd.

	Area I		Area II		Area III		Area IV	
SURVEY YEAR	1972	1977	1972	1977	1972	1977	1972	1977
Source of information about family planning								
HEA	NA	7%	NA	7%	NA	0%	NA	0%
F.P. Team		26		32		26		16
H.C. staff		22		1		4		6
Spouse		2		1		2		0
TBA		0		0		0		0
Radio/TV		2		3		6		6
Newspaper/magazine		3		3		1		2
Friend/relative		30		39		48		57
Other		6		11		11		12
Don't remember		0		1		1		1
Are self or partner now using any of the following methods?								
Abstinence	NA	1	NA	0	NA	0	NA	0
Breastfeeding	NA	0	NA	0	NA	0	NA	0
Rhythm	NA	1	NA	1	NA	0	NA	0
Withdrawal	NA	0	NA	1	NA	0	NA	0
Condom	NA	8	NA	4	NA	4	NA	2
Foam	NA	4	NA	4	NA	3	NA	1
Diaphragm	NA	0	NA	0	NA	0	NA	0
Pills	NA	7	NA	3	NA	2	NA	2
I.U.D.	NA	2	NA	0	NA	0	NA	0
Female sterilization	NA	1	NA	0	NA	0	NA	0
Male sterilization	NA	0	NA	0	NA	0	NA	0
Summary of F.P. use								
% ever using modern method[b]	16	30	10	23	4	12	9	10
% now using modern method[b]	NA	14	NA	8	NA	6	NA	5

[a]NA = not asked.

[b]Modern method includes condom, foam, diaphragm, pills, I.U.D. or sterilization.

A3.6 MORBIDITY SURVEY

The major findings have been presented in subsection 5.7.18.

A3.7 FERTILITY SURVEY

Because of sample size, the commonly used Brass methods of correction are not possible. The fertility results of the census and vital events registration appear to be more accurate estimates of fertility rates. For that reason, the results of the longitudinal fertility sample survey are not presented here.

Danfa Project
Final Report
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APPENDIX 4: VILLAGE HEALTH SURVEY

(A4-1)

A4.1 Background of the Village Health Survey (A4-1)

A4.2 Objectives of the Village Health Survey (A4-3)

A4.3 Methodology of the Village Health Survey (A4-3)

A4.4 Selected Findings from the Village Health Survey (A4-12)

A4.5 Implications of the Village Health Survey Findings (A4-20)

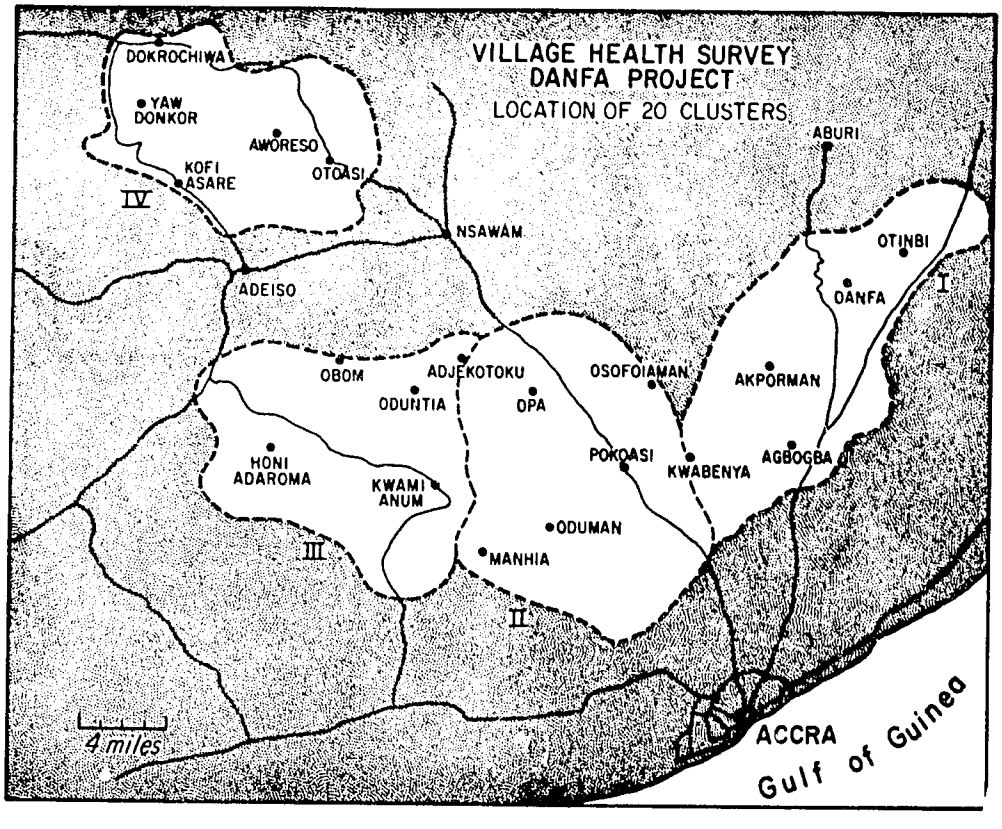
A4.6 Recommendations about Future Village Surveys (A4-21)

APPENDIX 4: VILLAGE HEALTH SURVEY

A4.1 BACKGROUND OF THE VILLAGE HEALTH SURVEY

The Village Health Survey (VHS) is both a planning and evaluation component of the Danfa Project. The baseline Village Health Survey was carried out in early 1973, in a randomly sampled cluster of twenty rural villages containing over 3700 subjects. In the selected households, members of all ages were interviewed and later given a medical examination. To determine the trend for selected conditions such as malaria and malnutrition initial survey results were compared to findings in resurveys of 4000 subjects. These resurveys were conducted in 1975 and 1977 in the same villages and households. See Figure A4-1.

Figure A4-1: Map Showing the Location of the 20 Village Clusters



People who use survey information about health status include program operators, district medical teams, and health administrators. Some of the questions such planners ask about health status include:

- What is the current disease pattern in this district?
- What age groups are affected by common communicable diseases or malnutrition?
- Are there seasonal disease peaks which would affect scheduling of education and program activities?
- Where can such health status information be obtained?

The VHS is one method the Danfa Project used to provide such information. The Project already had access to other health status information. For example, hospital diagnostic statistics told us which serious diseases hospitalized patients had, as well as common causes of death. Outpatient and Health Center statistics revealed the more frequent diagnoses and seasonal patterns for both acute conditions and epidemic outbreaks.

However, there are limitations to clinic-based health information. National health statistics, based on patient diagnoses, tend to be aggregates of a wide variety of reporting units. Such information is often incomplete or out-of-date. In areas where there are few health facilities such data give a misleading picture of the actual type and frequency of disease. There are also gaps in the regularity with which patient information is reported to district, regional, and federal statistical units. Therefore, a well-organized sample survey of the rural population may add to available information in several ways. As a multipurpose survey, the Village Health Survey produced a variety of information about the frequency of disease, utilization of available clinics and immunization program coverage. Because disease-oriented information is the most useful type of health status information for designing and evaluating programs and services, the VHS was designed to help a district medical officer identify major health problems in selected communities and by extrapolation, to a district or a regional population.

A4.2 OBJECTIVES OF THE VILLAGE HEALTH SURVEY

There are four objectives of the Village Health Survey:

(a) The main purpose of the VHS was to obtain accurate, up-to-date information about the health of residents in selected rural communities. This information was needed to guide Project MCH and family planning programs.

(b) Health status information was also needed to develop relevant training programs for MCH and family planning workers.

(c) The VHS was also designed to determine utilization rates and barriers to access to clinical care. While available Health Center patient statistics showed which communities were under-utilizing the clinic, only interviews with non-users explained why they could not use the services. Such information is necessary to plan the location of satellite or mobile clinic programs. When these cannot be developed, underserviced communities have a special need for primary health care programs using village health workers.

(d) The VHS also provided estimates of district immunization program coverage by age group.

A4.3 METHODOLOGY OF THE VILLAGE HEALTH SURVEY

A4.3.1 Selection of the Survey's Content

The first task in designing any survey is to find out who wants information and what they need to know. We first interviewed personnel at the University of Ghana School of Medicine and the Ghana Ministry of Health to ask what health information they needed to plan programs. Based on their responses, a list of diseases, including diarrhea, malaria, malnutrition, and intestinal parasites was considered for inclusion in the VHS. Consultants also wished to know how often children in different age groups received immunizations, the number of times a clinic was visited each year, and later on in the Project they asked about the pregnancy outcome of women who lived in the Danfa Project district. In reviewing their suggested questions we used a single selection criterion: could the survey information be directly applied to specific programs which the Project district resources could sustain?

After obtaining this information about the kinds of planning data which people wanted, each recommended condition was subjected to several criteria before including it in the preliminary survey content:

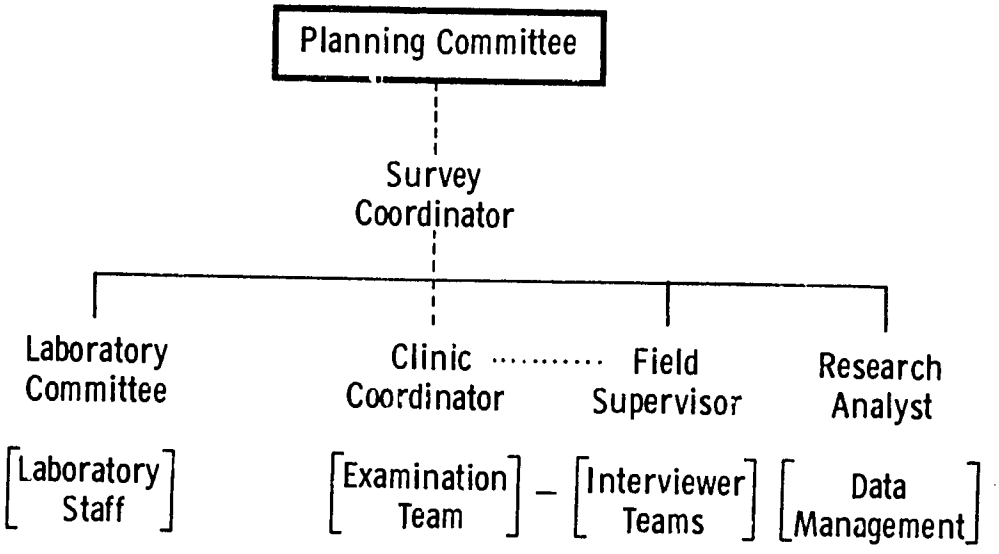
(a) Will the proposed item be useful to evaluate either public health or health education programs?
(b) Will the proposed item be relevant to a major health problem in the Danfa District?
(c) Can reliable information about the item be obtained under actual field conditions? How much time will be required to carry out the procedure? What special examiner skill and experience will be needed?
(d) Could information about the item be processed by existing laboratory facilities and other support personnel?

Besides questioning the usefulness and reliability of each proposed survey item, we were concerned about how acceptable the proposed test or procedure would be for a volunteer subject. In addition, many of the items used in the initial 1973 VHS were deleted in the resurveys because diagnosis of the condition was found to be infrequent or inaccurate.

A4.3.2 Survey Personnel

Figure A4-2 shows the various VHS planning and operational units. A planning unit with representatives from several departments in the Ghana Medical School and the Ministry of Health made the preliminary preparations for the survey. Then a survey coordinator was selected and assigned responsibility to order equipment and supplies, train field staff, arrange support programs (transportation, laboratory, and data processing), conduct a pretest of VHS procedures, and coordinate the actual field survey. At the end of the survey the coordinator prepared a preliminary report which was submitted to the health authorities.

Figure A4-2: Village Health Survey Personnel



A clinic coordinator was designated to supervise the examination team. Since the coordinator made the initial contact with study villages and helped to influence people to participate in the survey, he was critical in developing a high response rate.

A laboratory technologist acted as a liaison between survey personnel and laboratory staff, and coordinated the reporting of laboratory results. A research analyst was in charge of the group that edited, coded, and keypunched the completed examination forms at the end of the survey.

A4.3.3 Materials and Supplies

Survey field equipment included weight scales, skin calipers, measuring tapes, ophthalmoscopes, stethoscopes, and specimen collection materials, containers, and storage supplies. Supplies and materials arrived six to nine months after they were requested.

Several survey forms were prepared, including pre-coded medical examination forms, laboratory worksheets, prescription forms, and standard referral letters used to accompany patients to district hospitals from the survey site. The Medical School also supplied a standardized inventory of drugs which was taken to each village surveyed. These drugs are shown in Table A4-1.

Table A4-1: Standardized Inventory of Drugs Used in Village Health Survey

1.	Chloroquine	7.	Gentian Violet
2.	Aspirin	8.	Sulfa Eye Ointment
3.	Piperazine	9.	Triple Sulfa
4.	Ferrous Sulfate	10.	Penicillin
5.	Multiple Vitamins	11.	Benzyl Benzoate
6.	Cough Syrup	12.	Kaolin Mixture

Two vehicles were used in the field to transport staff. A third vehicle was used by the clinic coordinator to transport supplies between clinics, to return completed examination forms to the survey base office and to take specimens to the laboratory unit.

A4.3.4 Selection of the Village Health Survey Sample

A cluster sampling method was used to yield five villages in each of the four Project areas for a total of twenty villages. There were several advantages to using the cluster sampling approach:

(a) It was easier to use a central examination site for each cluster of households so that we could deliver heavy survey screening equipment and the field staff to a single collecting point. It would have been extremely difficult to visit separate households dispersed over a wide area.

(b) Clusters of households also enabled us to improve the quality of work because supervisors were able to check on interviewer and examiner performance at the centralized site.

(c) In the follow-up resurveys in 1975 and 1977 we were able to easily identify a cluster of households and therefore re-examine the same households at each resurvey. The Project statistical consultant recommended 200 persons as an optimal size for each cluster to sample, or about 40-50 households. When we selected a village which had a larger number of households, only 40-50 households were visited and those persons asked to attend the survey. While other residents were permitted to attend, they were not included in the final survey analysis.

To make a frame for sampling purposes, we assumed that larger communities differed from the smaller villages in several ways. We assumed that residents of larger communities had different occupations, higher educational levels, and better access to health services. Therefore, villages with less than 400 persons were listed as small communities, while villages with over 400 residents were defined as large villages.

In each cluster, important persons, such as the chief and other officials, were always invited to attend the survey. When they were not part of the selected 40-50 households, their examination results were not included in our final survey analysis.

To obtain a high response rate in the VHS we carried out a staged series of communications aimed at governmental officials, community leaders, local school teachers, and selected households in the survey area. Two months before the scheduled field survey we talked to regional and local health authorities so that they were familiar with the VHS objectives and how the anticipated survey information might be used. We obtained letters from them which authorized us to work in the district where the survey was to be held. One month before the survey we sent an information letter to the involved local authorities. Two weeks before the survey local schools which were near the study villages were visited by field staff with a letter from the Ministry of Education which authorized school children to be excused from school on the days of the survey. In many instances we used the school building as the clinic site and asked the teachers to voluntarily assist us in guiding people through their buildings.

Most important of all, shortly before the survey in a selected village, our field supervisor met with the village elders and other community members to explain the survey's purpose. We told them how their community was selected and what the dates would be for the interview and clinic. The village leaders were then asked to recommend the best site for the clinic location and the best day for them to attend the survey. They were asked to assume the responsibility to build a shaded waiting area near the clinic, provide a loan of benches and tables, and recruit three or four volunteers from the village to assist at the clinic. These initial pre-survey contacts enabled the community to ask questions and enabled us to resolve potential problems. One community we visited was not receptive to the survey because of traditional medicine attitudes, so we selected an alternative community.

Survey interviewers stressed the benefit to each individual of having a complete medical examination by a team of a physician and nurses in their own village.

The VHS timetable was designed so that the visits would be made during the dry season. Remote villages are often inaccessible during the rainy season, and farmers are very busy planting and weeding. Usually we surveyed two villages each week, spending two days in each village with an intervening day as a break to replenish our drugs and regain our strength. Because rural farmers leave their villages to work in their fields early, we tried to arrive in villages before seven each morning. With increasing experience, we could competently examine up to 200 subjects each day. But it was difficult to process more than 200 and the subjects had long waiting times.

A4.3.5 Training Survey Staff

Two weeks before commencing the pilot study, the screening examination team met to discuss the general survey objectives and the proposed field schedule, review the examination form, define diagnostic terms, and describe examination procedures using a survey procedure manual, Danfa Project Monograph No. 9, 1975.

All interviewers were trained to record information reported by the examiner as each subject was seen. Four interviewers were also trained to take blood pressure and anthropometric measurements. Pretest surveys were carried out in two schools and two representative non-survey villages. Pretesting was used to improve the clinic operation, learn about volunteer subject's reaction to examination, and train the team under realistic field conditions. From these pretests we learned that people were dissatisfied unless each examiner paid special attention to the subject's current health complaint rather than simply ticking off an examination form. Attending villagers expected some kind of medication to recompense them for attending the clinic.

A4.3.6 Data Processing

In the field each completed examination form was checked for omissions, legibility, and inconsistencies. At the end of each clinic day the clinic supervisor noted any errors and asked the responsible examiner to clarify the

problem. It was often possible to recheck subjects before leaving the community when the findings were uncertain.

The edited examination forms were coded and stored at a survey "base camp." After laboratory results became available, additional information was added to the forms. The numerical information was then transferred to punchcards which were run through a counter-sorter to determine a frequency distribution. The University of Ghana computer was used to produce cross-tabulations to show the age and sex distribution of selected diseases. In the 1977 VHS, a modified and much shortened screening examination form was used, with prearranged computer programs which expedited production of survey tabulations.

A4.3.7 Clinic Operation

The survey examination was conducted in buildings which the community had selected. In two-thirds of the villages we used the school building.

Five clinic stations were placed in rooms based on the need for light, space, reduced noise, and privacy requirements (See Figure A4-3). Since the dispensary was a most important reason for attendance, it was always placed outside the building where it could be easily seen by people considering attendance. Blood collection procedures were conducted in a small enclosed room to minimize apprehension.

The screening examination included height, weight and skin fold tests and an inspection for skin conditions, an eye, ear, nose and throat examination, an examination of the abdomen, particularly noting spleen enlargement, and a general check for gross deformities (See Table A4-2). Treatment was then prescribed for each participant.

One-quarter of the attending subjects had additional tests performed including a malaria blood film and a stool parasite examination. In the baseline survey several other lab tests were done to determine prevalence of anemia, hypertension, previous childhood infections (by serology tests), and schistosomiasis.

The dispensing nurse used a standard drug inventory (Table A4-1) including prepackaged tablets.

Figure A4-3: Patient Flow in the Village Health Survey

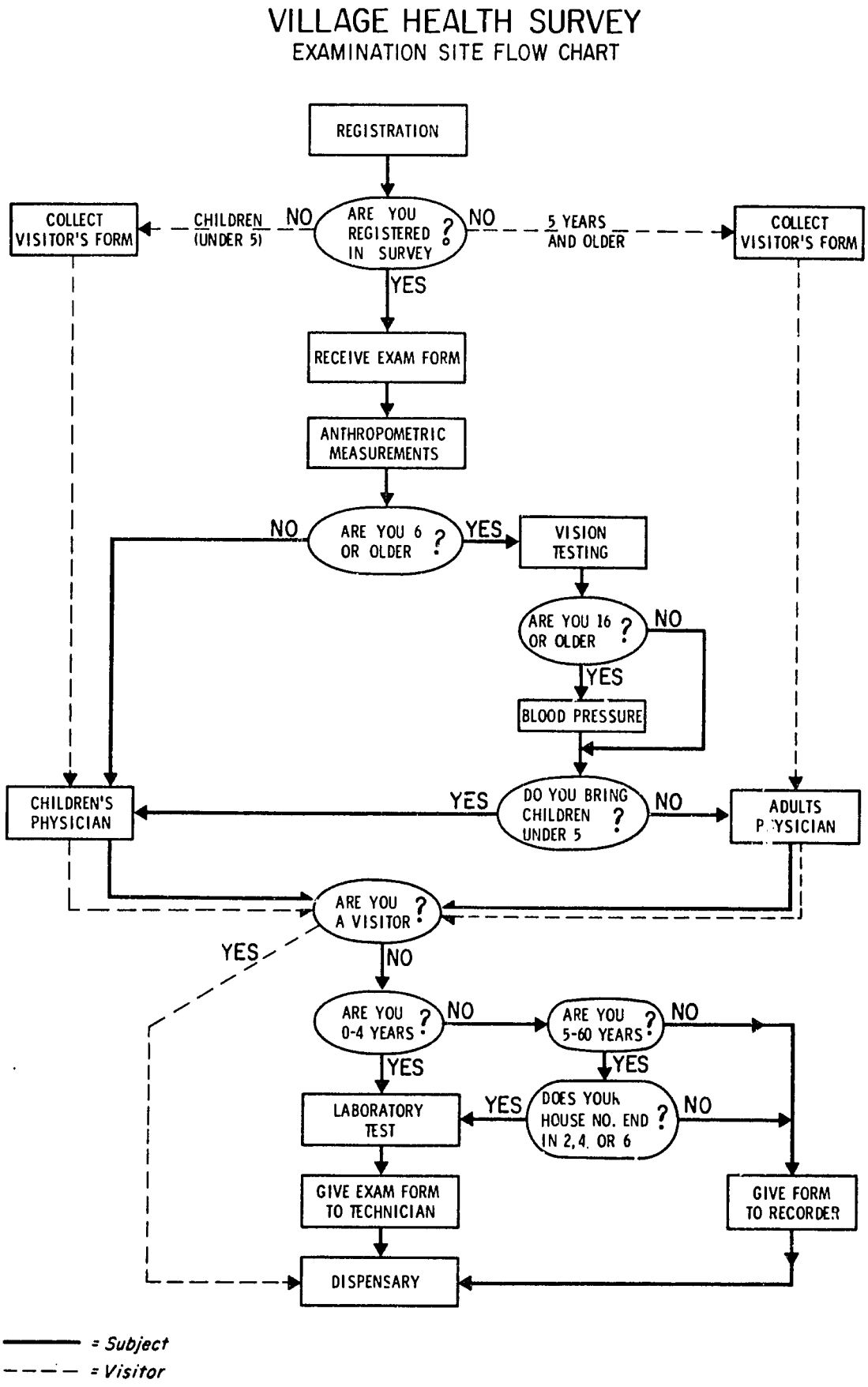


Table A4-2: Contents of the Baseline Medical Examination Form, 1973

Interview Section

*Information about the subject

*History of measles and immunization status in under-fives

Household environment

*Clinic attendance during the past 12 months

Medical Examination Section

*Height, weight, skinfold measurements

Eye examination, including visual acuity for six and above

Ear, nose, throat, and neck

Skin (including tuberculin test)

*Abdomen (also fever, diarrhea)

Cardiovascular examination

Neurological check

*Deformities and incapacitating conditions

Laboratory Section

*Malaria film

Hemoglobin, hemoglobin type, WBC count

*Stool ova and parasites

Stool culture for under-fives

Urine examination

Biochemistry (subsample for protein, other tests)

Serology (subsample for measles, polio, etc.)

---

*Only portions of the baseline survey were used in 1977. An asterisk indicates items included in the 1977 Village Health Survey.

There were three types of people attending each clinic. Patient flow through the clinic area was based on the category of the visiting subject. People who had been selected for the survey were sent through all five clinic stations and had the usual survey examination form filled out. Drop-in visitors with a specific complaint were sent directly to an examiner and then to the dispensary (Figure A4-3). Influential people from the community who were not in the sample often were asked to come to receive treatment and lend their support to the survey.

Clinic "close down" activities included the collection of completed examination forms and laboratory specimens and making an inventory of clinic equipment, drugs, laboratory supplies and record forms. Laboratory specimens were registered, packed, and transferred to the backup laboratory. Any operating problems which arose were discussed so that the next examination site would be run more effectively. Before leaving the community, a courtesy visit was always made to the chief and his elders to express our thanks for their cooperation and support.

A4.4 SELECTED FINDINGS FROM THE VILLAGE HEALTH SURVEY

The initial analysis of the VHS was based on conditions which were frequently encountered at the Danfa Health Center. Diagnoses which were made most frequently were identified by reviewing the 1970-71 Danfa Health Center statistical information. These are shown in Table A4-3.

Table A4-3: Frequent Danfa Rural Health Center Diagnoses

Malaria, P.U.O.	20.2%
Intestinal parasites	16.3
Diarrhea	13.8
Skin conditions	13.5
Musculoskeletal sx	9.9
Respiratory diseases	7.0
Miscellaneous	19.3
	100.0

A4.4.1 Malaria

The VHS did not provide adequate malaria information for guiding the district malaria control program. Since this survey was done during the dry season when there was less splenomegaly and rather low parasitemia rates, special studies had to be conducted throughout the year in the Project district to show the actual prevalence of malaria. However, information from

the VHS did show that high spleen rates were found in children up through age nine, an older age group than we had anticipated. District chemoprophylaxis programs were then extended beyond the preschool age group to include primary school children. The VHS confirmed previous reports that P. falciparum was the predominant malaria species.

A4.4.2 Intestinal Parasites

In the 1973 VHS, 47% of subjects had Ascaris. There was a plateau of about 60% prevalence from age five to age nineteen. Thirty-nine percent of stool specimens contained hookworm ova with a peak prevalence rate of 60% in the 10-19 year old age group. Only 5% of the sample had Strongyloides and less than 1% had Trichuris and Giardia. No stool samples contained E. histolytica. In subsequent secondary analysis we found that hookworm was not a significant factor in people who had anemia, probably because hookworm loads were quite light.

A4.4.3 Diarrhea

Diarrhea, defined as four or more stools during a preceding 24-hour period, was reported in only 3% of the subjects in the baseline survey. Routine stool cultures did not reveal the bacteriologic etiology.

A4.4.4 Skin Disorders

Pyoderma was diagnosed in 16-19% of subjects examined between 1973-77. One-fifth of these persons also had ulcers on their lower extremities and several had complications, particularly cellulitis. Only 4% of subjects had evidence of recent skin injuries and less than 1% had recent burns.

Less than ten people had leprosy diagnosed in the survey including one who had the lepromatous form. Guinea worm disease was diagnosed in less than 15 persons, but we later learned that the peak transmission period was missed by the VHS.

An important finding was a rise in infectious yaws from eight cases in 1973 to 48 in 1977. The peak rate occurred in 14-19 year old residents, usually living in villages near Nsawam.

A4.4.5 Schistosoma hematobium

In the 6-40 year old group which was most likely to be infected, urine samples were collected at the clinic. Six percent of samples contained Schistosoma ova. The highest infection rates were in the 10-14 year olds with 12% and 14% in the 15-19 year olds. More males than females were affected. Most cases lived near villages on the Densu River or its tributaries.

A4.4.6 Respiratory Infections

The VHS underestimated the annual prevalence of respiratory infections and measles, which Danfa Health Center health records showed to occur primarily in the second half of the year. Two persons with active pulmonary tuberculosis and one with spinal tuberculosis were diagnosed in the 1973 survey.

Tuberculin skin testing in the initial survey showed that less than 10% of children below age 15 had positive skin tests. After age 15 there was a gradual rise to about 50% positive tests after age 45.

A4.4.7 Malnutrition

The simplest anthropometric measurement, arm circumference, showed that 35% of 1-5 year old children had values below 14 cm. For additional information about malnutrition, see Section 5, "Health Status."

A4.4.8 Other Disease Information Collected

While the VHS had a primary responsibility to acquire information about preventable diseases and malnutrition, we also needed information about the extent and kind of disabling or handicapping disorders. In the future there may be adequate resources in Ghana to support programs to deal with these problems in rural areas.

Distance visual acuity was tested on all subjects aged six or older. Vision in school-aged children was found to be quite good: almost 90% had normal distance vision, in contrast to only 75% in U.S. school children surveys. Two percent of all tested subjects had severe impairment in one eye or both with scores of 20/400+, almost always in older people. Most of the people with severe eye disabilities had cataracts, while several had corneal opacities due to eye injuries. There were no cases of vitamin A deficiency or trachoma with pannus formation.

The major handicap in school age children was post-poliomyelitis paralysis. The VHS paralytic polio rates varied between two to four per thousand in the school age group. Subsequent epidemiologic studies were expanded to include a larger sample of school children throughout Ghana which disclosed that seven out of each thousand 6-15 year olds had post-polio paralysis. We did not see any cases of spastic paralysis during the three surveys. Three persons over age 65 had hemiplegia, presumably due to a cerebrovascular accident. Since both spastic paralysis and CVA may have poor survival rates in a rural environment, the actual incidence is presumably higher.

Of less importance for preventive programs but of future interest were several VHS studies about other health problems. Indirect inguinal hernias were detected in 7% of rural males aged 20 and older. Hypertension, an increasingly frequent diagnosis in urban African hospitals, was uncommon in the Danfa district. Of the 16-55 year old adults screened for hypertension, 2.5% had diastolic blood pressures of 95 or higher.

Thirty percent of subjects had periodontal disease, with more serious forms associated with increasing age. Many middle-aged and older adults were edentate.

Five hundred thirty-five adult males were interviewed about their current smoking habits. Seven percent were pipe users, and 41% reported smoking cigarettes. Only 16% of the male adult population smoked 10 or more cigarettes a day. Varicose veins were infrequent, with only 2% of adults having prominent lower extremity veins, usually on a single extremity. None had evidence of venous insufficiency. Overt cardiac disease and congestive heart failure were also infrequent. Severe anemia (below 7 gm. %) was rare, although moderate anemia (7-10 gm. % hemoglobin) was present in one-quarter of the 0-4 year old age group, and in one-tenth of both 5-9 year olds and 5-29 year old women who were tested.

A4.4.9 Utilization Rates

Besides disease prevalence the VHS provided information about participation in immunization programs and attendance at clinics. Informants reported that 15-18% of 0-4 year old children had been given measles vaccine. In the baseline survey of 1973, 9% of all subjects had BCG scars, with higher rates in adults. These results suggested immunization services in the Danfa district were underutilized.

Children four years and under use clinics three times as often as the overall population rate of one visit per year. Reported clinic attendance remained constant during the 1973-77 period. In 1973, 55% of all subjects were non-attenders, compared to 49% by 1977. Frequent users, here defined as three or more visits each year, rose from 15% of the baseline survey population to 23% frequent users in the 1977 survey. Areas I and IV of the Danfa district had higher utilization rates than residents in Areas II and III.

A4.4.10 Summary of Results from Village Health Survey

A summary of selected results from the Village Health Survey follows. Use the figure of approximately 4000 subjects per survey to estimate actual case numbers.

Table A4-4: Summary of Results from Village Health Survey

INFORMATION CATEGORY	PREVALENCE	COMMENTS
A. TRACER CONDITIONS		
1. Malaria	Spleen rates ranged from 20-28%; high rates were present through age 10	95% of positive films had P. falciparum; age distribution suggests meso- to hyperendemic transmission pattern
2. Malnutrition	See anthropometric data Section 5, "Health Status"	One-third of 1-5 year old children had mild undernutrition (arm circum.)
B. UTILIZATION RATES		
1. Clinic visits	No visits/1 yr.: range 49-59%; 3 or more visits yr. rose from 15-23%	Area I (Danfa) had half as many non-users; 75% more high users
2. BCG scars	Slight increase from 9-16% overall rate	(1)
C. GENERAL ILLNESS		
1. Fever	2.4% of subjects had oral temp. 100+° F.	Significance unclear due to tropical temperature and dry season fever
2. Diarrhea	3% reported 4+ stools within 24 hours	No bacterial etiology determined

INFORMATION CATEGORY	PREVALENCE	COMMENTS
3. Illness	40% alleged illness during preceding 2 weeks	Two times rate reported during interview survey (2)
D. SKIN DISORDERS		
1. Pyoderma	Range 16-19%, peak in children	(3,4)
2. Leg ulcer	3-4% prevalence	
3. Guinea worm	0.2-0.5%; peak in young adult male farmers	(5,6)
4. Burns	0.4%; chiefly in children, sometimes epileptics	
5. Trauma	4%	Often led to large ulcer
6. Scabies	Under 1%	
7. Pediculosis	About 5%	
8. Dermatomycosis	Majority T. versicolor - 11%	
9. Yaws	0.2 rose to 1.1%	Fivefold rise in 4 years, part of nationwide increase
10. Leprosy	0.2%	10% lepromatous form; almost all covered by treatment
11. Misc.	Buruli ulcer diagnosis in pretest villages	2 active typical ulcerations on trunk; scars in children
E. EXTREMITIES		
1. Post-polio paralysis	Range 0.2-0.4%	Detection increased with interest (7)
2. Hand/foot deformity	0.7%	Chiefly finger contractures; infrequent loss (e.g. ainhum)
3. Missing arm/leg	.05%	
4. Superficial varicosities	Less than 2% of adults	Usually unilateral; no signs of deep venous disease
5. Pedal edema	0.8%	Predominately postural

INFORMATION CATEGORY	PREVALENCE	COMMENTS
F. HEENT		
1. Visual acuity (distance)	2.3% 20/400+	Increase with aging; often unilateral
2. Corneal opacity	0.4%	
3. Cataract	1% of adults	Presumptive diagnosis made on direct examination
4. Trachoma	None	No evidence of pannus formatio
5. Hypovitaminosis A	None	No Bitot's spots, xerosis
6. Purulent conjunctivitis	1-3% during surveys; predominantly children	
7. Otitis media	As high as 3% of preschool children	
8. Ear discharge	0.7%	Further work necessary to differentiate drum perforation from external otitis
9. Diminished hearing	7%	Usually unilateral; crude field test with rubbed fingers
10. Goiter	0.3%	Only two grade 3; appeared to be euthyroid
G. RESPIRATORY		
1. URI	3% of preschoolers	
2. Pneumonia	0.1%	
3. Pulmonary TB	0.1%	Presumptive with hemotysis, apical rales, chronicity
4. Tuberculin test +	10% below age 15	Rise to plateau of about 50% by middle age (1)
5. Cigarette smoking	41% of adult males	Only 1/8 smoke over 10 cig/day
H. NERVOUS SYSTEM/MENTAL		
1. Cerebrovascular accident	1% of 65+ population	
2. Seizure history	4.5%	Increase partly explained by febrile convulsions, obstetrical care

INFORMATION CATEGORY	PREVALENCE	COMMENTS
3. Mental retardation	0.2%	Gross clinical impression
4. Parkinsonism	Diagnosis in pre-test village	Classical signs in 55 y.o. man
I. CARDIAC		
1. Hypertension	2.5% of 16-54 y.o. group had diastolic BP 95+	(8)
2. Cardiomegaly	1.6% of adults	Definition - PMI displaced lateral to ant. axillary line
3. Significant murmur	0.5%	Mitral (16 MR; 2 MS; 2 both); aortic (3 AR) murmurs; possibly related to cardiomyopathy
4. Congestive cardiac failure		1 middle-aged woman
J. ABDOMINAL		
1. Splenomegaly	20-28% had palpable spleen	Predominant cause is malaria; no S. mansoni, kala azar in Project district
2. Hepatomegaly	3.7%	Definition - palpable 3+ cm below costal margin; included 5 persons with probable infectious hepatitis
3. Inguinal hernia (indirect)	7% of 20+ males	Has been leading cause of acute intestinal obstruction (9)
K. LABORATORY PROCEDURES		
1. Hemoglobin type Anemia	AS in 16%; AC in 11% Below 10 gm % - 1/4 of 0-4 y.o. 1/10 of 5-9 y.o. and 15-29 y.o. women	(10)
2. Intestinal helminths	Ascaris 46% Hookworm 38%	Trichuris infrequent; no S. mansoni; no E. histolytica Light hookworm loads without related anemia (11)
3. Urinary S. hematobium	9% of 6-40 y.o.	
4. Bacterial stool cultures	2% of 0-4 y.o. had Shigella or Salmonella spp.	Treatment of majority of diarrhea in children is non-specific

A4.5 IMPLICATIONS OF THE VILLAGE HEALTH SURVEY FINDINGS

Malaria is the dominant communicable disease problem in the Danfa District. At least 30% of all Health Center visits are caused directly or indirectly by malaria with a clear seasonal peak in the second half of the year after the heavy rains. Since the predominant species is falciparum, chloroquine is used for treatment. Due to the impact of malaria on young children and pregnant women who may miscarry, anti-malaria chemoprophylaxis is recommended in the Project district.

The pattern of infection with intestinal parasites detected during the VHS did not appear to cause significant disease. Of particular importance, hookworm anemia is not a problem in the Project district, and therefore not a priority for prevention programs. Therefore, efforts to launch mass anti-helminthic treatment programs are not recommended. Since recent studies show that three or four annual deworming campaigns are required for effective control, such campaigns would be logistically impractical and costly. Since schistosomiasis infects only a minority of the population, there was no good evidence that resources currently should be directed against this problem either. Diarrhea was relatively uncommon and not productive of severe dehydration in those surveyed.

Skin infections were quite prevalent in the population studied, probably because of environmental and sanitation conditions in the villages. These problems are often related to socioeconomic factors and not readily amenable to change.

VHS serology studies showed that diphtheria was uncommon, but pertussis antibodies were present in almost half the preschool population. There was also evidence that tetanus is acquired, possibly by cutaneous entry, during the first few years of life.

These VHS disease patterns support the need for several low-cost preventive programs, especially multiple antigen mass immunization campaigns and malaria chemoprophylaxis programs aimed at the preschool and the school-age child. The VHS malnutrition data showed extensive mild malnutrition in the Project district, but that severe malnutrition, particularly in the first six to nine months of life when central nervous system sequelae may occur, was rare.

When VHS information was combined with other health status information from the patient statistics at Health Center and district hospitals, a

comprehensive profile of rural health status in the Danfa Project district was possible. Age groups of particular risk were identified for program focus. The VHS findings, chosen to provide program operational information, enhanced planning and program revision.

A4.6 RECOMMENDATIONS ABOUT FUTURE VILLAGE SURVEYS

Manpower and other resources for conducting similar community-based surveys are difficult to obtain since they have to be diverted temporarily from other activities, but because of the value of the information provided, we recommend similar small-scale community surveys in other parts of Ghana.

Since VHS involve organizational effort and time, they should provide multiple purpose information to justify the expenditure of resources. Based on Project experience in three Village Health Surveys, we recommend that community sample surveys should have these characteristics:

(a) The examination items used should be simple, relevant, and easy to perform under field conditions using middle-level health examiners.

(b) Precoded interview and examination forms should be used so that the results are standardized and comparisons can be made between different districts in Ghana. The use of a standard examination form enables a centralized office to process the data.

(c) In Ghana nurse practitioners already provide the majority of ambulatory care in rural health centers. They are competent to conduct this type of community survey. Nurse practitioners are more readily available and considerably less expensive to use in surveys than physician examiners.

(d) Laboratory tests, survey tabulation, and data processing often are done best in a central facility, such as the regional medical headquarters. This improves the control over processing and the quality of work accomplished.

In addition, based on our experience in the Danfa Project, the following items are useful in the planning and evaluation of maternal and child health programs. These include:

(a) Tabulate clinic information about the most frequent conditions and the time of year at which they occur. Such information supplements information obtained from a community sample survey.

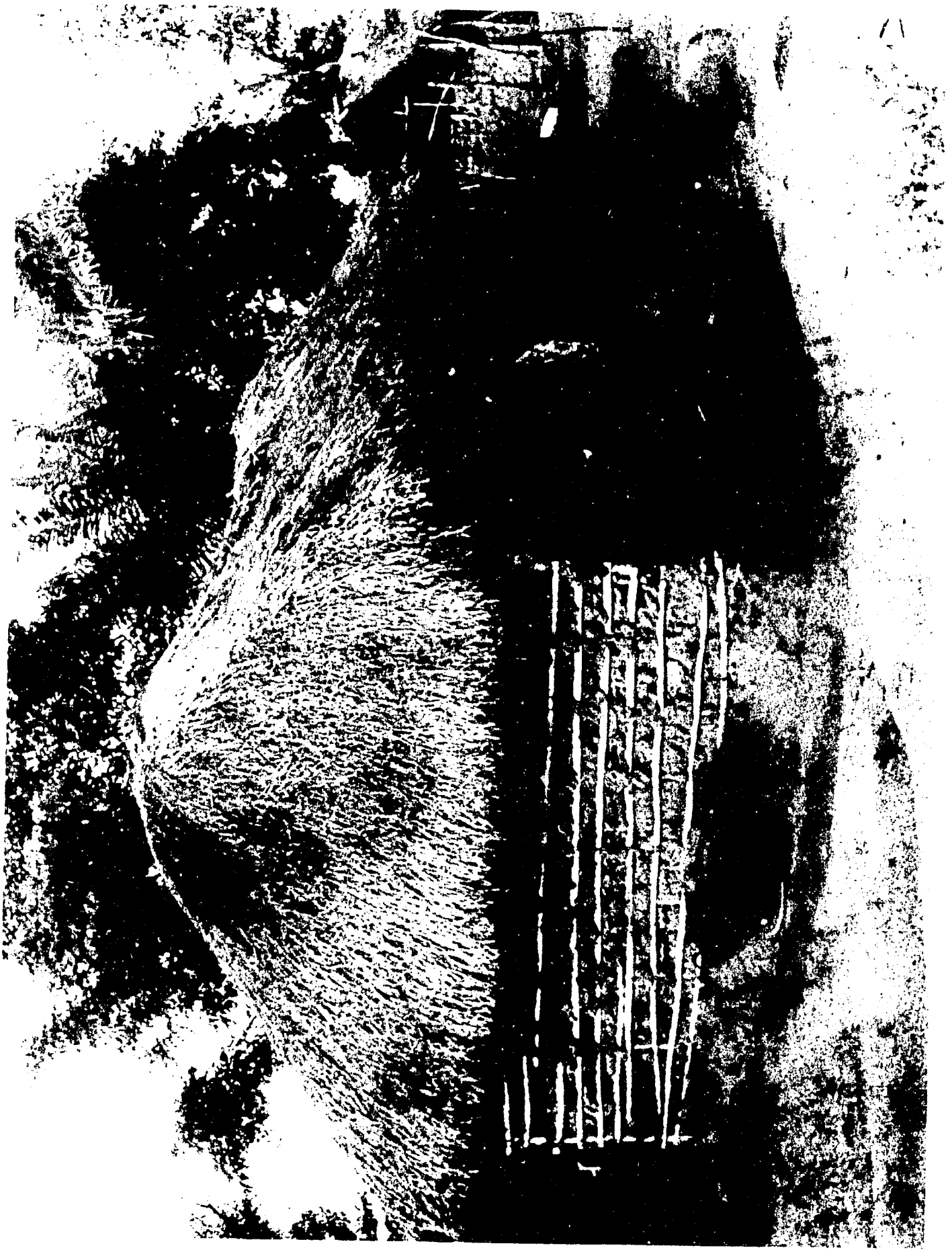
(b) Include survey questions about the use of clinics during the preceding 12-month period, participation in immunization programs aimed at preschool children, and the age at death of any live babies born to 15-44 year old mothers.

(c) Other survey examination items should include height and weight, vaccination scars, pyoderma, splenomegaly, poliomyelitis and selected local communicable disease problems (e.g. yaws, guinea worm).

(d) Useful laboratory tests include tuberculin reactivity, malaria films, hemoglobin and stool parasites.

The sampling method used was possible only because of the Project's unique demographic component for the selection of a sample of villages; surveys elsewhere in Ghana will have to use a simpler method. A district officer might select six or so representative communities which he could designate as reference communities. Surveys could then be conducted in these communities at two to three year intervals to measure health problems and to determine whether programs are effective. Villages chosen for such sample surveys should have population and environmental conditions typical of the area studied, including accessibility by vehicle, if that is a representative characteristic. To obtain seasonal information, resurveys should be scheduled to take place at different times in the year.

The major advantage for introducing the VHS-type survey in Ghana would be to standardize the community sample survey approach for different parts of the country. As described above it would then be possible to compare one district's disease prevalence and its population's use of clinics or medical facilities with the experience elsewhere in Ghana. The use of the standardized survey form, well-defined examination procedures, and an efficient data processing facility would permit a rapid feedback of up-to-date rural health status information to local health planners. Such information is currently nonexistent in Ghana, and with the advent of the district medical teams, there is a tremendous need for such data.



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APPENDIX 5: FAMILY PLANNING (A5-1)

A5.1 Family Planning Acceptor Registration Records (A5-1)

A5.2 Family Planning Acceptor Follow-up Studies (A5-7)

APPENDIX 5: FAMILY PLANNING

Additional data about Danfa family planning program acceptors derived from the family planning clinic registration records and from the acceptor follow-up surveys are presented in Tables A5-1 to A5-20.

A5.1 FAMILY PLANNING ACCEPTOR REGISTRATION RECORDS

A registration form was completed for each man or woman who accepted a method for the first time in any Danfa family planning clinic. This form recorded identification number, sex, village, date and place of acceptance, method accepted, history of previous pregnancies, living children, child or fetal losses, and intervals from last pregnancy and between previous two pregnancies. Copies of these forms were edited, coded and keypunched, and the data stored on magnetic tape. The original record remains in the Danfa family planning clinic files.

Table A5-1: Mean Age and Mean Number of Living Children of Acceptors by Area, 1972-77

	Females		Males	
	Mean Age	Mean No. Living Children	Mean Age	Mean No. Living Children
Area I	27.5	3.2	29.0	2.3
Area II	28.0	3.5	30.9	2.2
Area III	28.1	3.3	30.9	2.6
OPA[a]	28.5	3.3	28.8	2.0
All Acceptors	28.0	3.3	29.6	2.2

[a]OPA = Acceptors resident outside Project areas I, II or III.

Table A5-2: Mean Age and Mean Number of Living Children for All Female Acceptors by Method, 1972-77

Method	Mean Age	Living Children
Lo-oral[a]	24.7	2.6
Foam & Condom	26.3	2.4
Foam	26.5	2.9
Pill	27.9	3.3
Condom	28.2	2.8
I.U.D.	30.5	4.3
Injection	36.9	5.7

[a]Lo-oral refers to any low estrogen pill (e.g. Lo-Ovral, Loestrin or Modicom).

Table A5-3: Mean Age and Mean Number of Living Children for All Female Acceptors for Period Before or After Start of Extended Program (5/73)

Period	Mean Age	Living Children
Before start extended program (7/72 - 4/73)	28.1	3.3
After start extended program (5/73 - 6/77)	28.0	3.3

Table A5-4: Mean of Age, Number of Living Children, Interval Between End Last Pregnancy and Acceptance, and Interval Between Last Two Pregnancies for All Female Acceptors, by Family Planning Service Component 1972-77

Family Planning Service Component	Age	No. Living Children	Interval Since Last Pregnancy	Interval Between Last 2 Pregnancies
FP Team (9 clinics)	28.4	3.4	18.9	32.4
FP Team (extended program)	27.7	3.3	16.9	32.2
Health Center/Health Post Staff	27.6	3.2	18.0	32.8

Table A5-5: Mean of Interval Between End of Last Pregnancy and Acceptance, and of Interval Between Last Two Pregnancies Before Acceptance, for All Female Acceptors by Area, 1972-77

Area	Interval from End of Last Pregnancy to Acceptance (mos.)	Interval Between Last Two Pregnancies (mos.)
Area I	17.1	33.3
Area II	17.3	30.4
Area III	17.3	30.9
Other Acceptors	20.2	33.2
All Acceptors	18.1 (median = 13 mos.)	32.4

Table A5-6: Mean Age, Living Children, Interval Since Last Pregnancy and Interval Between Previous Two Pregnancies Before Acceptance for All Female Acceptors by Six Month Period Since Start of Family Planning Program, 1972-77

Period	Mean Age	Mean Number Living Children	Interval (mos.) Since Last Pregnancy	Interval (mos.) Between Last Two Pregnancies
7/72 - 12/72	28.0	3.3	17.5	29.3
1/73 - 6/73	28.3	3.5	17.1	31.9
7/73 - 12/73	28.3	3.4	21.6	31.1
1/74 - 6/74	29.2	3.5	18.2	34.1
7/74 - 12/74	28.0	3.3	21.4	35.4
1/75 - 6/75	28.7	3.5	18.7	31.5
7/75 - 12/75	27.1	3.1	16.6	33.5
1/76 - 6/76	26.6	2.8	14.3	33.3
7/76 - 12/76	27.9	3.3	18.7	32.7
1/77 - 6/77	28.8	3.4	17.7	34.6
7/72 - 6/77	28.0	3.3	18.1 (median=13 mos.)	32.4

Table A5-7: Distribution of Female Acceptors by Area and Year, 7/72 to 6/77[a]

Year		Total	Area I	Area II	Area III	OPA[b]
	Total Percentage	100.0	36.9	20.7	10.6	31.6
	Frequency	2030.0	751.0	421.0	216.0	642.0
1972	Row Percentage		46.7	19.3	7.5	26.3
	Frequency	186.0	87.0	36.0	14.0	49.0
1973	Row Percentage		43.5	20.3	15.0	21.0
	Frequency	418.0	182.0	85.0	63.0	88.0
1974	Row Percentage		41.6	22.3	10.7	25.2
	Frequency	336.0	140.0	75.0	36.0	85.0
1975	Row Percentage		23.7	27.9	10.2	38.0
	Frequency	497.0	118.0	139.0	51.0	189.0
1976	Row Percentage		39.7	15.5	7.3	37.3
	Frequency	476.0	189.0	74.0	35.0	178.0
1977	Row Percentage		29.9	10.2	14.5	45.3
	Frequency	117.0	35.0	12.0	17.0	53.0

[a]Note that 1972 and 1977 are half years of activity only.

[b]OPA = Acceptors resident outside Project areas I, II or III.

Table A5-8: Distribution of Male Acceptors by Area and Year, 7/72 to 6/77[a]

Year		Total	Area I	Area II	Area III	OPA[b]
	Total Percentage	100.0	16.4	20.2	17.7	45.5
	Frequency	1713.0	282.0	347.0	304.0	780.0
1972	Row Percentage		13.1	21.8	19.7	45.2
	Frequency	137.0	18.0	30.0	27.0	62.0
1973	Row Percentage		13.7	22.0	22.7	41.5
	Frequency	518.0	71.0	114.0	118.0	215.0
1974	Row Percentage		15.5	30.6	19.6	34.2
	Frequency	418.0	65.0	128.0	82.0	143.0
1975	Row Percentage		20.1	13.4	13.0	53.3
	Frequency	268.0	54.0	36.0	35.0	143.0
1976	Row Percentage		19.7	9.5	11.9	58.8
	Frequency	294.0	58.0	28.0	35.0	173.0
1977	Row Percentage		20.5	14.1	8.9	56.4
	Frequency	78.0	16.0	11.0	7.0	44.0

[a]Note that 1972 and 1977 are half years of activity only.

[b]OPA = Acceptors resident outside Project areas I, II or III.

Table A5-9: Distribution of Intervals from End of Last Pregnancy to Date of Acceptance, All Female Acceptors, 1972-77

	Interval in Months from End Last Pregnancy to Acceptance					
	Total	Less 6 mos.	6-11 mos.	12-17 mos.	18-23 mos.	24+ mos.
Percentage	100.0	23.4	22.3	21.0	9.6	23.5
Frequency	2013.0	472.0	450.0	423.0	194.0	474.0

Table A5-10: Distribution of Interval Between Two Previous Pregnancies Before Acceptance, All Female Acceptors, 1972-77

	Interval in Months Between Last Two Pregnancies Before Acceptance					
	Total	Less 12 mos.	12-23 mos.	24-35 mos.	36-47 mos.	48+ mos.
Percentage	100.0	2.0	25.4	40.3	18.6	13.4
Frequency	1535.0	32.0	390.0	619.0	287.0	207.0

A5.2 FAMILY PLANNING ACCEPTOR FOLLOW-UP STUDIES

In order to determine the pattern of contraceptive use by the men and women in the program and the impact of contraception on fertility, surveys were conducted in 1975 and 1977.

A follow-up questionnaire was administered to male and female family planning acceptors. A computer listing of all who accepted family planning in the Danfa program provided the sampling frame from which samples were selected from each of three Project areas, Areas I, II and III. In 1977, a sample of age-matched controls (non-acceptors) was also selected from the census files for each of the four Project areas. Similar questionnaires were administered to this control group.

The questionnaires were of the closed-answer type and took an average of 35 minutes to administer. Both male and female interviewers were used. The information obtained in both surveys included socioeconomic characteristics, reasons for acceptance, continuation of use, and effectiveness in preventing pregnancy. Systematic field checks of interview response were carried out by experienced survey supervisors. Data were processed using the MINI-TAB (1) and LIFE-TAB (2) computer programs developed at the University of Chicago.

In 1977, additional questions were asked about pregnancy history, contraceptive history over the previous five years, breastfeeding and the health status of children born just before starting contraception. In addition these children were weighed and their weight-for-age was compared to international standards. Contraceptive history data were processed using the COMPONENTS OF FERTILITY PROGRAM (3).

The sample sizes selected and interviewed each survey year by area are shown in Table A5-11 and Table A5-12. Please note that the sample size of female acceptors chosen in each area was proportionate to the number of actual acceptors in the program from each area.

Table A5-11: Sample Size of Male and Female Acceptors, 1975 F.P. Follow-up Survey, by Area

Female Acceptors[a]	Area I	Area II	Area III	TOTAL
Sample selected	351	149	90	590
Alternates	---	---	---	---
No. (%) interviewed	245	112	64	421 (71%)
Male Acceptors				
Sample selected	100	100	100	300
Alternates	30	30	30	90
No. (%) interviewed	71	85	71	227 (76%)

[a]All female acceptors from 7/72 to 6/74 were selected; therefore no alternates used.

Table A5-12: Sample Size of Acceptor and Control Groups, 1977 F.P. Follow-up Survey, by Area

Female Acceptors	Area I	Area II	Area III	Area IV	TOTAL
Sample selected	202	166	74	---	442
Alternates	61	29	15	---	105
No. (%) interviewed	122	119	51	---	292 (66%)
Male Acceptors					
Sample selected	42	62	47	---	151
Alternates	14	13	14	---	41
No. (%) interviewed	29	42	32	---	103 (68%)
Controls (females only)					
Sample selected	196	126	69	70	461
Alternates	70	19	13	23	125
No. (%) interviewed	114	79	45	43	281 (61%)

Tables A5-13 to A5-16 show selected continuation rates as determined from the 1977 follow-up survey of acceptors during period 7/72 to 6/76.

Table A5-13: Rates of Continuation (per 100 acceptors) of First Contraceptive Method, 1977 Acceptor Follow-up Survey, by Method for All Areas, and for All Methods by Area

Method	Project Area	Continuation Rate at Month After Acceptance							
		1	3	6	9	12	24	36	48
Females									
I.U.D.	All[a]	98	89	82	80	69	46	33	23
Pill	All	85	71	54	41	33	14	7	ND[f]
F & C[b]	All	75	59	39	31	16	6	3	3
Injection[c]	All	100	92	73	62	50	ND	ND	ND
Lo-Oral[d]	All	95	79	63	58	35	13	13	13
All[e]	All	84	71	53	42	32	15	8	3
All	I	89	78	63	50	39	18	10	4
All	II	82	68	47	35	25	10	7	4
All	III	80	61	43	39	33	15	ND	ND
Males									
All	All	94	88	78	73	69	50	37	25
All	I	97	93	83	76	76	54	38	ND
All	II	98	93	80	73	71	52	42	34
All	III	88	78	72	69	63	45	30	17

[a]Areas I, II and III.

[b]F & C = Foam and/or condom.

[c]Small sample size (N = 13).

[d]Lo-Oral = Low estrogen pill such as Lo-Ovral or Loestrin; sample small (N = 19).

[e]All methods combined.

[f]ND = No data.

Table A5-14: Rates of Continuation (per 100 acceptors) of Use of Any (First or Subsequent)[a] Family Planning Method, 1977 Acceptor Follow-up Survey

Method	Project Area	Continuation Rate at Month After Acceptance							
		1	3	6	9	12	24	36	48
Females-all	all[b]	84	72	55	44	36	17	9	3
Males-all	all	94	88	79	74	70	51	38	25
Couples[c]-all	all	87	77	62	52	46	27	17	10

[a]Any method: continuation of first, or subsequent method as long as there was no break in using some form of modern contraception, i.e. no break in continuation with change of method

[b]Areas I, II and III.

[c]Couples: male plus female acceptors.

Table A5-15: Rates of Continuation (per 100 acceptors) According to Literacy, 1977 Acceptor Follow-up Study

Acceptor Group	Continuation Rate at Month After Acceptance					
	1	3	6	12	24	36
Literate Females	86	71	52	28	8	5
Non-literate Females	88	71	54	33	14	11
Literate Males	95	91	84	75	54	39
Non-literate Males	92	80	60	51	39	32

Table A5-16: Rates of Continuation (per 100 Acceptors) According to Family Planning Service Component, 1977 Acceptor Follow-up Survey

F.P. Service Component	Continuation Rate at Month After Acceptance					
	1	3	6	12	24	36
Females						
FP Team (9 clinics)	90	75	58	40	19	13
FP Team (extended program)	79	66	44	25	8	ND
Health Center/Post Staff[a]	82[a]	79[a]	68[a]	30[a]	21[a]	ND
Males						
FP Team (9 clinics)	96	90	80	71	54	46
FP Team (extended program)	94	88	78	68	49	30
HC/HP staff	NO DATA					

[a]Small sample size.

Table A5-17: Rates of Accidental Pregnancies[a] and Extended Use-effectiveness[b] (per 100 acceptors), 1977 Acceptor Follow-up Survey, Females, First Method

Female Acceptor Category	Accidental Pregnancy rate[a] during first 12 months After Acceptance	Extended Use-Effectiveness[b] at 12 months After Acceptance
I.U.D.	0	89
Pill	19	60
F & C	42	51
Injection[c]	0[c]	100[c]
Lo-Oral[c]	31[c]	82[c]
All	20	60
All-Area I	18	63
All-Area II	24	58
All-Area III	17	55
Literate	27	49
Not literate	22	66
FP team (9 clinics)	16	61
FP team (extended program)	31	56
Health Center/Post Staff[c]	5[c]	75[c]

[a]Accidental pregnancy rate = Gross attrition rate or hypothetical rate of accidental pregnancy per 100 woman-years use if all other reasons for termination of use were eliminated

[b]Extended use-effectiveness or % not pregnant 12 months post-acceptance regardless of continued use of method or not.

[c]Small sample size.

Table A5-18: Rates of Accidental Pregnancies and Extended Use-effectiveness Rates (per 100 acceptors) Reported by Males for Their Partners, and for Couples,[a] 1977 (Acceptor Follow-up Study)

Male Acceptor Category	Accidental Pregnancy rate[b] during first 12 months After Acceptance	Extended Use-Effectiveness[c] at 12 months After Acceptance
All methods	4	87
Literate	3	88
Not literate	9	82
FP team (9 clinics)	5	88
FP team (extended program)	3	87
Couple Category		
All methods	14	67

[a]Couples = unweighted males and female acceptor sample experience combined.

[b]Accidental pregnancy rate = Gross Attrition Rates or hypothetical rate of accidental pregnancy per 100 woman-years' use if all other reasons for termination of use were eliminated.

[c]Extended use effectiveness or % not pregnant 12 months post-acceptance regardless of continued use of method or not.

The breakdown of the fertility of female acceptors and controls into its components is shown in Tables A5-19 and A5-20.

Table A5-19: Components of Fertility of Female Acceptors for 1972-76, 1977 Acceptor Follow-up Survey

	Category	Woman-Years	Pregnancies	Pregnancy rate[a]
I.	Exposed (total)	882	472	535
	A. Contracepting (total)	393[b]	70	178
	I.U.D.	53	0	0
	Pill	170	42	247
	F & C	32	14	438
	Rhythm	119	13	109
	Other	19	1	53
	B. Not Contracepting (total)	489	402	822
	Planning pregnancy	211	301	1429
	Not planning pregnancy	278	101	363
II.	Not Exposed (total)	618		
	A. Pregnant	341	---	---
	B. Other	277	---	---
III.	Total	1500 (FT)	472 (PT)	315
IV.	GFR = PT/FT x 1000 x 0.86 (1-miscarriage ratio) = 271			

[a]Per 1000 woman-years exposure in that category.

[b]393 ÷ 1500 = 26% of 5 year period contracepting and 18% using a modern method.

Table A5-20: Components of Fertility, Female Control Group; Period 1972-76, 1977 Acceptor Follow-up Survey

Category	Woman-Years	Pregnancies	Pregnancy rate[a]
I. Exposed (total)	758	383	505
A. Contracepting (total)	173[b]	10	58
Rhythm	152	8	53
Other	21	2	95
B. Not Contracepting (total)	586	373	637
Planning pregnancy	327	330	1009
Not planning pregnancy	259	43	166
II. Not Exposed (total)	607		
A. Pregnant	281	---	---
B. Other	326	---	---
III. Total	1365	383	281

IV. GFR = PT/FT x 1000 x 0.86 (1-miscarriage ratio) = 242

[a]Per 1000 woman years exposure in that category.

[b]173 ÷ 1365 = 13% of 5 year period contracepting and 1.5% using a modern method.

APPENDIX 5: REFERENCES

1. Elkins, H.G. Mini-Tab Edit, Mini-Tab Frequencies and Mini-Tab Tables: A Set of Three Interrelated Statistical Programs for Small Computers, RFFPI Manual No. 7. Chicago: Community and Family Study Center, University of Chicago, 1971.

2. Sinquefield, J.C. Single and Multiple Decrement Life Table Procedures for the Analysis of the Use-Effectiveness of Contraception, RFFPI Manual No. 8. Chicago: Community and Family Study Center, University of Chicago, 1975.

3. Bogue, D.J. and J. Nelson. The Fertility Components and Contraceptive History Techniques for Measuring Contraceptive Use-Effectiveness, RFFPI Manual No. 5. Chicago: Community and Family Study Center, University of Chicago, 1971.

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APPENDIX 6: HEALTH PRACTICES SURVEY

(A6-1)

A6.1 Background of the Health Practices Survey (A6-1)

A6.2 Objectives of the Health Practices Survey (A6-1)

A6.3 Design and Sampling of the Health Practices Survey (A6-2)

A6.4 Organization of the Health Practices Survey (A6-5)

A6.5 Results and Conclusions of the Health Practices Survey (A6-6)

APPENDIX 6: HEALTH PRACTICES SURVEY

A6.1 BACKGROUND OF THE HEALTH PRACTICES SURVEY

From its inception, the Danfa Project conducted such a wide variety of baseline surveys that the Project health education staff was dissuaded from carrying out their own baseline survey. As the implementation of the health education program proceeded, however, it became evident that a large portion of the data from the range of Danfa surveys focused on health outcomes. Survey questions about health and family planning, knowledge, attitudes and practices were limited to health problems that probably could not be solved through health education. In particular, survey items which had to do with preventive environmental and immunization behavior were absent.

Each health problem identified through Danfa surveys and fieldwork was associated with multiple health-related behaviors, but a comprehensive assessment of the impact of the health education program on these health-related behaviors would have been prohibitively expensive. Therefore, key items were selected to serve as measures of program impact. The result was the Health Practices Survey, formerly referred to as the Household Health-Related Behavior Survey, a more descriptive but awkward term. The survey was operationally-oriented and related to specific activities of the health education team. Items for the survey came from an analysis of tasks, from review of rural health literature, from HEAs' suggestions, and from Project staff. At that time, there were no expectations about how much health behavior change could be facilitated by individual health workers.

A6.2 OBJECTIVES OF THE HEALTH PRACTICES SURVEY

The overall purpose of the Health Practices Survey was to provide information about the health related behaviors of those in the Danfa Project district to see if Health Education Assistants could have a broad-based impact. These behaviors included maternal and child health practices, nutrition and environmental sanitation. Because family planning practices were included in other surveys, those questions were not included here.

Three rounds of the Health Practices Survey were completed (1973, 1974 and 1976).

In contrast to the indepth nature of the KAP surveys, the Health Practices Survey was a rapid approach to establishing "baseline" (or first-round) measures for key behavioral indicators. The Health Practices Survey had three objectives:

(a) To serve as a baseline (or first round) with regard to assessing the absolute impact of health education on the overall effectiveness of health care delivery.
(b) To provide data for health education planning by assessing areas of educational need.
(c) To operate as a source of feedback to Project staff with regard to their effectiveness.

In order to have accomplished these objectives, it was necessary for the survey to be broad-based, covering the results of the multidisciplinary health education program. The goal was to devise a survey that was sensitive and specific enough to measure real change in health behavior while having sufficient reliability to give confidence to findings. Both paramedical health workers and expert interviewers participated, requiring a simple questionnaire that could be tabulated manually or electronically, making results rapidly available. Finally, since the long-range aim of the Project is to encourage villagers to be more self-reliant through preventive health practices, the Health Practices Survey yields data which can be readily interpreted to laymen, such as village leaders.

A6.3 DESIGN AND SAMPLING OF THE HEALTH PRACTICES SURVEY

In each of the four areas, where villages had less than 40 households (but more than the minimum 50 inhabitants), an attempt was made to survey every household. In villages with more than 40 households, a household number was randomly selected, and approximately 40 additional households were selected serially by household number. (Existing village maps and Danfa Project house numbers greatly facilitated the entire sampling procedure.) Figure A6-1 visually illustrates this design. The sampling

frame for Areas I and II was different than for Areas III and IV because health education had formal programmatic input only into Areas I and II.

The area totals were achieved by weighting each community, based on the number of households surveyed in that village over the total number of households surveyed in the area. Thus, the percentage of households in each village surveyed was not a consideration in determining area averages.

FIGURE A6-1: Health Practices Survey Sampling

Area I: Sampled all villages with more than 50 residents (Sampled 1,110 households)

Area II: Sampled all villages with more than 50 residents (Sampled 1,020 households)

Area III: Villages dichotomized

- Less than 60 households: 12 of 60 small villages sampled
- 60 or more households: 3 of 11 large villages sampled

→ Total of 292 households surveyed

Area IV: Villages dichotomized

- Less than 60 households: 17 of 53 small villages sampled
- 60 or more households: 3 of 9 villages sampled

→ Total of 282 households surveyed

Table A6-1: Areas I and II Villages Sampled in 1973 and 1976 Surveys by Size of Village[a]

	No. Villages Sampled with < 60 Households		No. Villages Sampled with > 60 Households	
	1973	1976	1973	1976
Area I	7	8	5	4
Area II	8	9	4	4

[a]This represents the subsample of villages in Area I and Area II that were randomly selected for comparison with Area III.

While interviewing took place in a number of representative communities in Area III, interviewing was much more comprehensive in Areas I and II. In preparation for final analysis, however, villages in Areas I and II were separated into those with 60 and more households and those with less than 60 households. A random number table was used to select a proportionate number of large (60+) and small villages to include in the analysis. This provided for a more equivalent error factor for each of the areas. (See Table A6-1.)

A6.4 ORGANIZATION OF THE HEALTH PRACTICES SURVEY

In preparation for the first round of the Health Practices Survey in 1973, a four-day interview training session was held for eight Health Education Assistants. Then the draft questionnaire was field tested for five days on 200 of the approximately 800 households which were included in the Village Health Survey.

The final questionnaire contained 53 individual items. Once the document reached final form, 11 experienced Danfa Project field interviewers were added to the team. A second training session was held for the group of 19, and an additional one-day pretest was carried out. By this time, the survey had been translated from English into the three local languages: Ga, Twi, and Ewe. Each interviewer was trained in the local languages he or she spoke.

The 19 individuals were divided into four teams and in each area clusters of villages were assigned to a given team. Two supervisors each took responsibility for two teams containing a mixture of field interviewers and HEAs. One member of each team was appointed as leader. The team leader assigned predetermined households to each interviewer and edited the questionnaires prior to editing by the supervisor. The Project health educator and health education advisor oversaw activities of the supervisors and kept track of editing, coding and keypunching of forms at the Legon office. Once cards had been punched, a computer listing was checked for omission of households and of questionnaire items. Completed data were analyzed at Legon through programs written for the computer at UGMS. The first-round survey began on August 1, 1973. It ended on September 8th and the data were discussed with village leaders as early as September 15th. This is considered to be a remarkable turnaround time.

The Health Practices Survey began simultaneously in Areas I and II. Areas III and IV were completed by the field interviewers while the HEAs resumed their community educational efforts.

A6.5 RESULTS AND CONCLUSIONS OF THE HEALTH PRACTICE SURVEY

In the 1973 and 1976 Health Practice Surveys, a wide variety of health-related practices were measured, in keeping with the multipurpose focus of the Health Education Assistants. The overall purpose for conducting the survey was to determine:

(a) The potential for integration of health education into comprehensive health care (Area I), and
(b) The extent to which health education could have an impact when implemented without comprehensive health services.

Tables A6-2 through A6-6 compare Health Practices Survey results for 1973 and 1976, for each of research Areas I, II and III. Area IV is not included because a survey was not carried out there in 1976.

Brief descriptions of important survey results and conclusions follow.

THE PERCENTAGE OF UNDER SIXES WITH A BIRTH CERTIFICATE

Each of the three areas received a roughly equivalent effort in birth certificate registration. Although the HEAs inputs did not begin simultaneously in the areas, each area achieved approximately the same final coverage. This would suggest that achieving greater than a two-thirds coverage within such a short time period would require a very different approach.

THE PERCENTAGE OF UNDER TWOs WITH A MORLEY OR OTHER WEIGHING CARD

Area I had had an active health care program since 1971. This is reflected in the high percentage of children with weight cards in 1973. It may also indicate a greater access to the capital, Accra, since both Morley and other weighing cards are considered here. While there was a small drop off in Area I in the three years, there was a dramatic rise in Area II, and a modest increase in Area III. It would indicate that almost complete coverage of individuals with a home-based health record is a possibility.

IMMUNIZATION

Those children 2-5 years surveyed in Area I were about twice as likely to have received BCG, smallpox and measles immunizations as children surveyed in Area II. In addition, these Area I children were almost three times as likely to have had these immunizations as children in Area III. More than half of Area I children 2-5 years received DPT immunization, compared to only 2-5% in Areas II and III.

Comprehensive health care (Area I) can lead to significant immunization levels which may be superior to those found in the developed world. Without comprehensive health care, health education alone is not sufficient to stimulate individuals to seek immunizations outside their area of residence.

PRENATAL CARE

This includes anyone who has seen a trained health worker prior to delivery for a prenatal examination. The lower average in Area II suggests a need for an extended prenatal care program.

DELIVERY

In Area I, about three-fourths of the women interviewed in both surveys reported that their last child had been delivered by a TBA or health professional. In Area II, one-third initially reported this, but in the 1976 survey the proportion reporting a TBA or health professional-assisted delivery jumped to nearly one-half.

HOUSEHOLDS WITH MEMBERS PARTICIPATING IN COMMUNITY ACTIVITIES

The approach to health education in the Danfa Project centered on outreach and community organization. An important component was community involvement. One way of measuring this was by determining the extent to which households were represented by at least one individual involved in a men's or women's club, or a community development or health committee.

In Area I, there was a large increase from 37% in 1973 to 58% involved in community activities in 1976. In Area II, there was an increase from 19% to 34%. There was also a more modest increase in Area III. While these changes were not dramatic, they do seem to be indicative of the differing levels of effort in health going into each of the three areas.

While this is a very crude measure, it does suggest that health can be related to community development activities.

REFUSE DISPOSAL IN A MAINTAINED DUMP

Each separate section of the village had an area where refuse was thrown. However, when those interviewed were asked to identify a specific maintained site in the village, many had difficulty. Hence, the inconsistency in reported rates.

ADEQUATE HUMAN WASTE DISPOSAL

Men and women used public or private pit latrines or uninhabited areas on the outskirts of the village. A health subobjective was to increase availability of acceptable pit latrines so that individuals would have the option to use them. Different age and sex groups report varying utilization patterns. However, the changes across the three areas are so similar that it cannot be claimed that significant program effect in Areas I and II occurred. Whether this is a measurement error, response error through reporting, or actual occurrence is not assessed.

BOILED OR FILTERED DRINKING WATER

Much of the water used for drinking in the villages was from streams or ponds, sources which are easily contaminated. By boiling or filtering, contamination could be considerably reduced, but villagers often cannot afford the fuel for boiling or afford the filters. From these survey results, there does not appear to be any improvement in boiling or filtering drinking water.

TREATMENT OF DRINKING WATER

Several antiseptic solutions were added to the drinking water. The usefulness of these was open to question but none seem harmful. The intent of the item was simply to monitor its occurrence. Between 5% and 10% reported this practice in 1976.

COVERED DRINKING WATER

While it was doubtful that uncovered drinking water barrels would lead to considerably greater contamination, these barrels served as ideal breed-

ing sites for mosquito larvae. Increasing the covering of barrels could have decreased mosquitoes. Seventy-four to 88% of those interviewed had at least some drinking water containers covered in 1973-76.

DRINKING WATER BARRELS WITH MOSQUITO LARVAE

The best way to assess whether there was a change in the mosquito larvae population in the barrels was to look. While this was an assessment at only a single point in time, it is relatively objective. While in Area I there was a small increase, Area II dropped from 36% to less than 10%. In Area III there was a decrease from 37% to 20%.

USE OF FOODSTUFFS IN THE LAST WEEK

Because of limited resources, it was impossible to carry out a sophisticated dietary survey. Foods that were reported as having increased usage in the last week were a proxy measure. Of particular interest were beans, groundnuts and greens.

In general, Area I had higher rates of usage than Areas II and III. Increases in Area III seemed the greatest. It appears that in Area II education without agricultural extension work is severely handicapped.

GROWING OF FOODSTUFFS

The dramatic changes in the three areas are probably related to rapidly escalating food costs. This provides an ideal situation for agricultural extension activities because of the villagers' felt needs for appropriate means of reducing their expenditures for food.

PURCHASE OF FOODSTUFFS

In 1973, proportionately more Area II residents had purchased considerably more specific foods than residents in Areas I or III. However, by 1976, the residents of Areas I and III consistently reported purchasing many more specific foods than Area II residents.

Table A6-2: Health Practices Survey Changes in Maternal and Child Health Practices: 1973-1976[a]

	Area I		Area II		Area III	
	Year					
Practice	1973	1976	1973	1976	1973	1976
Children under six with BIRTH CERTIFICATE	40.1%	68.5%	45.0%	70.2%	29.9%	65.2%
Children under two with MORLEY WEIGHING CARD	79.8	71.6	39.0	84.5	19.0	49.9
Children 2-5 years received BCG vac	19.9	58.3	15.9	26.4	0.8	13.8
Children 2-5 years received SMALLPOX vaccination	56.4	47.7	68.0	25.4	30.8	18.0
Children 2-5 years received DPT innoculation	23.3	50.9	8.2	2.3	0.7	5.5
Children 2-5 years received MEASLES vaccination	62.4	52.1	49.7	20.7	39.3	16.8
Women seek adequate PRENATAL CARE (most recent pregnancy)	89.6	99.6	81.6	83.3	51.9	91.2
Women had adequate DELIVERY	74.0	74.3	31.1	46.7	57.9	50.4
Households with member in COMMUNITY ACTIVITIES	36.8	58.4	19.0	33.5	17.2	27.0

[a]Area IV is not included because the Health Practices Survey was not carried out there in 1976.

Table A6-3: Health Practices Survey-Changes in Environmental Health Practices: 1973-1976

	Area I		Area II		Area III	
	Year					
Practice	1973	1976	1973	1976	1973	1976
Household practices adequate REFUSE DISPOSAL	26.9%	39.9%	31.2%	23.6%	0.3%	38.0%
Children under six practice adequate HUMAN WASTE DISPOSAL	11.3	60.4	19.6	67.9	13.4	67.8
Children 6-14 practice adequate HUMAN WASTE DISPOSAL 6-14	78.0	72.4	70.0	75.4	83.2	80.4
Adult males practice adequate HUMAN WASTE DISPOSAL	90.5	83.9	68.3	77.1	82.5	80.8
Adult females practice adequate HUMAN WASTE DISPOSAL	79.7	80.4	66.5	81.3	79.0	79.7
Household drinking water boiled/filtered	9.1	6.0	4.6	3.7	4.9	7.8
Household drinking water treated usually or occasionally	2.3	5.4	0.4	9.0	0.3	10.8
At least some drinking water containers covered	84.4	77.2	87.7	80.6	74.1	87.4
At least some drinking water containers with mosquito larvae	29.7	36.6	35.7	9.6	36.7	20.3

Table A6-4: Health Practices Survey-Changes in Foods Eaten ("During the Past Week"), 1973-1976

	Area I		Area II		Area III	
	Year					
Foods Eaten	1973	1976	1973	1976	1973	1976
Groundnuts	49.7%	58.2%	52.9%	40.1%	24.5%	35.6%
Beans	48.6	46.2	55.1	33.4	25.6	37.5
Garden eggs	87.1	66.2	86.0	89.0	68.4	76.4
Okro (Okra)	83.4	70.0	81.3	84.0	63.8	76.5
Tomatoes	98.9	96.7	95.6	100.0	94.9	99.2
Greens	39.8	54.7	58.8	47.0	29.7	48.5
Pineapple	16.5	27.8	19.8	22.3	7.4	22.5
Pawpaw	55.0	74.7	26.4	47.8	8.2	43.7
Orange	33.7	71.3	32.0	70.4	22.5	64.9
Palm nuts	91.6	78.9	83.7	84.7	86.3	68.8
Palm oil		69.6		54.0		55.5

Table A6-5: Health Practices Survey-Changes in Foods Grown, 1973-1976

	Area I		Area II		Area III	
	Year					
Foods Grown	1973	1976	1973	1976	1973	1976
Groundnuts	6.5%	6.1%	2.7%	3.0%	2.5%	6.8%
Beans	7.8	38.3	3.3	12.9	1.0	12.8
Garden eggs	3.9	48.9	15.0	56.2	25.6	43.0
Okro (Okra)	38.0	48.0	10.1	44.1	14.0	42.9
Tomatoes	61.3	77.9	13.6	64.6	21.2	60.9
Greens	32.8	63.5	37.3	71.0	22.6	64.0
Pineapple	13.1	45.0	10.2	48.6	6.3	41.7
Pawpaw	51.8	80.1	23.4	62.5	8.2	57.0
Orange	2.2	21.1	5.1	25.2	11.0	47.2
Palm nuts	21.6	53.7	17.2	61.8	29.1	59.4
Palm oil		15.6		4.9		10.8

Table A6-6: Health Practices Survey-Changes in Foods Purchased, 1973-1976

	Area I		Area II		Area III	
	Year					
Foods Purchased	1973	1976	1973	1976	1973	1976
Groundnuts	43.4%	73.8%	51.1%	47.9%	22.0%	63.5%
Beans	41.2	51.7	51.7	38.9	24.5	62.2
Garden eggs	31.6	58.1	69.6	36.5	43.4	74.8
Okro (Okra)	46.8	59.2	71.8	54.2	51.5	73.2
Tomatoes	36.9	61.8	83.0	50.9	75.6	79.5
Greens	6.4	23.0	21.3	7.6	7.4	34.3
Pineapple	2.6	39.0	10.9	14.3	0.3	31.1
Pawpaw	1.4	15.7	4.1	5.9	0.0	16.9
Orange	30.9	71.5	27.0	46.2	10.9	45.9
Palm nuts	71.2	65.7	69.2	35.9	58.5	36.7
Palm oil		74.2		45.2		66.5

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APPENDIX 7: DATA MANAGEMENT

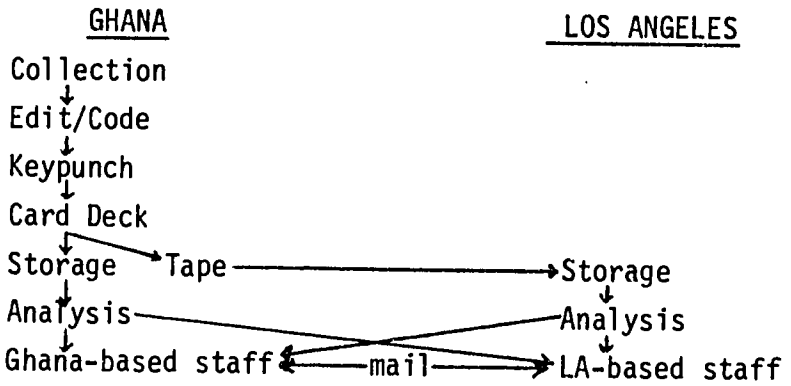
A7.1 Overview of Data Management
A7.2 Data Processing Staff and Equipment
A7.3 Data Generation
A7.4 Preparation of the Data
A7.5 Data Storage and Retrieval

APPENDIX 7: DATA MANAGEMENT

A7.1 OVERVIEW OF DATA MANAGEMENT

The original scheme of the Project for the flow of data visualized raw data being prepared and retained in Ghana for processing with copies on tape shipped to UCLA. Analysis would then be carried out both in Ghana, using card medium and within the limits of the small computer at the University of Ghana, and at UCLA, where the larger equipment could handle more sophisticated levels of analysis. Analyzed data would be shared by mail. It was expected that at least until the later stages of the Project, most of the analysis would be at a level which could be done on the equipment at the University of Ghana Legon campus computer center. Figure A7-1 shows the flow.

Figure A7-1: Proposed Flow of Data



Management and supervision of the data processing system was to have been undertaken by senior personnel from the Institute for Statistical, Social and Economic Research (ISSER) of the University of Ghana. However, early in 1972, as the first longitudinal survey was being prepared for the field, due to illness, death and resignation, ISSER's staff was radically reduced. With key people missing and the Project timetable set on its course, it was agreed that the longitudinal survey raw data should be sent to UCLA for processing.

The survey instruments were marked in duplicate in the field using carbon paper and field editing was performed. One set of forms was sent to UCLA and one was retained in Ghana. The process of editing and coding these forms at UCLA was greatly facilitated by the presence of two of the Project's Ghanaian research analysts who had been responsible for field supervision of the survey. They were at UCLA (sequentially, for three months each) for training in records and data management and helped to resolve editing/coding problems. This was the only time that raw data were processed at UCLA.

The staffing problems at ISSER persisted and when the UCLA Ghana-based staff was augmented in 1973 by the addition of the systems analyst, he became responsible for management and supervision of the data processing system.

As may be seen in Figure A7-1, data analyses could be requested by either Ghana-based or UCLA-based staff from either of the two data processing locations. More commonly, analyzed data were shared by the two groups of staff. Coordination between the two locations was greatly facilitated by occasional visits by staff from one group to the other. The training that Ghanaian staff received at UCLA was also helpful to the UCLA-based group. These training participants were able to provide input from a Ghanaian point of view on conducting multistaged analyses, where subsequent analysis required some interpretation of preceding analyses. Thus, the participants, while in the United States, were not only able to acquire the training needed for improved institutional development, but they also continued to make important contributions to Project research.

A7.2 DATA PROCESSING STAFF AND EQUIPMENT

A7.2.1 Data Processing Staff and Equipment in Ghana

From 1970 to 1974 the Project had one computer programmer on its full-time staff in Ghana. By early 1974, it was clear that the workload had become too great for one programmer, and the problem was exacerbated

by certain limitations of available software. In April 1974, the programmer left unexpectedly. The Project recruited a new programmer who was finishing a diploma course in computer science at the University of Ghana. This individual proved to be an excellent choice: bright, apt, and hardworking. (In 1978 the Project sponsored him as its final overseas participant trainee for a Master's degree in computer science at UCLA.)

At the same time, the Project acquired the services of a United States Peace Corps volunteer, an experienced programmer who was finishing a two-year assignment as a mathematics teacher, and was willing to extend his duty in Ghana. The two programmers were able to train two editor/coder staff who developed an interest in electronic data processing to the point where these two assistants could handle the mechanics of running the data processing equipment. (The University computer center requires hands-on operations). Eventually, both assistants were even able to do light programming. When the American programmer completed his two-year assignment, the Peace Corps recruited another volunteer to help for another year, that is, until the last major research efforts ended in 1977.

In order to assure that the transfer of data from raw forms to cards would not become a bottleneck, the Project maintained two keypunch operators seconded to its staff from the Institute for Statistical, Social and Economic Research. One keypunch and one verifier were also rented. ISSER maintained additional operators and machines in the same location and some of its staff and equipment were made available for Danfa work when necessary.

In 1972, the University of Ghana acquired a disc-based IBM 1130 to replace its 1620. The 1130 had two serious limitations vis-a-vis the Project's needs. First, it had no tape capability, and second, it had a poor system software package.

From the beginning it had been Project policy to maintain identical data sets in Ghana and Los Angeles. This meant that data had to be mailed back and forth, necessitating a tape medium. Several agencies in Ghana did have machines with tape drives and time was rented on these. This solution was workable, but inefficient. The University is located

well out of town, and not only did transporting the card decks draw on an already taxed Project transport pool, it was also very time-consuming for the programmer or the assistants to travel to the machines with tape drives. Moreover, Danfa Project work obviously had lower priority than in-house work at these organizations. After a lengthy trek into town it was not unusual for Danfa staff to be told to return the next day or even in the middle of the night. The telephone system did not permit checking in advance.

Ultimately, the Project received permission from USAID/Ghana to use funds earmarked for computer time rental to purchase an IBM tape drive as a gift to the University of Ghana. Not only did the addition of the tape drive enhance the research capabilities of the entire University community, it also resulted in a decided improvement in the skills taught to students in the computer science diploma course, who previously were graduating with no "tape" experience. The new tape drive had a salutary effect on the Project's data processing capability.

The addition of the tape drive to the 1130 system alleviated one problem, but the difficulty with software remained. The problem was that no packaged programs were available and every job required the staff to do tedious custom programming.

In 1974, a consultant from the UCLA Center for Health Sciences Computing Facility was brought in to investigate the situation. It was determined that it was feasible to design a small cross-tabulating statistical package for the Project. After some guidance from the consultant when she returned to UCLA, a UCLA computer science graduate student was brought to Ghana for several months and produced a rudimentary packaged program which was dubbed GHASP, Ghana Statistical Package. Later, features of this original package were merged with some components of an existing University of Chicago package also written for a small computer and the entire package was placed on-line. Several seminars on its use were given, and it was made available to the entire University of Ghana community.

It should be noted that, from the very beginning, the University of Ghana, as one facet of its support for the Danfa Project, provided computer time free-of-charge and in very generous blocks.

A7.2.2 Data Processing Staff and Equipment at UCLA

At UCLA, there were no such limitations on hardware or software. The Health Sciences Computing Facility operated an IBM 360/91 with all the support one would expect from a major facility, including a wide array of packaged programs. Programmer time could be purchased from a pool maintained by the facility and until 1977, when the UCLA staff returned from Ghana and settled in to a long period of intensive data analysis, such programming was obtained from the pool when needed. In the fall of 1977, two full-time programmers were hired directly by the Project at UCLA. At one point, a third programmer was also used part time. In addition, some members of the senior staff became quite adept with the Statistical Package for the Social Sciences (SPSS).

A7.3 DATA GENERATION

Almost all of the Danfa Project's service and research activities have been recorded in detail for electronic processing. After more than seven years in the field, the Project's assemblage of raw data is estimated to be in the range of 11 million to 14 million data-items, a data-item is defined as one value in one variable. For example, one person's responses to a survey instrument containing 40 questions would generate 40 data-items, and one patient-visit to the Health Center generated 29 data-items. Given that every electronic file was edited and "cleaned" and sometimes re-formatted before it was ready for use in analysis, the total number of pieces of information maintained in the Danfa files may well approach the 50 million mark.

Data was initially generated in the field as responses to interview instruments, such as those of the longitudinal surveys or the Family Planning Follow-up Survey, or as a record of the details of a service provided, such as a patient visit to the Health Center/satellites or an encounter with the family planning team. Cursory editing of forms was done directly in the field by supervisory staff who checked for gross errors of ommission, e.g., failure to mark a response for a variable, or commission, e.g., marking a current state of pregnancy for a person whose age was shown as 24 months. Glaring errors were expected to be corrected in the field, if at all possible.

A7.4 PREPARATION OF THE DATA

From the field (or the Health Center), raw data forms were brought back to the Danfa Project offices on the campus at Legon. There they were edited more finely by a group of editor/coders checking specially designated points for internal consistency. Every effort was made to do the work within a few days of the time the data were originally obtained, so that errors could be sent back to the field for correction, if necessary. The office editor/coder also coded open-ended material on the instruments, such as I.C.D.A. disease codes. (As a rule, open-ended variables were avoided to the maximum extent feasible.)

Following editing and coding, the data were key-punched onto cards and from cards the data were copied onto tape for shipment to UCLA.

At first, in the period before the disc-based 1130 replaced the 1620 at Legon, the data were not only stored on cards, but the card decks also served as the working input medium. Tape was used only for the transfer of data from Ghana to UCLA. Some of the card files were as much as 40,000 cards in length, extremely cumbersome to handle and quite time consuming to pass through the card-reader. When the tape drive was added, both media were used for processing.

Some of the data sets, such as the patient encounter record, were originally set up in a variable-length format. As we began to rely more and more on packaged programs both in Ghana and in Los Angeles, it was found well worth the investment in time to convert these variable length records to fixed-length so that they could be run with the packaged programs. In particular, once most of the analytic activity shifted to UCLA (in 1977) many of the files were converted and stored as SPSS files. The SPSS format greatly increases the speed with which data can be obtained, due to the minimal additional programming required even for very complex analyses. The SPSS format also reduces running costs.

A7.5 DATA STORAGE AND RETRIEVAL

Processing of raw data to the point of storage already has been described. All raw data forms are stored in Ghana. In addition, the data are on tape, with one complete set being held in Ghana and a twin

set at UCLA. At both institutions, duplicate tapes are maintained, one for library purposes, one for working purposes. The one set of raw data which was punched at UCLA (the first longitudinal survey) was taped and sent back to Ghana when the tape drive was added to the system there. Thus, we have adhered to the basic policy of maintaining full sets of data in both locations.

All the working files have been altered to some degree. Some have only been electronically edited and "cleaned," while others have been manipulated by re-formatting or combining with other files to create new data sets. Most of this work has been done at UCLA to take advantage of the Health Sciences Computing Facility hardware and software, especially the SPSS package. The data files were catalogued and a complete set of the files (other than the SPSS files) has been sent to the University of Ghana Medical School for archiving, along with appropriate documentation. There was no reason to send SPSS files since that package is not expected to be available in Ghana in the near future because of hardware limitations. It would be possible, however, to organize the basic cleaned data for any packaged system which does become available, or to transfer it to another storage medium which might be more useful in the future. For example, the Department of Community Health is arranging to obtain a new computer system to be physically located in the Medical School instead of at the main University campus 15 miles away; the data could be transferred to the system discs either as a single task or on an ad hoc basis.

The Project codirectors, representing their respective institutions, have agreed on a policy for the use of Danfa data which calls for release of the information by either of the institutions for any purpose which seems likely to advance the welfare of people. In particular, both institutions would encourage scholarly analysis of the data to maximize the information derived from the many years of work by Ghanaian and American participants in the Danfa Project.

Danfa Project
Final Report
summary conclusions
and recommendations

APPENDIX 8: PUBLICATIONS AND REPORTS

	PUBLICATIONS AND REPORTS	(A8-1)
A8.1	Danfa Project Publications Policy	(A8-1)
A8.2	Manuscript Checklist	(A8-3)
A8.3	List of Danfa Publications and Reports	(A8-4)
A8.4	Summary of Publications	(A8-13)

APPENDIX 8: PUBLICATIONS AND REPORTS

This appendix includes Danfa Publications Policy; a sample "Manuscript Checklist"; a list of publications, presentations, monographs, training manuals, etc.; and finally, a summary of each publication and selected monographs.

A8.1 DANFA PROJECT PUBLICATIONS POLICY

The following is the Publications Policy (revised in January 1976) verbatim:

1. The Danfa Project is a collaborative research project between the University of Ghana (principally the Medical School) and the University of California, Los Angeles, U.S.A., and is funded jointly by the U.S. Government (through AID) contract, and the Government of Ghana. There are two codirectors in charge of the Project - a Ghanaian and the other from UCLA, with the Ghanaian Codirector as senior.
2. These guidelines for publication are deemed necessary by the Codirectors to protect the interests of research workers in the Project in both collaborating institutions.
3. Permission for authorship using Danfa Project data may be allowed research workers by the Codirectors for any of the following reasons:

   (i) Planning the project or special study that is the subject of the paper.
   (ii) Taking part in the execution of the project to a significant degree.
   (iii) Taking a significant part in the reduction, analysis and interpretation of data.
   (iv) Taking part in the planning, review of the literature, and the writing of the paper.

4. The senior author will be the one principally responsible for the planning and the execution of the work in question and/or the one who played the principal role in the analysis and interpretation of

the data and the actual writing as determined by both Codirectors. All co-authors of a paper must have taken an active part in the preparation of material and the writing of the paper to the satisfaction of the Codirectors.

5. Unless both Codirectors decide otherwise, articles will include at least one author from the Ghanaian side and one from the UCLA side.
6. No article using original Danfa Project data may be submitted for publication without the prior written approval of both Codirectors.
7. All articles for publication should bear the following footnote "supported in part by US/AID Contract OCOP/AID/afr-I.D.A. - 73 - 14."
8. Before deciding to write a paper, for the purposes of coordination, it is suggested that the author(s) should informally discuss matters with the Ghanaian field Coordinator, the UCLA Chief of Party, or the Codirectors, and then submit tentative titles and arguments, and the prospective co-authors in order of listing on the special Project manuscript checklist to the Codirectors for review.

   The authors thereby become committed to completing the writing of the proposed manuscript within four to six months. They will then submit the manuscript for final approval using another set of the Project manuscript checklist.
9. In an effort to help authors, the Project whenever possible will arrange for bibliographic searches, provide copies of articles and books, provide limited editorial services and special manuscript typists who will prepare articles for submission in the specified manner prescribed by the journal selected for the publication.

   Students may be given permission to work with Danfa data for their University thesis by the two Codirectors.

A8.2 MANUSCRIPT CHECKLIST

The following is a facsimile of the form used when a manuscript was planned, and again when it was completed.

Figure A8-1: Danfa Comprehensive Rural Health and Family Planning Project Manuscript Checklist

In accordance with publications guidelines established by the Danfa Project Codirectors it is kindly requested that four (4) copies of this form be completed both when a paper is in the planning stage and when completed.

Check one:

Initial Planning Stage _____ (date) _____

**Manuscript Completed _____ (date) _____

TITLE

BRIEF OUTLINE OF PAPER (use only at planning stage)

AUTHORS (in order of appearance) (List affiliations and degrees if not noted on manuscript).

ACKNOWLEDGEMENTS

Supported in part by the Ghana Government and by USAID Contract AID/CM/Afr-IDA-73-14 (mandatory for all project manuscripts).

Computing assistance was obtained from the Health Sciences Computing Facility, UCLA, supported by NIH special research resources grant RR-3 (mandatory if UCLA Computer Center has prepared computerized tables, listings, etc.)

Other (in narrative form)

S. Ofosu-Amaah, Codirector

A.K. Neumann, Codirector

F.K. Wurapa, Field Coordinator

I.M. Lourie, Chief of Party

Senior Author

**NOTE: The checklist copies are to be attached to a copy of the manuscript when the latter is completed and being forwarded for final signatures.

A8.3 LIST OF DANFA PROJECT PUBLICATIONS AND REPORTS

This subsection consists of a chronological list organized as follows:

A8.3.1 Published papers

A8.3.2 Papers in press

A8.3.3 Papers submitted

A8.3.4 Conference presentations

A8.3.5 Monographs

A8.3.6 Training manuals

A8.3.7 Annual or semi-annual progress reports

A8.3.8 Proceedings of the Annual Review Meetings

Subsection 8.4 summarizes papers and monographs.

A8.3.1 Published Papers

1. Sai, F.T., F.K. Wurapa, E. Quartey-Papafio. "The Danfa/Ghana Comprehensive Rural Health and Family Planning Project - A Community Approach." Ghana Medical Journal, Vol. 11, No. 1, pp. 9-17, 1972.

2. Neumann, A.K., J. Prince, E.F. Gilbert, I.M. Lourie. "The Danfa/Ghana Comprehensive Rural Health and Family Planning Project - Preliminary Report." Ghana Medical Journal, Vol. 11, No. 1, pp. 18-24, 1972.

3. Ashitey, G.A., F.K. Wurapa, D.W. Belcher. "Danfa Rural Health Centre: Its Patients and Services 1970-71." Ghana Medical Journal, Vol. 11, No. 3, pp. 266-273, 1972.

4. Kpedekpo, G.M.K. "The Planning and Design of Sampling Surveys with Particular Reference to the Epidemiological Survey of the Danfa Project in Ghana." Ghana Medical Journal, Vol. 11, No. 4, pp. 377-382, 1972.

5. Kwansa, E.V.G., J.A. Cannon, D.W. Belcher, M. Hosu-Porbley. "Perception and Comprehension of Health Education Visual Aids by Rural Ghanaian Villagers." Ghana Medical Journal, Vol. 11, No. 4, pp. 387-396, 1972.

6. Neumann, A.K., F.T. Sai, I.M. Lourie, F.K. Wurapa. "A New Trend in International Health Work: The Danfa Project." Focus: Technical Cooperation, International Development Review, pp. 11-14, 1973/2.

7. Neumann, A.K., D.A. Ampofo, D.D. Nicholas, S. Ofosu-Amaah, F.K. Wurapa. "Traditional Birth Attendants - A Key to Rural Maternal and Child Health and Family Planning Services." Journal of Tropical Pediatrics and Environmental Child Health (Monograph No. 32), Vol. 20, No. 1, pp. 21-27, 1974.

8. Neumann, A.K., F.T. Sai, S.R.A. Dodu. "Danfa Comprehensive Rural Health and Family Planning Project: Ghana, Research Design." Journal of Tropical Pediatrics and Environmental Child Health (Monograph No. 32), Vol. 20, No. 1, pp. 39-54, 1974.

9. Neumann, A.K., S.R.A. Dodu. "Danfa Project." Letter to Lancet, March 30, 1974.

10. Wurapa, F.K., D.W. Belcher, A.K. Neumann, I.M. Lourie. "An Approach to Illness Measurement in a Rural Community - A Questionnaire Sample Survey of Households in the Population of the Danfa Comprehensive Rural Health and Family Planning Project in Ghana." Ghana Medical Journal, Vol. 13, pp. 98-105, 1974.

11. Belcher, D.W., F.K. Wurapa, W.B. Ward, I.M. Lourie. "Guinea Worm in Southern Ghana - Its Epidemiology and Impact on Agricultural Productivity." American Journal of Tropical Medicine and Hygiene, Vol. 24, No. 2, pp. 243-249, 1975.

12. Wurapa, F.K., D.W. Belcher, W.B. Ward. "A Clinical Picture of Guinea Worm Disease in Southern Ghana." Ghana Medical Journal, Vol. 14, pp. 10-15, 1975.

13. Belcher, D.W., F.K. Wurapa, W.B. Ward. "Failure of Thiabendazole and Metronidazole in the Treatment and Suppression of Guinea Worm Disease." American Journal of Tropical Medicine and Hygiene, Vol. 24, No. 3, pp. 444-446, 1975.

14. Belcher, D.W., D.D. Nicholas, S. Ofosu-Amaah, F.K. Wurapa, S.N. Blumenfeld. "Factors Influencing Utilization of a Malaria Prophylaxis Programme in Ghana." Social Science and Medicine, Vol. 9, pp. 241-248, 1975.

15. Belcher, D.W., A.K. Neumann, F.K. Wurapa, D.D. Nicholas, S. Ofosu-Amaah. "The Role of Health Survey Research in Maternal and Child Health/Family Planning Programs: Danfa Project, Ghana." Journal of Tropical Pediatrics and Environmental Child Health, Vol. 21, No. 4, pp. 173-177, 1975.

16. Belcher, D.W., S.N. Afoakwa, E. Osei-Tutu, F.K. Wurapa, L. Osei. "Non-Group-A Streptococci in Ghanaian Patients with Pyoderma." Lancet, p. 1032, November 22, 1975.

17. Wurapa, F.K., L.K.A. Derban, D.W. Belcher, W.A. Chinery, R.O. Asante. "A Survey of Parasitic Infections in Rural Ghana." Ghana Medical Journal, Vol 14, No. 4, pp. 282-288, 1975.

18. Kpedekpo, G.M.K., F.K. Wurapa, I.M. Lourie, D.W. Belcher, A.K. Neumann. "A Modified Myburgh's Formula for Estimating the Expectation of Life at Birth from Survival Data Derived from Vital Registration Records." Sankhya: The Indian Journal of Statistics, Vol. 37, Series B, Pt. 1, pp. 106-113, 1975.

19. Johnson, O.G., A.K. Neumann, S. Ofosu-Amaah. "Health Information System Installation - Principles and Problems." Medical Care, No. 3, pp. 210-222, 1976.

20. Neumann, A.K., S. Ofosu-Amaah, D.A. Ampofo, D.D. Nicholas, R.O. Asante. "Integration of Family Planning and MCH in Rural West Africa." Journal of Biosocial Science, Vol. 8, pp. 161-173, 1976.

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22. Belcher, D.W., J.O.M. Pobee, E.O. Larbi, K. Occran, F.K. Wurapa. "A Rural Health Examination Survey in Ghana--Non-Response Factors." Public Health Reports, Vol. 91, No. 4, pp. 368-372, 1976.

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24. Belcher, D.W., F.K. Wurapa, D. Atuora. "Endemic Rabies in Ghana - Epidemiology and Control Measures." American Journal of Tropical Medicine and Hygiene, Vol. 25, No. 5, pp. 724-729, 1976.

25. Neumann, A.K., W.B. Ward, M. Pappoe, D. Boyd. "Education and Evaluation in an Integrated MCH/FP Project in Rural Ghana: The Danfa Project." International Journal of Health Education, Vol. 18, No. 4, pp. 233-244, 1976.

26. Ampofo, D., D.D. Nicholas, S. Ofosu-Amaah, A.K. Neumann. "The Danfa Family Planning Program in Rural Ghana." Studies in Family Planning, Vol. 7, No. 10, pp. 266-274, 1976.

27. Wurapa, F.K., D.W. Belcher. "A Tuberculin Skin Test Survey in a Rural Ghanaian Population." Tropical and Geographical Medicine, Vol. 28, pp. 291-296, 1976.

28. Nicholas, D.D., D.A. Ampofo, S. Ofosu-Amaah, R.O. Asante, A.K. Neumann. "Attitudes and Practices of Traditional Birth Attendants in Rural Ghana: Implications for Training in Africa." WHO Bulletin, Vol. 54, pp. 343-348, 1976.

29. Belcher, D.W., F.K. Wurapa, D.D. Nicholas, S. Ofosu-Amaah. "The Role of Health Examination Surveys in Planning Rural Medical Services. I. Planning and Conducting Rural Health Surveys." Ghana Medical Journal, Vol. 15, pp. 86-92, 1976.

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31. Pobee, J.O.M., E.B. Larbi, D.W. Belcher, F.K. Wurapa, S.R.A. Dodu. "Blood Pressure Distribution in a Rural Ghanaian Population." Transactions of the Royal Society of Tropical Medicine and Hygiene, Vol. 71, No. 1, pp. 66-77, 1977.

32. Nicholas, D.D., J.H. Kratzer, S. Ofosu-Amaah, D.W. Belcher. "Is Poliomyelitis a Serious Problem in Developing Countries? 1. The Danfa Experience." (This is a companion paper to #33.) British Medical Journal, Vol 1, pp. 1009-1012, 1977.

33. Ofosu-Amaah, S., J.H. Kratzer, D.D. Nicholas. "Is Poliomyelitis a Serious Problem in Developing Countries? 2. Lameness in Ghanaian Schools." (This is a companion paper to #32.) British Medical Journal, pp. 1012-1014, 1977.

34. Ampofo, D.A., D.D. Nicholas, M.B. Amonoo-Acquah, S. Ofosu-Amaah, A.K. Neumann. "The Training of Traditional Birth Attendants in Ghana: Experience of the Danfa Rural Health Project." Tropical and Geographical Medicine, Vol. 29, pp. 197-203, 1977.

35. Belcher, D.W., S.N. Afoakwa, E. Osei-Tutu, F.K. Wurapa, L. Osei. "Endemic Pyoderma in Ghana: A Survey in Rural Villages." Transactions of the Royal Society of Tropical Medicine and Hygiene, Vol. 71, No. 3, pp. 204-209, 1977.

36. Bruce-Tagoe, A., D.W. Belcher, F.K. Wurapa, P. Turkson, D. Nicholas, S. Ofosu-Amaah. "Haematological Values in a Rural Ghanaian Population." Journal of Tropical and Geographical Medicine, Vol. 29, pp. 237-244, 1977.

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40. Ward, W.B., M. Sam, D. Nicholas, M.E. Pappoe. "Impact of Family Planning Information on Acceptance at a Ghanaian Rural Health Post." International Journal of Health Education, Vol. XXI, No. 4, pp. 266-274, 1978.

41. Lamptey, P., D.D. Nicholas, S. Ofosu-Amaah, I. Lourie. "An Evaluation of Male Contraceptive Acceptance in Rural Ghana." Studies in Family Planning, Vol. 9, No. 8, pp. 222-226, 1978.

42. Neumann, A.K., F.K. Wurapa, I.M. Lourie, S. Ofosu-Amaah. "Strategies for Strengthening Health Service Infrastructure." Social Science and Medicine, Vol. 13C, No. 2, pp. 129-135, 1979.

43. Belcher, D.W., D.D. Nicholas, S. Ofosu-Amaah, J. Kratzer. "A Comparison of Methods for Estimating the Frequency of Paralytic Poliomyelitis in Developing Countries." WHO Bulletin, Vol. 57, No. 2, pp. 301-307, 1979.

A8.3.2 Papers in Press

1. Wurapa, F.K., D.D. Nicholas, D.W. Belcher, S. Ofosu-Amaah. "Epidemiology of Malaria in the Accra Plains of Ghana--Implications for Control Programmes." Ghana Medical Journal.

2. Lamptey, P., D.D. Nicholas, E. Quartey-Papafio. "A Village Based Primary Health Care Program in Rural Ghana--Selection, Training and Supervision of Village Health Workers" (1978, unpublished). WHO Forum.

3. Lamptey, P., F.K. Wurapa, D.D. Nicholas. "The Evolution of a Primary Health Care Program--The Danfa Experience, 1970-1977." Journal of Tropical Pediatrics and Environmental Child Health.

4. Ward, W.B., Belcher, D.W., Wurapa, F.K., Pappoe, M.E. "Perception and Management of Guinea Worm Disease Among Ghanaian Villagers: A Framework for Differential Health Planning." Journal of Tropical and Geographic Medicine.

A8.3.3 Papers Submitted

1. Lamptey, P., F.K. Wurapa, D.D. Nicholas. "The Evolution of a Primary Health Care Program--The Danfa Experience, 1970-1977." Submitted to the Ghana Medical Journal.

A8.3.4 Conference Presentations

1. Wurapa, F.K. "Rapid Population Growth and Rural Development." Published in The Teaching and Practice of Family Health - Proceedings of the Conference sponsored by the Association of Medical Schools in Africa; Kampala, Uganda, November 29 - December 3, 1971.

2. Wurapa, F.K., I.M. Lourie. "The Danfa Rural Health and Family Planning Project." Published in the Proceedings of the African Regional Population Conference, sponsored by the IUSSP and ECA; held in Accra, Ghana, December 13-17, 1971.

3. Sai, F.T. "A Rural Health Model: Danfa, Ghana." In Health Care for Remote Areas, An International Conference, sponsored by Kaiser Foundation International, Bellagio, Italy, May 1972. (James Hughes, Editor.)

4. Wurapa, F.K., I.M. Lourie. "Population Growth and Rural Health." Presented at the West African Regional Seminar on Population Studies, December 1-4, 1972. Published in the Proceedings of the Seminar.

5. Wurapa, F.K., I.M. Lourie. "Focusing on Family Health in the Rural Communities." Published in The Teaching and Practice of Family Health - The Proceedings of a Regional Seminar, sponsored by the Association of Medical Schools in Africa; Accra, Ghana, January 8-12, 1973.

6. Wurapa, F.K. "Community Approach to the Organization of a Comprehensive Rural Health Care System - The Danfa Experience." Paper presented at the Conference on Health of the Family Unit, University of Sierra Leone, September 1973. Published in the Proceedings.

7. Neumann, A.K. "Management Issues in the Organization and Delivery of Family Health/Family Planning Services." Paper presented at the Second Interuniversity Workshop in Family Planning Administration, March 1974. Published in the Proceedings.

8. Wurapa, F.K., D.W. Belcher, A.K. Neumann. "Morbidity in Rural Communities - The Questionnaire Interview Approach to Providing Useful Data for Health Planning." Paper presented to the Inaugural Conference of the Population Association of Africa, University of Ibadan, May 1974, Published in the Proceedings.

9. Britt, P.M., S.N. Blumenfeld, F.K. Wurapa, G.M.K. Kpedekpo, A.K. Neumann. "A Case Study in Computer Applications for Developing Countries - The Danfa Comprehensive Rural Health and Family Planning Project, Ghana." Paper presented at the Second Jerusalem Conference on Information Technology, July-August, 1974, Published in the Proceedings.

10. Sohrab, L. "Computer Applications in the Danfa Project - A Tool for Social and Economic Development of Ghana." Presented at the Student Paper Sessions of the Jerusalem Conference on Information Technology, August 1, 1974.

11. Belcher, D.W., F.K. Wurapa, D.D. Nicholas. "Health Care and Family Planning." Presented at the International Health/Family Health Conference. Washington, D.C., October 1974.

12. Ward, W.B., L. Enberg, D.W. Belcher. "Preliminary Report of Efforts to Develop Social Indicators to Guide and Assess Rural Development." University of Ghana, May 1974.

13. Neumann, A.K., C.G. Neumann, W.B. Ward. "The Design and Implementation of an Integrated Nutrition Health and Family Planning Program in Rural African Villages." Presented to the 19th Annual Meeting of the African Studies Association, Boston, Massachusetts, November 3-6, 1976.

14. Nicholas, D.D., J.H. Kratzer, S. Ofosu-Amaah. "Paralytic Poliomyelitis in Ghana--Survey of Lameness." Poster presentation at 1976 Joint Meeting of the American Society of Tropical Medicine and Hygiene and the Royal Society of Tropical Medicine and Hygiene, November 4, 1976.

15. Neumann, A.K., F.K. Wurapa. "Strategies for Strengthening Health Services Infrastructure." Presented at the Latin American Studies Association - African Studies Association Annual Meeting, Houston, Texas, November 4, 1977 (See #3 of Section D).

16. Neumann, A.K. "Integration of Rural MCH/Nutrition/Family Planning Services - The Danfa/Ghana Project as a Model." Prepared for IUNS Working Conference in Hyderabad, India, October 7-21, 1977 on the theme: Community Action - Family Health Programme Delivery - An Integrated Package.

17. Neumann, A.K., C. Neumann, S. Ofosu-Amaah. "Integration of MCH, Family Planning and Nutrition Programs from a Managerial Perspective." Presented to the XVth International Congress of Pediatrics, New Delhi, India, October 1977.

18. Wurapa, F.K. "Institutional Organization: Assessment of Alternatives." Presented at the Conference on the Future of Academic Community Medicine in Developing Countries, April 10-14, 1978.

19. Lourie, I.M. "Background and Introduction to The Danfa Project." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

20. Lamptey, P. "The Danfa Project Primary Health Care Program." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

21. Neumann, A.K. "Impact Institutionalization and Policy Implications of The Danfa Project." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

22. Blumenfeld, S.N. "Systems and Costs Aspects of the Danfa Project." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

23. Nicholas, D.D. "The Danfa Family Planning Program." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

24. Ward, W.B. "The Impact of Community Health Education on Health and Family Planning Practices in Rural Southern Ghana." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

25. Belcher, D.W., F.K. Wurapa, D.D. Nicholas, S. Ofosu-Amaah. "Health status measurement in a Rural Health Project." Presented at the 106th APHA Annual Meeting in Los Angeles, California, October 15-19, 1978.

26. Neumann, A.K. "Introduction to Practical Evaluation." Prepared for the AID African Health/Nutrition/Population Officers Conference held at Taita Hills, Kenya, November 26 - December 1, 1978.

27. Ward, W.B., M.E. Pappoe. "Health Education in Rural Ghana." Presented at the International Union of Health Educators Conference, London, England, September 3-6, 1979.

A8.3.5 Monographs

1. Kpedekpo, G.M.K., D.W. Belcher, F.K. Wurapa, A.K. Neumann, I.M. Lourie. "Results of the Analysis and Evaluation of Vital Registration Data from the Four Project Areas." (Vital Events 1 - Monograph Series, Number 1) 1975.

2. Kpedekpo, G.M.K., F.K. Wurapa, I.M. Lourie, D.W. Belcher, A.K. Neumann. "Estimates of Indices of Mortality from Registration Data." (Vital Events 2 - Monograph Series, Number 2) 1975.

3. Kpedekpo, G.M.K., D.D. Nicholas, S. Ofosu-Amaah, F.K. Wurapa, D.W. Belcher. "Estimates of Indices of Fertility from Registration Data." (Vital Events 3 - Monograph Series, Number 3) 1975.

4. Kpedekpo, G.M.K., F.K. Wurapa, I.M. Lourie, A.K. Neumann, D.W. Belcher. "Some Results and Problems on the Estimation of Vital Rates in a Rural African Setting via Multiple Methods." (Vital Events 4 - Monograph Series, Number 4) 1975.

5. Kpedekpo, G.M.K., F.K. Wurapa, I.M. Lourie, A.K. Neumann, D.W. Belcher. "Migration Patterns, Population Growth and Change in the Project Areas of Danfa." (Vital Events 5 - Monograph Series, Number 5) 1975.

6. Kpedekpo, G.M.K., I.M. Lourie, F.K. Wurapa, D.W. Belcher, A.K. Neumann. "The Basic Demographic Characteristics of the Danfa Project Areas - An Analysis of the Population Size, Age/Sex Distribution." (Demography 1 - Monograph Series, Number 6) 1975.

7. Kpedekpo, G.M.K., F.K. Wurapa, D.W. Belcher, A.K. Neumann, I.M. Lourie. "The Basic Demographic Characteristics of the Danfa Project Areas - An Analysis of Marital Status, Education, Ethnic, Religious and Occupational Composition." (Demography 2 - Monograph Series, Number 7) 1975.

8. Kpedekpo, G.M.K., K. Asuming, S.N. Blumenfeld, F.K. Wurapa, D.W. Belcher. "An Analysis of the Characteristics of Households, Household Size, Household Heads and the Relationship within the Households." (Demography 3 - Monograph Series, Number 8) 1975.

9. Belcher, D.W., F.K. Wurapa, D.D. Nicholas, G.M.K. Kpedekpo, S. Ofosu-Amaah, L.K. Derban, R.O. Asante. "Conducting a Rural Health Survey: Experience from the Village Health Survey, Danfa Project, Ghana." (Monograph Series, Number 9) 1975.

10. Belcher, D.W., G.M.K. Kpedekpo, F.K. Wurapa, I.M. Lourie. "Mapping and House Numbering Methods in a Rural Health Project." (Monograph Series, Number 10) 1976.

11. Belcher, D.W., F.K. Wurapa, I.M. Lourie, K. Kwabia, S. Avle. "Experience in Selecting Training and Supervising Interviewers in a Rural Health Project." (Monograph Series, Number 11) 1976.

A8.3.6 Training Manuals

1. A Programme Manual for Traditional Birth Attendants - Organization, Training and Evaluation, December 1977.

2. Manual A and B for Health Workers and Serving Personnel, March 1977.

3. Danfa Comprehensive Rural Health and Family Planning Project: Ghana - Preliminary Manual for Trainers of Village Health Workers, Phase I and Phase II, 1978.

4. Village Health Survey Manual. In progress.

A8.3.7 Annual or Semi-annual Progress Reports

1. Semi-Annual Progress Report - January-June 1971.

2. Semi-Annual Progress Report - July-December 1971.

3. Semi-Annual Progress Report - January-June 1972.

4. Semi-Annual Progress Report - July-December 1972.

5. Annual Progress Report - January-December 1973.

6. Annual Progress Report - January-December 1974.

7. Annual Progress Report - January-December 1975.

8. Annual Progress Report - January-December 1976.

9. Annual Progress Report - January-December 1977.

A8.3.8 Proceedings of the Annual Review Meetings

1. Proceedings of the Fifth Annual Review Meeting. February 26-28, March 1, 1974. Accra, Ghana.

2. Proceedings of the Sixth Annual Review Meeting. March 17-18, 1975. Accra, Ghana.

3. Proceedings of the Seventh Annual Review Meeting. February 12, 1976. Accra, Ghana.

4. Proceedings of the Eighth Annual Review Meeting. February 24, 1977. Accra, Ghana.

A8.4 SUMMARY OF PUBLICATIONS

In this subsection, abstracts of Danfa Project publications are grouped by subject area, and where appropriate, cross-referenced. These are organized as follows:

A8.4.1 Project History Background
A8.4.2 Health Status
A8.4.3 Health Care Delivery
A8.4.4 Fertility and Family Planning
A8.4.5 Monographs

Requests for reprints of publications may be directed to either:

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Los Angeles, California 90024

A.8.4.1. PROJECT HISTORY BACKGROUND

The Danfa/Ghana Comprehensive Rural Health and Family Planning Project - A Community Approach. Sai, F.T., Wurapa, F.K., Quartey Papafio, E.K. Ghana Medical Journal 11 (1): 9-17, 1972.

Shortly after the University of Ghana Medical School was established in 1964, it was decided that a rural health project affiliated with the School would be useful in teaching medical students about community health problems. Faced with a high fertility rate, high infant and maternal mortality rates and a preponderence of preventable infectious and parasitic diseases common to developing countries, Ghanaian health planners determined that such a research/teaching/demonstration project could help to:

(a) Investigate the socioeconomic state of rural communities, the physical amenities and health status of inhabitants;
(b) Train all levels of health care personnel for effective rural health care delivery and;
(c) Develop comprehensive health care services at the Danfa Health Center (established 1970) which address the needs of the communities and which are replicable throughout Ghana.

Underlying these goals were deliberate efforts from the outset to involve the communities in planning and implementing the Project.

While the Danfa Health Center was being built, negotiations were undertaken between the University of Ghana Medical School, University of California at Los Angeles (UCLA) School of Public Health and USAID to provide external assistance in some of the research and training activities of the Project. These negotiations culminated in an agreement between the two universities in April 1970. Numerous University of Ghana departments and Government of Ghana agencies are included in the project in recognition of the synergistic relationship between health care and other components of rural development.

The Danfa/Ghana Comprehensive Rural Health and Family Planning Project--Preliminary Report. Neumann, A.K., Prince, J., Gilbert, F.F., Lourie, I.M. Ghana Medical Journal 11 (1): 18-24, 1972.

In 1970, the teaching and research activities of the Ghana Medical School in the Danfa district (the Danfa Project) were expanded via an agreement with the University of California at Los Angeles (UCLA) School of Public Health and USAID. The liaison with UCLA was intended to strengthen the existing health services infrastructure in Ghana. Administrative procedures were adopted to ensure that the Danfa Project remains an essentially Ghanaian effort.

The original Project design divided the study region (located north and west of Accra) into four areas. All areas maintained the standard Ministry of Health services; in three of the areas family planning was provided, and in two areas health education was integrated with family planning, in order to measure family planning acceptance rates under various health service modalities. Longitudinal and cross-sectional studies were planned throughout the life of the Project to study

morbidity, child care practices, fertility, maternity practices, and family planning knowledge, attitudes and practices. Cost analysis was an important component of the planned research.

A New Trend in International Health Work: The Danfa Project. Neumann, A.K., Sai, F.T., Lourie, I.M., Wurapa, F.K. International Development Review, Focus 1973/2: 11-14.

The Danfa Project involves intensive collaboration between the two countries involved; this equality of effort between host and donor groups represents a growing trend in international health projects and reflects the steady increase of highly skilled and sophisticated health workers in developing countries over recent years. The collaborators in the Danfa Project outlined several administrative conditions prior to the Project's implementation to facilitate the relationship between the two staffs. These administrative conditions included:

(a) Joint development of final Project plans.
(b) Approval of UCLA staff by the Ghanaian Codirector.
(c) Separation of Ghana Medical School and UCLA budgets.
(d) Clear delineation of responsibility of major project components (i.e. service and teaching - Ghana Medical School; research primarily UCLA).
(e) Joint publication of project papers.
(f) Formal annual Project review meetings involving representatives from all involved university departments and agencies.

These specifications, made early in the Project, have helped to foster a harmonious working relationship between the Ghana Medical School and UCLA staffs.

Danfa Comprehensive Rural Health and Family Planning Project: Ghana, Research Design. Neumann, A.K., Sai, F.T., Dodu, S.R.A. Journal of Tropical Pediatrics and Environmental Child Health, 20 (1):21-27, 1974.

In order to determine the most acceptable and cost efficient manner of delivering health and family planning services in rural Ghana, the

Danfa Project delineated a field "laboratory" in a region north and west of Accra divided into four areas. Each area contained about 2,000 households and between 10,000-15,000 persons. Project services are provided as follows:

	SERVICE PROVIDED			
AREA	COMPREHENSIVE HEALTH CARE	HEALTH EDUCATION PROGRAM	FAMILY PLANNING PROGRAM	STANDARD MINISTRY OF HEALTH SERVICES
I	yes	yes	yes	yes (equivalent)
II	no	yes	yes	yes
III	no	no	yes	yes
IV	no	no	no	yes

Area I: One approach is based on the contention that couples will have fewer children if convinced that those they have now are more likely to survive childhood. Proponents of this concept believe that family planning programs should be integral to a program of curative and preventive services stressing maternal and child care and nutrition. Area I includes the Danfa Rural Health Care Center.

Area II: A second approach provides family planning services in conjunction with an intensive educational campaign promoting good health practices and family planning.

Area III: A third approach assumes that simply making family planning services readily available will facilitate favorable change without concern for any health services or special educational program.

Area IV: A fourth approach proposes that change comes about as a result of economic growth and an expanded educational system, regardless of special programs or services.

Several hypotheses prompted the adoption of the four-cell research design:

(a) Comprehensive health care, as delivered by the Danfa Project, will reduce child morbidity and mortality rates.
(b) Family planning services within a program of comprehensive health services and health education are more effective in reducing fertility rates than family planning services without these additional components.
(c) Family planning services coupled with health education are more effective in reducing fertility rates than family planning services provided without health education.
(d) The introduction of family planning services utilized by the Danfa Project will result in a greater reduction of fertility rates than traditional family planning methods normally employed.

Project activities were planned to include maternal child health, family planning, health education, training at all levels, epidemiologic studies, special studies (including the training of traditional birth attendants) and studies of health and family planning knowledge and behavior. Baseline studies were conducted in 1972 and included the following: registration, vital events registration, morbidity survey, child health KAP survey, maternal health practices survey, fertility survey and family planning KAP surveys.

In the sampling procedure used to select respondents for the surveys--only those households with fertile females were used in the selection of all except the morbidity and male family planning KAP studies. Both longitudinal and cross-sectional studies were planned throughout the life of the Project.

Danfa Project. Dodu, S.R.A., Neumann, A.K. Letter to Lancet, 570, March 30, 1974.

The Danfa Project, initiated in 1970, is a service, research, demonstration and teaching project, primarily situated in the Ghana Medical School but closely associated with the Ghana Ministry of Health, the Ministry of Social Welfare, the Ministry of Finance, the Ghana National Family Planning Programme, various University of Ghana departments and other Ghanaian agencies. An effective collaborative working relationship

has evolved between the Ghanaian and American institutions involved in the Project. A rural population of about 50,000 is being studied to provide information to Ghanaian health and community development planners as well as to other African countries.

Strategies for Strengthening Health Service Infrastructure: A Case Study in Ghana. Neumann, A.K., Wurapa, F.K., Lourie, I.M., Ofosu-Amaah, S. Social Science and Medicine, 13C: 129-135, 1979.

Training, information transfer and cost control were essential in the Danfa Project's efforts to institutionalize Project findings.

An early Project policy was to conduct as much training as possible in Ghana and the majority of Danfa trainees have received training in their own country, including inservice training and special seminars or courses. Project training activities have included:

(a) Junior level training (village health workers, traditional birth attendants).
(b) Middle level training (health education assistants, Health Center staff, research assistants).
(c) Medical student training.
(d) Senior level training (overseas participant training program).

The Ministry of Health and the Ghana National Family Planning Programme have been given information about the Project's activities and findings through progress reports, meetings, publications, seminars and workshops, including recommendations on:

(a) Malaria prophylaxis programs
(b) Methods of training and utilizing community level health workers
(c) Health conditions among rural Ghanaians
(d) "Outreach" family planning methods
(e) Health center operations

Specific measures were undertaken to facilitate cost control in those activities which were intended to be replicated (service and training).

The Government of Ghana has provided and paid for all ongoing service staff, training personnel, some of the research and support personnel, all of the routine drugs and supplies used in health services and some of the equipment and transport. At all times project planners observed twin constraints of using personnel available in Ghana and keeping Danfa per capita service costs within current Government of Ghana expenditures. Training and utilization of multipurpose staff reduced training and research costs.

Findings of the Project are already being tested and implemented in other parts of Ghana by the Ministry of Health, and in particular, the Ministry's Health Planning Unit.

Health Information System Installation--Principles and Problems. Johnson, O.G., Neumann, A.K., Ofosu-Amaah, S. Medical Care 3: 210-222, 1976.

It is crucial that the planner, health information specialist and the users of data work together from the beginning of a project or program so that the collection of data is not only efficient but also useful to those who need health information. The Danfa Project applied the following basic principles in planning and implementing the health information system used in collecting Project data:

(a) It is essential that the population of the program be defined, identified and counted.
(b) Uniform and explicit definitions of terms, which may have different interpretations among the personnel, are essential for meaningful records and reports.
(c) Criteria are selected by the users of the data.
(d) The individual is the unit of reference.
(e) The selection of the unit(s) of measurement should be determined early in the organization of an information system.
(f) Data that are to be grouped or classified later should be of sufficient detail to permit flexibility in arrangement.
(g) Each source document must reflect the function it is to serve in the recording, processing and use of the data.

(h) Linkage of data pertaining to an individual must have the same identifying information on each form that is selected for matching.

A8.4.2 HEALTH STATUS

The Planning and Design of Sampling Surveys with Particular Reference to the Epidemiological Survey of the Danfa Project in Ghana. Kpedekpo, G.M.K. Ghana Medical Journal 11(4): 377-382, 1972.

Sample surveys are important devices for the collection of demographic, health and other community statistics in African countries. Such information is needed for efficient planning of health and other community development programs. While a number of sample designs are available (and any sampling design should be tailored to survey requirements), cluster sampling may be the most practical for use in rural Africa. Rarely are individual household listings accurately maintained in Africa, so the cluster sample design, focussing on groups of households, is often recommended. Cluster sampling may result in cost savings since collection of data from clusters of villages is faster and more convenient than enumerating households scattered over a region. Negative aspects of cluster sampling include the fact that inhabitants of the same cluster tend to resemble one another (intraclass correlation) with a resulting decrease in precision of the sample estimates--larger sample sizes can help remedy this problem. The preferred sample size, of course, also depends on other factors such as the money available for the survey, the number of statistical breakdowns required and the desired limits of and ability to control error, particularly non-sampling error.

The Danfa Project chose a stratified cluster sampling design (according to village size) for its multisubject health survey planned at intervals throughout the life of the Project. Villages with under 50 persons were eliminated from the scheme for logistics reasons. Clusters of 100-200 persons were formed in each stratum--the cluster size recommended by recent African demographic studies. In the absence of any reliable knowledge on the pattern of intraclass correlation on the variables of interest, the sample size estimated for a simple random sampling design was doubled for use in the cluster design.

An Approach to Illness Measurement in a Rural Community--A Questionnaire Sample Survey of Households in the Population of the Danfa Comprehensive Rural Health and Family Planning Project in Ghana. Wurapa, F.K., Belcher, D.W., Neumann, A.K., Lourie, I.M. Ghana Medical Journal 13: 98-105, 1974.

In order to provide much needed information about health status of rural communities, both longitudinal and cross-sectional morbidity surveys were planned as important components of the Danfa Project survey schedule. Households were randomly selected from a framework of households reporting at least one fertile female (age 15-44), since surveys of maternal care practices, child care practices and family planning KAP surveys were administered along with the morbidity questionnaire. Sample size selected provided an estimated 3,000 respondents in each of the four Project areas, allowing for a 50 percent attrition rate over the planned five years' follow-up. The head of each selected household or other responsible adult was queried as to sickness, injury, disability, dental problem or pregnancy occurring among all household members during the two weeks prior to the interview. The major findings of the pattern of illness in the initial (baseline) survey included:

(a) A striking preponderance of the infective and parasitic group of conditions in the child population;
(b) Symptom complexes related to the more chronic conditions increasing with age; and
(c) A generally higher incidence of illness and restricted rates among women as compared with men.

Guinea Worm in Southern Ghana: Its Epidemiology and Impact on Agricultural Productivity. Belcher, D.W., Wurapa, F.K., Ward, W.B., Lourie, I.M. American Journal of Tropical Medicine and Hygiene 24(2): 243-249, 1975.

In southern Ghana guinea worm disease was found to occur almost exclusively in villages dependent upon pond water during the dry season. The recent occurrence of guinea worm for the first time in many villages in the survey area suggests that the disease is spreading. The risk of increasing disease in the Accra plains is serious, because almost half

of the 159 villages surveyed use pond water, and residents frequently travel to endemic areas. In this study adult male farmers were at greatest risk of becoming infected. The average work loss in untreated adults was more than five weeks. Because guinea worm disease is seasonal, coinciding with peak agricultural activities, and few alternative labor sources are available for the incapacitated farmer, a marked reduction in agricultural output occurs. Additional research is needed to guide health education programs, to evaluate the effectiveness of chemical control of cyclops in ponds, and to develop low-cost improved rural water supplies.

A Clinical Picture of Guinea Worm Disease in Southern Ghana. Wurape, F.K., Belcher,D.W., Ward, W.B. Ghana Medical Journal 14: 10-15, 1975.

Follow-up visits on 112 confirmed cases of guinea worm in six Danfa Project villages were conducted from September to December 1973. The disease was most common in adult males; almost half of all patients also developed bacterial complications. A smaller number developed allergic reactions and synovitis. Drug trials using thiabendazole and metronidazole were done to assess their efficacy in guinea worm disease. Neither drug was found to have direct anti-helminthic activity, although reduction in pain and swelling occurred, probably due to an anti-inflammatory property.

The high bacterial complication rate was caused by a combination of readily contaminated ulcers on the leg, continued work activities, poor environmental sanitation, and use of traditional methods to expel or extract the worm. Patients with bacterial superinfections responded well to long-acting penicillin.

It was found in this study that most patients do not report at any clinic or hospital during their illness until they have developed some complications. This fact coupled with the poor hygiene in most of these villages and the popular use of herbal poultices make the management of the complication in a clinic or hospital more difficult. The logistic problems in taking medical care to villages are tremendous and effective antihelminthic therapy remains to be found.

Interruption of the transmission cycle is the major means for reducing guinea worm disease. We have initiated a collaborative study

with the Institute of Aquatic Biology (C.S.I.R.) to identify pond cyclop species, seasonal variation in numbers and infection rates.

Failure of Thiabendazole and Metronidazole in the Treatment and Supression of Guinea Worm Disease. Belcher, D.W., Wurapa, F.K., Ward, W.B. American Journal of Tropical Medicine and Hygiene 24(3): 444-446, 1975.

Guinea worm disease is endemic in West Africa. In 1973 a field drug trial was conducted to compare effectiveness, cost, and side-effects of thiabendazole and metronidazole in treating active guinea worm disease and preventing latent worms from emerging. A mass chemotherapy campaign was planned to follow the drug trial. Only 15.5% of the treated patients expelled the worm completely, and in 28.4% of the cases worms continued to appear. Both drugs were equally unsatisfactory in their anti-helminthic effect. Consequently, our efforts to control guinea worm have shifted from chemotherapy to chemical control of cyclops and improvement of rural water supplies.

The Role of Health Survey Research in Maternal and Child Health/Family Planning Programmes: Danfa Project, Ghana. Belcher, D.W., Neumann, A.K., Wurapa, F.K., Nicholas, D.D., Ofosu-Amaah, S. Journal of Tropical Pediatrics and Environmental Child Health 21(4): 173-177, 1975.

Accurate information about the health status of rural populations in less developed countries is needed to plan adequate, relevant and cost effective health services. This information is particularly important in integrated programs of maternal and child health and family planning services which are based on the rationale that family planning acceptance is, to a great extent, dependent on reduced morbidity and mortality rates.

Two health assessment instruments--the morbidity questionnaire and accompanying physical examination--are being used in the Danfa Comprehensive Rural Health and Family Planning Project, Ghana, to help provide information about Ghanaian villagers and thereby relate health services to needs. In the initial Village Health Survey in early 1973, over 3,700 men, women and children in the Project's research area were randomly selected and examined by project staff. Preliminary results of the survey have

helped to direct the attention of health planners and health educators. Additional studies in this survey will relate parity, birth interval and family size to family health in an effort to delineate the relationship between family planning and improved maternal and child health.

Non-Group-A Streptococci in Ghanaian Patients with Pyoderma. Belcher, D.W., Afoakwa, S.N., Osei-Tutu, E., Wurapa, F.K., Osei, L. Letter to Lancet, 1032, November 22, 1975.

From March to April 1975, the Danfa Project conducted a survey of skin infections among residents of 20 villages within 50 miles of Accra. Cultures were taken from skin lesions in 76 persons who had pyoderma. For 56 subjects who had positive streptococcal cultures, representative colonies of 3-haemolytic streptococci were subcultured.

Forty-six of the 56 strains (82.1%) were group-G streptococci, and ten (17.9%) were group C. There was a complete absence of group-A strains. We thought this distribution was extraordinary, since reports from several countries have revealed a preponderence of group A isolates. However, we subsequently saw a report from Lagos, Nigeria, where only 22% of skin streptoccal isolates were found to be group A., 34 % were group C, 10% group G, and 34% other streptococcal groups. In the Nigerian patients, two-thirds of nose-and-throat isolates were groups C and G.

These preliminary studies suggest that non-group-A streptococci are frequent causes of pyoderma in southern Ghana and Nigeria. Because most studies have investigated only the role of group A in glomerulonephritis, more research is needed to clarify the relationship of non-group-A to pyoderma and its complications.

A Survey of Parasitic Infections in Rural Ghana. Wurapa, F.K., Derban, L.K.A., Belcher, D.W., Chinery, W.A., Asante, R.O. Ghana Medical Journal 14(4): 282-288, 1975.

During the baseline 1973 Village Health Survey of the Danfa Project, 3,653 subjects in 20 selected villages were given physical examinations by a team of physicians and assistants; a 25% sample was used to collect stool, blood and urine specimens. Patterns of parasitic infection in this subsample were analyzed.

(a) Ascaris: The overall prevalence rate was 46.5%. Twenty-three percent of infants were positive. Percentages of positive stool exam increased with age to age 30 after which there was a gradual reduction.

(b) Hookworm: The overall prevalence rate was 38.5%. Infection rates peaked at 60% in the 10-19 year age group. No male preponderence in infection was found, presumably because Ghanaian women also work at farming and are therefore equally exposed to hookworm. There was no correlation found between infection and low hemoglobin levels.

(c) Strongyloides: Present in 4.7% of stools examined and was uniformly present in all age groups and both sexes.

(d) Shistosomiasis: Highest infection rates were in the 10-19 year old age groups, but rates were lower in the Project areas than in other regions of Ghana.

(e) Malaria: Only 6% had positive malaria blood films, although enlarged spleens (indicating recent infection) were found in 30-50% of younger age groups. The survey was conducted in the dry season when low transmission is present. Falciparum malaria was found to be the dominant type.

On the basis of this survey program priorities for parasitic disease eradication were established with the major focus on malaria control.

A Modified Myburgh's Formula for Estimating the Expectation of Life at Birth from Survival Data Derived from Vital Registration Records. Kpedekpo, G.M.K., Wurapa, F.K., Lourie, I.M., Belcher, D.W., Neumann, A.K. Sankhya: The Indian Journal of Statistics 37 (Series B, Part 1): 106-113, 1975.

Attempts to use Myburgh's formula for estimating life expectancy with data from vital events registration records have yielded poor results, while data from surveys/censuses have yielded results comparable to those from other estimation methods. A modification of the formula was used with Danfa Project vital events registration record data, and when results were compared with the results obtained from applying survey data, the agreement was satisfactory. Wider application of this

modified formula with vital events registration data is recommended to explore the full range of possible error situations.

A Household Morbidity Survey in Rural Africa. Belcher, D.W., Wurapa, F.K., Neumann, A.K., Lourie, I.M. International Journal of Epidemiology 5(2): 113-120, 1976.

A household morbidity interview survey with 2,000 randomly selected households (14,729 people) in rural Ghana covered a two-week recall period; 20.8% of people reported some illness, injury or disability. This prevalence is lower than reported during surveys in Colombia, USA, Britain and Australia. Adults averaged 0.5 days lost from work, which results in an estimated annual work loss of 13.4 days.

The reported illness varied markedly with age, with a peak in middle-aged adults and females in their reproductive years. The use of clinic services varied with age (they were sought particularly for pre-school children), type of condition, and accessibility. The use of drug sellers was surprisingly high, about half that of clinic attendance, and increased in those geographical areas where clinics were least accessible.

Rural Health Examination Survey in Ghana--Nonresponse Factors. Belcher, D.W., Pobee, J.O.M., Larbi, E.B., Ocran, K., Wurapa, F.K. Public Health Reports 91(4): 368-372, 1976.

A random cluster sample of 20 rural villages was studied from January to March 1973 to collect baseline data on morbidity of the Danfa Project population. Motivational efforts were intensive and included preliminary contact with village leaders and individualized persuasion by highly motivated interviewers. Supervisors attempted to persuade villagers to attend and after the first of the two days of clinics in each village, each interviewer visited those who had not attended to encourage them to come the second day. A follow-up study of 196 non-participants in the examination survey was undertaken to learn why they did not attend the health examination clinics and what health problems they had.

An interviewer and physician visited each nonparticipant; 104 consented to an interview and examination at home. Eight refused examinations. Other household members were questioned about absent subjects.

Nonparticipants were older than the participants and predominantly male. Work was the most frequently mentioned deterrent to participation. The examination survey was scheduled not to conflict with farming activities; most nonparticipants were in occupations other than farming. Incapacitation was also an important reason for nonattendance, especially in those 65 years or older. Traveling (to visit relatives, attend festivals, conduct business) was a common reason for not participating. Reluctance to be examined, fear and a belief that the examination was unnecessary also featured significantly in nonparticipation. Social obligations, and religious-cultural beliefs which prohibited use of modern medical services were also mentioned. Only two people had not heard of the survey.

Most nonparticipants lived in large villages where easier access to regular health services may have resulted in less interest in the survey. Larger villages also contain more nonfarmers.

Follow-up visits increased the overall examination rate from 94.8 to 97.5%. Fifty percent of all nonparticipants reported symptoms of illness. Diagnoses during these home visits increased the prevalence rates for acute tuberculosis, paralysis, blindness, malignancy, cardiac failure and psychosis.

Comparison of Morbidity Interviews with a Health Examination Survey in Rural Africa. Belcher, D.W., Neumann, A.K., Wurapa, F.K., Lourie, I.M. American Journal of Tropical Medicine and Hygiene 25(5): 751-758, 1976.

A study of the Danfa Project, compared information obtained from morbidity interviews with information obtained during subsequent health examinations. One to four days prior to examination by a team of physicians, 3,653 rural Ghanaians were interviewed by a team of auxiliary workers. Information obtained from the interview survey was noticeably different from examination diagnoses. Significant health problems such as malaria, intestinal parasites and diarrhea, as well as minor and chronic conditions were seriously underreported. Interview findings were more accurate for children, women in the reproductive age group, and in cases in which the disease caused considerable discomfort or disability. Although individual examination was eight times as costly as an interview, small scale rural

health examination surveys of a representative sample of the population are recommended to provide accurate morbidity information for health planners.

Endemic Rabies in Ghana. Belcher, D.W., Wurapa, F.K. and Attuora, D.O.C. American Journal of Tropical Medicine and Hygiene 25(5): 724-729. 1976.

Rabies is well established in Accra and there has been no decline in canine or human cases during the past five years. In the first six months of 1975, canine cases almost doubled over the period average. So far dogs are the only confirmed carnivorous vector in Ghana. A clear seasonal peak exists, so that intervention efforts can be timed to achieve a maximum impact. Persons at greatest risk of contracting rabies are males and school-aged children, who need improved educational and post-dog bite services. The fundamental issue for health policy is to achieve a proper balance between environmental, preventive and treatment aspects of rabies. Problems with logistics, canine vaccine shortage and failures, lack of owner cooperation, and a large stray dog population confound efforts to control the disease.

A Tuberculin Skin Test Survey in a Rural Ghanaian Population. Wurapa, F.K., Belcher, D.W. Tropical and Geographical Medicine 28: 291-296, 1976.

A Danfa Project study was conducted to determine the prevalence of positive tuberculin skin tests in the project study area. Subjects over 14 exhibited the greatest percentage of positive reactions (40%), those under 15, less than 10%. Males had a higher percentage of positive reactions than females, which is consistent with the results of other tuberculin skin test studies. Prevalence of BCG scars was also studied as part of a village health survey medical examination. Overall BCG coverage was low (10%): the school age population, most easily reached by mobile vaccination teams, had the highest rate of coverage (16%).

There was a poor correlation between mothers' perception of children's BCG immunization status and the children's actual status determined during the medical examination, largely due to poor communication between immunization staff and the villagers. The authors conclude that BCG

immunizations should be encouraged, particularly in children under 15, preferably via a mobile, mass campaign approach, with careful communication between medical staff and villagers.

The Role of Health Examination Surveys in Planning Rural Medical Services. Planning and Conducting Rural Health Surveys. Belcher, D.W., Wurapa, F.K., Nicholas, D.D., Ofosu-Amaah, S. Ghana Medical Journal 15: 86-92, 1976.

Up-to-date health information is needed to design effective health programs and to make health workers' training relevant. While patient data are useful to analyze acute or epidemic diseases, as well as serious life-threating conditions, they are incomplete. Many persons who are ill do not attend clinics because of the distance and cost involved, or because they prefer other sources of care. To achieve a more accurate picture of actual disease in the community, village health surveys should be conducted.

The Danfa Project's 1973 and 1975 village health surveys have provided information on the prevelance of selected diseases, pregnancy histories of women and use of available medical services, including immunization. The approach adopted by the Project is feasible for use elsewhere in Ghana and in other developing areas.

Gastrointestinal Infections in Pre-school Children in the Danfa Project Area. Wurapa, F.K., Belcher, D.W., Afoakwa, S.N., Mingle, J.A.A., Kelemen, G., Voros. Ghana Medical Journal 15: 158-162, 1976.

During the 1972-1973 Village Health Survey, stool histories were taken and specimens were collected from randomly selected preschool age subjects. Examiners were looking for evidence of diarrhea, bacterial and viral isolates and previous salmonella infection.

Overall diarrhea prevalence was 4% in 0-4 year olds; 2.4% of the 498 specimens contained salmonella or shigella organisms. Paratyphi C isolates predominated over A and B isolates. 11.9% of these subjects had positive culture for enteropathic E. coli.

Virus isolates were recovered in 27.9% of 0-4 year olds' stool specimens. Polio type I and Echovirus type 6 were the predominant virus strains isolated--45% of the isolates were untypeable. The isolation

rate in this survey compared favorably with other previous surveys but was considerably lower than a Danfa Health Center year-round study. The excretion of polio virus was found to occur chiefly in the two year olds.

Blood Pressure Distribution in A Rural Ghanaian Population. Pobee, J.O.M., Larbi, E.B., Belcher, D.W., Wurpa, F.K., Dodu, S.R.A. Transactions of the Royal Society of Tropical Medicine and Hygiene 71 (1): 65-72, 1977.

Hypertension and related complications appear, from clinical impression, to be increasing problems in urban Ghanaians. In early 1973 we conducted a blood pressure survey in 20 rural Ghanaian villages to determine the prevalence of hypertension, in comparison with studies done in Accra residents and black Americans. Rural Ghanaians had mean systolic and diastolic blood pressures which were lower at all ages than the urban groups. Of the subjects aged 16 to 54 years 2.5% had diastolic blood pressures of 95 or higher mm Hg. These findings are discussed in view of the proposed hypertension control program in Accra. We conclude that hypertension is not a significant health problem in rural Ghanaians and that large-scale hypertension case-finding and intervention programs should be confined to urban populations.

Is Poliomyelitis a Serious Problem in Developing Countries?--The Danfa Experience. Nicholas, D.D., Kratzer, J.H., Ofosu-Amaah, S., Belcher, D.W. British Medical Journal 1: 1009-1012, April 16, 1977.

Children were examined for lameness in the Danfa Project district of rural Ghana to assess the impact of endemic poliomyelitis and to test a widely held hypothesis that paralytic poliomyelitis is relatively rare in such districts (less than 1 per 1000 children affected). The observed prevalence of lameness attributable to poliomyelitis was seven per 1000 school-aged children, and the annual incidence is estimated to be at least 28 per 100,000 population. Although no evidence for an epidemic was found, these rates are comparable with those in the USA and Europe during the years of severe epidemics and indicate that a high price is being paid in the Danfa district for the natural acquisition of immunity. As a result, immunization against poliomyelitis has been given high

priority. A teacher questionnaire was also tested for use in postal surveys as a rapid means of estimating the prevalence of lameness attributable to poliomyelitis in countries with a reasonable network of primary schools.

Is Poliomyelitis a Serious Problem in Developing Countries?--Lameness In Ghanaian Schools. Ofosu-Amaah, S., Kratzer, J.H., Nicholas, D.D. British Medical Journal 1: 1012-1014, April 16, 1977.

A postal survey of lameness in schools throughout Ghana showed an estimated prevalence of lameness attributable to poliomyelitis of 5.8 per 1000 school-aged children and an estimated mean annual incidence of paralytic poliomyelitis of 23 per 100,000 population. Official reported incidence rates range from 0.1 to 2.1 per 100,000 population, indicating that at least 90% of cases are not reported. No evidence of epidemics was found to account for these high rates. These suggest that mean annual incidence rates in tropical endemic countries have always been as great, if not greater, than those experienced by temperate countries during epidemic periods in the twentieth century and that the total number of cases of paralytic poliomyelitis occurring in the world each year has been reduced by only 25% since the advent of polio vaccine. Immunization against poliomyelitis must have a high priority in Ghana and other tropical countries where the disease is endemic.

Endemic Pyoderma in Ghana: A Survey in Rural Villages. Belcher, D.W., Afoakwa, S.N., Osei-Tutu, E., Wurapa, F.K., Osei, L. Transactions of the Royal Society of Tropical Medicine and Hygiene 71(3): 204-209, 1977.

The prevalence and characteristics of pyoderma in a randomly sampled rural population in Ghana have been studied. In the present study, conducted in 1975 as part of the Danfa Project's Village Health Survey, pyoderma was diagnosed in 19.4% of villagers examined. Peak rates occurred in the 5-9 year old age group, and pyoderma was more prevalent among males and unskilled laborers and farmers than among those engaged in more sedentary occupations. Non-bullous impetigo was most common (72% of lesions) and, in contrast to other studies, non-group A-streptococci predominated in these lesions (82% of streptococcal lesions were Group G, 18% Group C).

Hematological Values in a Rural Ghanaian Population. Bruce-Tagoe, A.A., Belcher, D.W., Wurapa, F.K., Turkson, P., Nicholas D.D., Ofosu-Amaah, S. Tropical and Geographical Medicine 29: 237-244, 1977.

Early in 1973 residents of 20 randomly selected rural villages in southern Ghana were studied to determine the prevalence of anemia. Laboratory tests were conducted to learn what hemoglobin phenotypes were present and the distribution of white blood cells counts.

Moderate anemia (below 10 g%) was fairly common, particularly in children and 15-29 year old women, but severe anemia (below 7g%) was rare. Malaria infection and diets with low iron content were major factors affecting hemoglobin level, while hookworm infestation and high parity had little effect.

Neutropenia (about two-thirds of Caucasian values) and the distribution of hemoglobin types (AS 16.3%; AC 11.1%) were similar to findings in earlier studies. To improve hemoglobin levels in children and young women, low-cost intervention programs based on volunteer village workers are recommended.

The Prevalence of Inguinal Hernia in Adult Ghanaian Males. Belcher, D.W., Nyame, P.K., Wurapa, F.K. Tropical and Geographical Medicine 30: 39-43, 1978.

Indirect inguinal hernia imposes a heavy patient caseload on surgical services in Africa. This study, conducted in rural southern Ghana in 1973, showed a marked increase in prevalence in adult males aged 55 years and older. In contrast, hospitalized patients undergoing surgery for hernias in Accra were evenly distributed through all age groups. As hospital services expand and rural patients have better access to surgical care, recent innovations such as short stay surgery may be important for coping with rising patient demand.

A Comparison of Methods for Estimating the Frequency of Paralytic Poliomyelitis in Developing Countries. Belcher, D.W., Nicholas, D.D., Ofosu-Amaah, S., Kratzer, J. WHO Bulletin 57(2): 301-307, 1979.

Standard reporting systems have proved to be unreliable in estimating the frequency of paralytic poliomyelitis in many developing countries. The cost and effectiveness of three survey methods for estimating the

prevalence of lameness attributable to poliomyelitis were compared in the Danfa Health Project district of rural Ghana. Lameness was studied because it is easily identified by inexpensive survey techniques. A postal survey of school headteachers was the least costly and most accurate method, giving a prevalence of lameness attributable to poliomyelitis of 7.2 per 1000 school children. This method is recommended for countries with an extensive network of primary schools. Medical examinations in a village health survey yielded a prevalence of 4.6 per 1000 children aged 6-15 years. This method was relatively expensive but could be justified if the survey was multipurpose. A question added to the annual district census showed a prevalence of 2.2 per 1000 children, a rate still many times higher than estimates from national statistics. The inclusion of such a question in a census or other national survey entails little additional cost and with more careful questioning results should improve. Repeated surveys can be used to assess the success of polio vaccination programs.

Epidemiology of Malaria in the Accra Plains of Ghana: Implications for Control Programmes. Wurapa, F.K., Nicholas, D.D., Belcher, D.W., Ofosu-Amaah, S. (in press, Ghana Medical Journal).

One of the Danfa Project's objectives was to reduce morbidity and mortality due to malaria in children under five. Baseline data on the extent, distribution and type of malaria were drawn from two surveys: the Village Health Survey (1972-1973) and the Malaria Program Survey (1973-1974). The Village Health Survey determined spleen rates for all age groups in selected villages in all the Project's study areas during the dry season. The Malaria Program Survey examined children 15 and under in selected villages in Areas I and II and spleen rates, plasmodium species and parasite densities determined during varying seasons. Both surveys used a stratified cluster design to select villages.

High spleen rates (45%) were found in the 2-9 year age group with lower rates in adults. Spleen rates varied seasonally, but with no consistent relationship to the occurrence of rains. Parasitemia rates exhibited a similar seasonality. Parasite densities were usually lower in the 6-10 year age group than in the 0-5 year group indicating less severe infection and probably a higher degree of immunity in the former.

P. falciparum was present in 95% of positive slides; P. malariae in 7.4% and P. ovale in 5.1%.

These data suggest malaria is hyperendemic in Ghana. Malaria in the Project district manifests many of the features associated with stable malaria including hyperendemicity, A. gambiae vector, P. falciparum predominating type and a high degree of immunity in adults. Control of the disease is therefore difficult and these surveys suggest that any chemoprophylaxis program should cover school children as well as those under five years and should be carried out year round.

A8.4.3 HEALTH CARE DELIVERY

Danfa Rural Health Centre; Its Patients and Services 1970-71. Ashitey, G.F., Wurapa, F.K., Belcher, D.W. Ghana Medical Journal 11 (3): 266-273, 1972.

Studies were conducted at the Danfa Rural Health Center from January, 1970, to July, 1971, to provide information for planning satellite clinics, defining health worker roles, improving clinic organization, and setting up an in-service training program. Study of the health problems at the clinic showed that:

(a) A typical patient was young and suffered from relatively few types of diseases;
(b) Almost all diseases encountered were readily diagnosed and treated by medical auxiliaries using a relatively few drugs;
(c) 70% of Danfa patients lived within three miles so that little contact was being made with preschool children and pregnant women further away.

Analysis of operations of the Health Center showed that:

(a) Patients were backing up at history-taking, examination, and dispensary stations so that the average patient spent nearly 4 hours at the Health Center.

(b) History-taking was redundant and occasionally misleading unless done by the examiner.

(c) Dispensary efficiency could be improved by prepackaging frequently dispensed drugs and making the location of stock drugs more functional.

As a result of these studies, the clinic has been reorganized, a MCH clinic is being held daily, prepackaged drugs are in use, and a program of in-service training specifically related to detailed job descriptions has been conducted.

Two satellite clinics have been started in villages at some distance from Danfa. A large patient load is being provided curative care and the satellite clinics have improved village cooperation in immunization, antenatal care, and health education programs.

Perception and Comprehension of Health Education Visual Aids by Rural Ghanaian Villagers. Kwansa, E.V.G., Cannon, J., Belcher, D.W., Hosu-Porbley, M. Ghana Medical Journal 11 (4): 387-396, 1972.

The perception and comprehension of health education posters by 1,060 rural villagers in Ghana were studied during 1971. A sample of those posters currently used in Ghana were chosen covering nutrition, environmental sanitation and communicable disease control. Color and type preference were also investigated in a separate study. Villagers selected resembled those in the Danfa Project areas. Both children and adults were selected. Fifty-nine percent of all respondents answered correctly the questions asked about the posters' messages. Ranking a poster on familiarity, realism and simplicity was an effective predictor of correct responses in 80% of the posters. Pretesting, however, is still the best way to predict comprehension and acceptability of health education aids. In a separate study color posters were perferred over photographs, blockout and line drawings. Color preference investigation revealed that white, red and black have strong emotional overtones to these villagers while green, yellow, and blue are weak in emotional or symbolic meaning.

Traditional Birth Attendants--A Key to Rural Maternal and Child Health and Family Planning Services. Neumann. A.K., Ampofo, D.A., Nicholas, D.D., Ofosu-Amaah, S., Wurapa, F.K. Journal of Tropical Pediatrics and Environmental Child Health 20 (1) (Monograph 32): 21-27, 1974.

Experience in several countries has shown that the options for dealing with traditional birth attendants (TBAs) are many--attempts can be made to eliminate their practice, they can be ignored, or the most promising can be trained and integrated into the formal health care delivery system with improved skills. Health education and family planning roles can also be assumed by TBAs.

The problems uncovered by a search of the relevant literature suggest certain guidelines to be followed once concerned health center or other government personnel are agreed that training traditional midwives has potential merit. The Danfa Rural Health and Family Planning Project in Ghana is attempting to follow these guidelines in an effort to study Ghanaian TBAs, train them in safer delivery techniques and involve them in government health services. Guidelines for organizing and training TBAs include:

(a) Identify and register TBAs in the area.
(b) Determine age, sex, literacy, previous training.
(c) Determine social status and influence in village.
(d) Ascertain activity or inactivity of midwives (estimate percentage of births in area attended by them).
(e) Learn the scope and range of TBAs' activities (Do they perform deliveries or simply cut the cord of the newborn? Provide postpartum care? Perform abortions and provide other family planning services or guidance?).
(f) Determine the cultural beliefs and practices associated with child bearing.
(g) Discover if TBAs have sufficient interest in training and an enhanced role in organized health services.
(h) Determine attitude toward family planning and involvement in the family planning program.

(i) Ascertain if there exists a community-felt need for improvement in midwifery practice and/or family planning.
(j) Establish a means of supervising the TBAs, once trained.
(k) Establish an administrative network facilitating the participation of TBAs in the local Maternal and Child Health and Family Planning Program.
(l) Establish a suitable framework for program evaluation.

Factors Influencing Utilization of a Malaria Prophylaxis Programme in Ghana. Belcher, D.W., Nicholas, D.D., Blumenfeld, S.N. Social Science and Medicine 9: 241-248, 1975.

In 1973 an interview survey was done in rural Ghana to learn about factors affecting participation in a malaria prophylaxis program and whether volunteer workers could effectively serve as medication distributors. Several maternal characteristics were associated with higher participation and continuation rates. Education was not a factor, but women over age 30 and those with larger families had better program attendance. This was attributed to a greater sense of need in larger families and greater previous use of and satisfaction with health programs by older mothers. In addition, mothers who knew about modern preventive actions to avoid fever had significantly higher entry and continuation rates in the program. Village volunteers were more successful than trained health workers in creating an initial awareness of the program and in motivating mothers to start and remain in the program. Special efforts are planned for the 1974 malaria program to encourage younger mothers to participate and to maintain improved information flow.

Education and Evaluation in an Integrated MCH/FP Project in Rural Ghana: the Danfa Project. Neumann, A.K., Ward, W.B., Pappoe, M.E., Boyd, D.L. International Journal of Health Education 18 (4): 233-244, 1976.

The evaluation of health education programs can serve several functions. It not only can demonstrate the impact health education can have on influencing individuals to adopt satisfactory health behavior, but it can also illustrate the advantages of reinforcing the existing

health education program (or redirecting efforts and budget allocations elsewhere) and identify specific parts of a program which need improvement.

Few well-documented rural health education studies exist to serve as the basis for development of such programs. Limited staff, inadequate demographic data, lack of satisfactory control areas for comparison and the focus on single-problem programs have been factors limiting sound evaluation of the effectiveness of health education.

The health education component of the Danfa Project is effectively integrated into the Project's overall health services, and the Project's rigorous research framework and detailed demographic, behavioral and attitudinal surveys provide health education services with an ideal setting for evaluation. In addition, t Household-Health Practices Survey, a brief survey instrument, was developed primarily on health education program planning and evaluation. The evaluation effort is concerned not only with assessing the achievement of end goals but also strives to provide feedback information to program staff so that alterations in the health education program can be made continually.

Attitudes and Practices of Traditional Birth Attendants in Rural Ghana: Implications for Training in Africa. Nicholas, D.D., Ampofo, D.A., Ofosu-Amaah, S., Asante, R.O. WHO Bulletin 54: 343-348.

A survey of the characteristics, attitudes and practices of traditional birth attendants (TBAs) was carried out in the Danfa Project area of rural Ghana. The typical TBA was an elderly illiterate housewife or farmer who practices midwifery part time: 48% were men who often practiced herbalism as well. The TBAs usually gave correct or neutral advice and, although they delayed in referring some complications to hospital, most saw the benefits of rapid referral for serious problems. They were supportive of family planning and very interested in improving their skills. However, a number of factors must be considered in organizing training programs. Special adult educational methods must be employed. To achieve adequate coverage one must train large numbers of TBAs, who perform an average of only seven deliveries per year and who are widely scattered in remote rural villages. This poses formidable problems, especially in transportation and follow-up supervision. Combining TBA training with other village health programs or community development projects could provide a solution.

The Training of Traditional Birth Attendants in Ghana: Experience of the Danfa Rural Health Project. Ampofo, D.A., Nicholas, D.D., Amonoo-Acquah, M.B., Ofosu-Amaah, S., Neumann, A.K. Tropical and Geographical Medicine 29: 197-203, 1977.

Three quarters of deliveries in Ghana are still attended by untrained personnel, including traditional birth attendants (TBAs), and maternal mortality remains high. The Ministry of Health is exploring ways of improving this situation. Recently, training traditional birth attendants to improve maternal and child health practices and promote family planning has been considered. Most TBAs in rural Ghana are elderly illiterate farmers or housewives. The Danfa Project has identified and trained 57 of these TBAs.

Selected villages were clustered for training. One of the eight sessions in the course was given every two weeks; follow-up and refresher training is to last indefinitely. The continuing supervision and evaluation of the trained TBAs is a crucial component of training.

Recommendations based on the Danfa experience include:

(a) Younger and the most active TBAs should be motivated for training.
(b) A trainer's manual should be developed based on studies of TBA practices in the community.
(c) The training program should be simple, emphasizing proper cord care, family planning and the recognition of high risk patients or those with complications and in need of referral.
(d) Instruction should emphasize demonstration and role playing since most trainees are illiterate.
(e) Villages can be clustered for training so that transportation is efficiently used.
(f) Village participation and cooperation in the training effort should be fostered.
(g) A cordial working relationship between supervisors and TBAs should be maintained.
(h) Small-scale pilot programs help in designing effective regional or nationwide programs.

A Mass Immunization Campaign in Rural Ghana - Factors Affecting Participation. Belcher, D.W., Nicholas, D.D., Ofosu-Amaah, S., Wurapa, F.K. Public Health Reports 93 (2): 170-176, 1978.

In November 1974, a four-day mass immunization campaign in one area of the Danfa Project was aimed at vaccinating 80% of the preschool children against measles, pertussis, tetanus, diptheria and poliomyletis (although villagers of all ages were encouraged to obtain vaccinations). To evaluate the results of the survey, a household interview survey was conducted immediately after the campaign in 676 households containing at least one child under 15. Interview questions included reasons for participating in the campaign, reasons for nonattendance, opinions about the program and recommendations for future campaigns. Maternal characteristics such as age, education, occupation and parity were investigated and mothers or other close relatives were specifically asked why their children 0-4 years old had not attended the immunization clinic, if applicable.

Program communications in this campaign were quite successful. Ninety-two percent of mothers knew in advance about the campaign; most had heard via the traditional village "gong-gong" or bell-ringing alarm systems. The campaign failed to achieve its objective of reaching 80% of all 0-4 year olds, since infants and one year olds, a group at special risk from measles and poliomyelitis, had 68% and 77.9% attendance respectively. Satisfactory vaccination coverage was attained in children aged 2-14 years. Rates are based on reported attendance; about 90% of child vaccination reports were validated with visible scars or vaccination cards. Maternal attributes were not associated with attendance rates for 0-4 years old children. The major reasons given for nonattendance of these children were lack of information, competing maternal responsibilities and mothers' negative attitudes toward the campaign. Distance from the facility also appeared to affect attendance.

Respondents recommended that the diseases which could be prevented by vaccination be discussed clearly, that the time period for the immunization clinic be extended, that villagers be notified of the hours, that village volunteers remind villagers of the clinic on the day the team visits, that something be done to lessen the side effects of the vaccinations, and that vaccinators be more considerate of frightened

children. Many asked that other curative medications be dispensed at the same time. Some of these recommendations could be enacted through the use of village volunteers to handle precampaign communication efforts and to provide first-aid care for minor postvaccination side effects. Precampaign propaganda should stress the diseases the vaccinations prevent and the need for infants and one year olds to be protected against these diseases.

Perception and Management of Guinea Worm Disease Among Ghanaian Villagers: A Framework for Differential Health Education Planning. Ward, W.B., Belcher, D.W., Wurapa, F.K., Pappoe, M.E. (in press, Journal of Tropical and Geographical Medicine).

A survey, rapidly conceived and implemented, resulted from the need to understand the health behavior of southern Ghanaian villagers in the Project district during an epidemic of guinea worm disease. While such problems are usually studied at a time when the epidemic has abated, this study was concerned with getting into the field quickly to obtain data before the epidemic passed. If behavior models are to have value for program planning in the developing world, they should be amenable to such quick sample approaches.

The study involved a survey on attitudes, beliefs, and practices related to guinea worm disease in five selected villages comprised of two ethnic groups. Results showed distinctive and somewhat differing perceptions of susceptibility, seriousness, curability and preventability for the two ethnic groups within a single geographic area. The analysis of the survey results suggested various educational strategies for both of the groups. This quick survey approach must be more highly refined before it has wide applicability. There appears to be a significant potential for developing a simplified checklist to be used by health workers in carrying out a rapid educational diagnosis of a specific health problem for a given population.

The Evolution of a Primary Health Care Program--the Danfa Experience, 1970-1977. Lamptey, P., Wurapa, F.K., Nicholas, D.D. (in press, Journal of Tropical Pediatrics and Environmental Child Health).

In order to improve coverage of preventive and curative services in the comprehensive service area (Area I) of the Project district, a number of village-based programs were developed to augment the services offered by the Danfa Health Center and its satellite clinics.

During Phase I of a three phase approach, health education, sanitation, and traditional birth attendant (TBA) training programs were initiated. Health Center staff, Health Education Assistants (HEAs), a sanitarian and village volunteers carry out health education programs stressing nutrition, family planning and environmental sanitation. The Health Center sanitarian coordinates all sanitation programs in the area. HEAs, Village Health Workers (VHWs), village women's groups and entire communities are also involved in sanitation efforts emphasizing the improvement of water supply and the disposal of excreta and refuse. Since it was apparent that TBAs delivered most of the infants in the Project district, a training program was organized to upgrade TBAs' skills and facilitate referral of complicated maternity cases.

Phase II marked the introduction of the malaria chemoprophylaxis program for children and modification of the family planning program and immunization programs to include village-based efforts. Malaria is a major health problem for children in the Project district, and they have become the focus of a chemoprophylaxis program carried out by village volunteers, school teachers, community health nurses and more recently, VHWs.

To achieve family planning coverage beyond the Health Center and satellite catchment areas, the family planning team visits each of the remaining villages in the area once every four months.

In 1974, a three-day mass immunization campaign using multiple antigens was conducted to improve the coverage of under-fives in the area and the program has been repeated annually.

In Phase III the Village Health Worker program was initiated in Area I. The VHW is a village resident selected by the community to provide primary health care under supervision of a public health nurse, the sanitarian and the Health Center Superintendant. VHWs are trained

to distribute anti-malarials and family planning supplies, to improve village sanitation, to conduct simple health education lessons, to monitor child growth and development and to stimulate community organization for self help projects.

Thus, the Project has achieved a successful transition from Health Center-based to village-based services.

A Village Based Primary Health Care Program in Rural Ghana--Selection, Training and Supervision of Village Health Workers. Lamptey, P., Nicholas, D.D., Quartey-Papafio, E. (in press, WHO Forum, 1978).

A training program for Village Health Workers (VHWs) in rural Ghana was conducted as part of an effort to increase community based health services in one of the Danfa Project's four research areas. Community acceptance was an important consideration from the program's start, and village representatives joined project staff and government health officials in determining the program's objectives, designing the curriculum and screening candidates for training. Three villages participated in a pilot study after which six additional villages were chosen as program sites; 20 volunteers were selected for training. Older, more established VHWs have proved the most satisfactory in terms of stability and commitment.

An 11 week, 110 hour course covered prevention of disease, simple diagnostic and curative measures, basic record keeping and referral procedures.

Supervison of VHWs is a joint effort of the trainers, village development committees and where applicable, other more senior village based health workers. Regular continuing education of the VHW is also provided.

Despite problems in receiving promised remuneration from villagers, the VHWs seem satisfied with their voluntary status and enjoy the prestige of serving as "village doctor." Most village leaders in the Project district have been enthusiastic about the program.

A8.4.4 FERTILITY AND FAMILY PLANNING

Integration of Family Planning and Maternal and Child Health in Rural West Africa. Neumann, A.K., Ofosu-Amaah, S., Ampofo, D.S., Nicholas, D.D., Asante, R.O. Journal of Biosocial Science 8: 161-173, 1976.

There is controversy extending beyond that of whether family planning or population control measures should be promoted among various populations. Even when the decision has been made to provide family planning advice, information and service, debate often arises as to the best method of administering a family planning program--whether to integrate it with maternal and child health (MCH) services, offer it post-partum, or provide it independently of all other health activities.

The Danfa Comprehensive Rural Health and Family Planning Project, Ghana, is investigating the general problem of health service delivery, including family planning, and is doing so with a firm commitment to efficient management, staff training and supervisory maintenance. An established research design and ongoing evaluation efforts, including cost and functional analyses, are an integral part of the Project. While it is believed that the integrated MCH/Family Planning approach will yield optimal results in family planning acceptance (as well as reduction in morbidity and mortality), other alternatives of health care and family planning service delivery are being evaluated.

The Danfa Family Planning Program in Rural Ghana. Ampofo, D.A., Nicholas, D.D., Ofosu-Amaah, S., Blumenfeld, S.N., Neumann, A.K. Studies in Family Planning 7 (10): 266-274, 1976.

In the first two and a half years of its operation, the Danfa Comprehensive Rural Health and Family Planning Project used a mobile family planning team to provide services in both clinics and villages throughout a 150-square-mile area of Ghana, having a population of 45,000. Sixteen percent of couples accepted family planning during this period. Fifty-four percent of the women acceptors chose the pill and 17% the IUD. More than half of all acceptors, however, were men. The annual per capita cost was US $0.40.

Because accessibility of services was found to be one of the major determinants of acceptance, community distribution programs using traditional

midwives and other volunteers are being developed, and resident clinic health workers are also being trained so that they will be able to offer family planning services on a daily basis. A combination of clinic-based and community-based services may help to make modern family planning part of the usual life style of rural Africa.

Attitudes Towards Family Size and Family Planning in Rural Ghana--Danfa Project: 1972 Survey Findings. Belcher, D.W., Neumann, A.K., Ofosu-Amaah, S., Nicholas, D.D., Blumenfeld, S.N. Journal of Biosocial Science 10: 59-79, 1978.

A family planning KAP survey was conducted in 2000 households in rural Ghana between April and October, 1972, as one of the Danfa Project's baseline studies. Subsequent resurveys were done in 1975 and 1977 to assess changes related to project health education and family planning programs.

Reported knowledge about family planning was three times that found in previous studies in rural Ghana. About 70% of the respondents approve of family planning, but most want a large family, with over six children. At all ages, males wanted two or three more children than did women.

The current 3% population growth rate in Ghana may increase due to continued early age of marriage, the rising size of the reproductive age group and improved pregnancy outcome.

Although the expected relationships between knowledge and use of family planning and age and education were present, these differentials were typically only 10-15%. In the Project area it appears that women will be most important in making the decision to practice family planning, although education of males is being stressed.

Most villagers hear about family planning through informal, word-of-mouth channels with relatively little use of news media, family planning workers or clinic health personnel. To improve the practice of family planning, village-based health educators are working with volunteers including traditional birth attendants, community leaders, teachers and church groups.

Impact of Family Planning Information on Acceptance at a Ghanaian Rural Health Post. Ward, W.B., Sam, M., Nicholas, D.D., Pappoe, M.E. International Journal of Health Education XXI (4): 266-274, 1978.

A Danfa Project study was conducted of female attendees in a rural district health post to determine if changes in family planning knowledge, attitudes and behavior were prompted by the provision of family planning information sessions and to demonstrate that ongoing evaluation and continuing revision of the information sessions would result in increased understanding of family planning at successive information sessions.

The sessions were the responsibility of a Health Education Assistant based in a nearby village. A Project family planning team visited the village once weekly, providing a full range of family planning services.

There were significantly more acceptors on the days when family planning information was offered. As the sessions were originally designed, there was no statistically significant evidence that the effectiveness of the presentations improved over the course of the sessions. However, a change in course methodology in the final session (inclusion of audience participation component) significantly increased the accuracy of responses for the information-type questions, vs. opinion-type questions. Negative opinions about the IUD remained unchanged as well as deeply rooted notions concerning the age when childbearing should start and cease.

A health facility service with a family planning component appears to be an appropriate and effective site for informing and influencing individuals to adopt a family planning method. Additional studies are needed to investigate the most effective method for disseminating information and reaching desirable levels of opinion change.

An Evaluation of Male Contraceptive Acceptance in Rural Ghana. Lamptey, P., Nicholas, D.D., Ofosu-Amaah, S., Lourie, I.M. Studies in Family Planning 9 (8): 222-226, 1978.

To evaluate the effect of male contraceptive acceptance on fertility, the Danfa Family Planning Project in rural Ghana studied a sample of its male family planning acceptors. The findings show that half of the survey respondents accepted foam for use by their partners and half

accepted the condom. The continuation rate (69% at 12 months) and use-effectiveness rate (80% at 12 months) reported by men were higher than those reported by women program acceptors.

It is felt that men can play a significant role in affecting fertility through their influence on a couple's choosing to use contraception and as a result of their motivation to obtain contraception and see that it is used. It is urged that increasing emphasis be placed on providing family planning services for men in African programs.

A8.4.5 MONOGRAPHS

The demographic and vital events data presented in Monographs 1-8 are preliminary and therefore, are not summarized below.

Monograph No. 9: Conducting a Rural Health Survey: Experience from the Village Health Survey, Danfa Project, Ghana. Belcher, D.W., Wurapa, F.K., Nicholas, D.D., Kpedekpo, G.M.K., Ofosu-Amaah, S., Derban, L.K.A., Asante, R.O., 1975.

In order to provide accurate and current information about the health of rural villagers in the Danfa Project areas, a Village Health Survey was conducted in 20 communities in 1972-1973, and resurveys planned for 1975 and 1977. A random stratified cluster sample of villages was selected. The field supervisor met with village chiefs and elders to explain the survey and arrange the interview and clinic dates. Three thousand seven hundred forty-five villagers were interviewed to obtain recent medical histories approximately one week before the examination team arrived. Subjects, therefore, were given ample notice of the examination survey. At the end of the first of two days of examination clinics at each site, interviewers visited those households whose members had not participated to encourage their attendance. These motivation efforts helped to achieve a 97.5% examination attendance rate.

The field supervisor (an experienced research assistant) and clinic coordinator managed the actual survey field operation under the direction and supervision of the survey coordinator (a physician). Committees comprised of project senior staff formulated the VHS plan and ordered the supplies required for the examinations and tests. The Ghana Medical

School, Ministry of Health and departments of the University of Ghana at Legon were involved in planning and implementing the VHS.

Before the definitive survey, pretesting of 712 subjects was done in non-survey villages and in two middle schools. This enabled survey staff to test methodology and refine logistical preparations.

The definitive survey was conducted over a 10 week period. Two villages were studied each week; two days were spent in each village. Most subjects were farmers and preferred being seen early in the day; 80-90% attended the first day.

Logistical planning (procuring, storing and transport of supplies, equipment and examination forms, storage and transport of laboratory specimens and management of the three vehicles used in the survey) was the responsibility of the clinic coordinator.

The building to be used for the clinic was selected during original discussions with community leaders; the interviewer team made arrangements for the necessary chairs, tables and benches and eventually became responsible for setting up the clinics so that examinations could begin when the examination team arrived.

Survey subjects were processed at seven different stations (registration, anthropometric measurement, vision--for subjects over six years, medical examination/interview, blood pressure--for subjects over 15 years, laboratory testing for a 25% subsample of subjects, and dispensary). The dispensary was a motivating factor behind many villager's attendance and was prominently displayed. Subjects not included in the sampling design were sent to a consultation station and to the dispensary in order not to offend those interested in the survey but not included in the sample. Chiefs, elders and other respected community leaders were seen first. When the examinations were completed, forms were collected and screened by the field supervisor for accuracy and neatness. An inventory of equipment, forms and supplies was also conducted and laboratory specimens delivered to processing units.

Examiners comprised a combination of Project senior medical staff, Ministry of Health staff and Project field interviewers specially trained in simple examination procedures. Additional Project interviewing staff recorded examination results.

The estimated cost of the survey, based on 1973 figures, averaged $2.83 per examinee.

The 1975 survey was similar to the 1973 baseline effort with the following exceptions: 1) fewer examination procedures were done (visual acuity, tuberculin skin testing, venipuncture blood collection, urinalysis and stool cultures were deleted); 2) blood specimens were obtained by finger prick for malaria and hemoglobin level assessments and serological analysis (the villagers were far more receptive to this method of collecting blood); 3) teeth were examined for peridontal disease; 4) birth order of preschoolers was investigated for use in studying nutritional status factors; and 5) some villages were provided only a one day (rather than the customary two day) clinic. No appreciable loss in attendance was detected and considerable savings could be realized.

Monograph No. 10: Mapping and House-Numbering Methods in a Rural Health Project: Experience in the Danfa Project, Ghana. Belcher, D.W., Kpedekpo, G.M.K., Wurapa, F.K. and Lourie, I.M., 1976.

Detailed village maps were required to enable Project staff to designate and interviewers to locate households for the various field surveys and censuses.

District government officials prepared authorization letters for the Project mappers and local community development officers contacted village chiefs and elders to distribute authorization letters and answer questions.

Mappers had a middle school education and were fluent in two or more of the local languages; although no mapping experience was required. The training course gave mappers an orientation to the Danfa Project and stressed the need to establish and maintain good relations with villagers, since the mapping effort would be most villagers' first contact with the Project. Initially, mappers made detailed drawings showing every village structure, including those in ruins or under construction. While the details were interesting from a sociological and community development perspective, we found they required too much time to prepare. Therefore, simplified maps showing only landmarks essential to household identification were adopted.

A separate team painted the numbers onto houses. Once villagers understood the numbers were to be used to conduct surveys which would facilitate health program planning, they readily accepted house numbers. A painting technique was chosen which proved to be long lasting and highly visible (black lettering applied over white patch on walls facing main road/paths). Maps were continually updated as new houses were built and old ones collapsed or abandoned.

Work proceeded slowly at first, but an increase in supervision, setting of quotas, and more efficient provision of paint, transport and housing accommodations improved output.

Mapping and house numbering efforts were later combined, and the time and cost required was considerably reduced and accuracy was improved.

Monograph No. 11. Experience in Selecting, Training and Supervising Interviewers in a Rural Health Project: Danfa Project: Ghana. Belcher, D.W., Wurapa, F.K., Lourie, I.M., Kwabia, K. and Avle, S.K., 1976.

The Danfa Project's vital events registration, census, longitudinal and special surveys required a pool of skilled interviewers. Initially, the Project trained and employed veteran enumerators from the 1970 Ghana National census staff, but the quality of their work proved unsatisfactory. New interviewers were recruited and a new training course devised. The work environment and survey tasks required interviewers who:

(a) Were willing to live in rural villages for long periods
(b) Had verbal communication skills
(c) Had demonstrated language fluency in at least two of the three vernacular languages of the Project area
(d) Possessed good health
(e) Had achieved O-level education (ordinary level, secondary school)

Interviewers were hired on a temporary basis--satisfactory workers were rehired (most were rehired over a period of several years). Candidates were selected by a panel which included Project survey staff and language experts, the latter to ensure that the applicant possessed the desired fluency in local dialects.

The training course included an orientation to the Project, a description of interviewing work and its evaluation, discussion of the importance of the survey and census work to the achievement of Project goals and objectives, discussions and demonstrations of interviewing principles, mock interviews, training and practice sessions in non-survey villages and, as the Project progressed, training in special skills needed for particular surveys.

Field supervisors were also given special training and conducted pretests of survey questionnaires to obtain first-hand knowledge of the field conditions the interviewers would face. An interviewer's performance checklist was devised to guide and standardize the supervisor's evaluation procedures. In time, supervisors also took over some of the interviewer training responsibilities of the senior staff.

During the first five training courses several problems were identified and revisions were made in subsequent courses.

(a) Insufficient time had been scheduled to retrain interviewers to use new questionnaire instruments. At least two weeks were required to reach an acceptable level of performance.

(b) Training course sessions were shortened to one hour each and demonstration, discussion, and role playing were emphasized to increase trainee participation and maintain the attention of trainees. By the third course, about 40% of the students' time was spent in field practice in non-survey villages.

(c) Motivation efforts required repeated emphasis. Lecture evaluation forms gave trainees an opportunity to rate an instructor's performance and trainees themselves were given constant feedback on their performance from instructors and supervisors. Well-motivated, experienced interviewers were used as role models.

In the field, experienced and capable interviewers reviewed the work of new interviewers daily and made suggestions for improvement. The supervisor edited completed forms on a daily basis to detect errors and immediate feedback was given in the field. Daily editing helped to improve interviewer performance rapidly.

These efforts at motivation and constant feedback and supervision led to low turnover rates of interviewers, few discharges for unsatisfactory performance and high quality interview information.

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APPENDIX 9: AID/DANFA PARTICIPANT TRAINING OUTSIDE GHANA

Appendix 9: AID/Danfa Project Participant Training Outside Ghana

NAME	UNIVERSITY STUDY OR TRAINING FIELD	INITIATED	TERMINATION DATE	PRESENT STATUS
1. ODAI, Joshua K.	1. Data processing and records non-degree certificate	March 1970	June 1970	Staff - I.S.S.E.R. University of Ghana
2. ASHITEY, Gilford A.	2. Field experience - communicable disease control non-degree certificate	June 1970	October 1970	Faculty, Dept. of Community Health Ghana Medical School
3. DOVLO, Daniel K.	3. Data processing and records non-degree student	January 1971	August 1971	Substantial portion of the time devoted to DRHP staff I.S.S.E.R.
4. ASUMING, K.	4. Data processing and records MPH degree (UCLA)	October 1971	June 1972	Was Statistician Programmer for the Danfa Project - resigned late 1973 to obtain more education
5. ASANTE, Dr. R.	5. MCH-MPH degree (UCLA)	October 1971	September 1972	Supervising physician Danfa Health Center and Ghana Ministry of Health, Accra Regional Office
6. PAPPOE, Mrs. M.	6. Health education - MPH degree (UC Berkeley)	September 1971	October 1972	Health Educator in Dept. of Community Health, Ghana Medical School and Health Educator for Danfa Project
	7. Health education field travel - Africa	November 1973	December 1973	

NAME	UNIVERSITY STUDY OR TRAINING FIELD	INITIATED	TERMINATION DATE	PRESENT STATUS
7. GADZEKPO, J.	8. Cytotechnology non-degree certificate John Hopkins Univ.	September 1971	September 1973	Technologist, Korle Bu Teaching Hospital
8. QUARTEY-PAPAFIO, E.	9. Health education/ behavioral sciences - B.A. (San Fernando Valley State College, CA)	September 1971	June 1973	Faculty, Dept. of Community Health, University of Ghana Medical School
	10. Community organization - M.S. University of Missouri Columbia, MO.	September 1973	March 1975	
9. ABEDI, O.	11. Data processing and records non-degree student	September 1972	January 1973	Research Analyst (Assistant Statistician) resigned September 1974 to enroll in University of Ghana programming course
10. KWABIA, K.	12. Data processing and records non-degree student	January 1973	April 1973	Research Analyst and later became Assistant Registrar to the Ghana Medical School
	13. Health services management and data management - MPA degree (University of Southern California	January 1976	December 1977	

NAME	UNIVERSITY STUDY OR TRAINING FIELD	INITIATED	TERMINATION DATE	PRESENT STATUS
11. ADDY, Dr. H.	14. MCH/Nutrition - MPH (UCLA)	September 1973	November 1974	Ministry of Health Advisor in MCH/FP/ Nutrition
12. LAMPTEY, Dr. P.	15. MCH/FP/Nutrition - MPH (UCLA)	September 1974	November 1975	Medical Officer Danfa Project, Area I
13. MENSAH, Dr. E.	16. Epidemiology - MPH (UCLA)	September 1974	November 1975	Medical Officer Danfa Project, Areas II and III
14. AVLE, S.	17. Health records/ biostatistics data management (UCLA)	March 1975	August 1975	Principal Research Assistant, Dept. of Community Health, Ghana Medical School
15. OSEI-TUTU, Dr. E.	18. MCH/FP/Nutrition - MPH degree (UCLA)	July 1975	October 1976	Epidemiologist under training WHO Schistosomiasis Project Anyabone Eastern Region, Ghana
16. OSEI, Dr. L.	19. MCH/FP/Nutrition - MPH degree (UCLA)	July 1975	October 1976	Lecturer, Dept. of Community Health, Ghana Medical School
17. AMONOO-LARTSON, Dr. R.	20. MCH/FP/Nutrition/ Management - MPH degree (UCLA)	August 1976	December 1977	Deputy Director of Medical Services in charge of hospital services
18. FORDJOR, EDITH	21. Health education - MPH degree (University of California at Berkeley)	April 1977	Present	Faculty, Dept. of Community Health, Ghana Medical School

NAME	UNIVERSITY STUDY OR TRAINING FIELD	INITIATED	TERMINATION DATE	PRESENT STATUS
19. TIPONG-ANNOR, K.	22. Computer technology data processing and management leading to M.S. degree	September 1978	Present	In study

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APPENDIX 10: PERSONNEL

APPENDIX 10: PERSONNEL

I. GHANAIAN STAFF

A. Codirectors

Three codirectors served in the following order:

Dr. F. T. Sai (1970-1972)

Dr. Silas R. A. Dodu (who continued in "acting" capacity (1972-1975)

Dr. S. Ofosu-Amaah (1975-1979)

B. Department of Community Health, Ghana Medical School

Dr. F. K. Wurapa, Field Coordinator/Epidemiologist (1970-1979)

Dr. P. R. Lamptey, MCH/FP and Medical Officer Area I

Dr. L. Osei, Medical Officer Areas II and III

Dr. E. K. M. Agbenu, Sociologist/Anthropologist

Mrs. E. M. Pappoe, Health Educator

Mr. E. K. Quartey-Papafio, Community Development/Sociology

Mrs. E. M. Asante, Public Health Nurse

Mrs. D. Richardson, Public Health Nurse

Mrs. M. Peasah, Public Health Nurse

Mrs. M. B. Amonoo-Acquah, Family Planning Nurse/Midwife

Mrs. S. Botchway, Family Planning Nurse/Midwife (FP Team)

Mrs. Stella Ansah, Public Relations, Writer/Editor

C. Department of Obstetrics and Gynecology, Ghana Medical School

Dr. D. Ampofo, assisted in MCH and Family Planning

D. Ministry of Health

Dr. R. Amonoo-Lartson, Deputy Director of Medical Services

Dr. R. O. Asante, Medical Officer

Dr. E. Osei-Tutu, Epidemiologist

E. Danfa Health Center

Approximately 16 staff, including Health Center Superintendent, midwives, nurses, sanitarian, laboratory technician, dispensary (pharmacy) assistant, engine attendants (for electric generator), laborers.

F. University of Ghana Campus at Legon

1. Supervisors -- There were two to four supervisors at different times.
   (a) Chief and Principal Research Assistants were K. Assuming, K. Kwabia, S. Asher, O. Abedi, S. Avle
   (b) Senior Research Assistants were T. Nsiah and S. Afo-Kantanka

2. Research Assistants -- There were four to eight research assistants (editing/coding) at different times, with approximately 16 total.

3. Computer programmers -- D. Dovlo and K. Tipong-Annor

G. Field Staff

1. Interviewers -- range of 30-45 at different times. Total of 100-120 different interviewers over the years.

2. Vital Events Registration Assistants
   (a) Volunteers (first phase) -- 57
   (b) Full-time (second phase) -- 18
   Total of approximately 85-90 for the duration of the Project.

3. Family Planning Team
   (a) Nurse midwife -- one (over the years three different ones used)
   (b) Family planning (nurse's) assistant -- one
   (c) Clerk -- one (over the years two different ones used)

4. Health Education Assistant Teams -- Two teams of four persons each: community health nurse, nutrition technical officer, rural sanitarian, family planning field worker; total of eight persons. Total of approximately 16 different staff over the years.

II. UCLA STAFF

A. In Ghana

In Ghana, the Project began with four and later six staff in residence.

	Resident in Ghana	Full Time Resident at UCLA	Other
Dr. Irvin M. Lourie Chief of Party	8/70 - 4/78	4/78 - 8/79	TDY; feasibility study
Dr. Donald W. Belcher Epidemiologist	8/70 - 6/76		7/76 - 8/79 Part time
Dr. Jerry Niswonger Family Planning Specialist	8/70 - 11/71		
Replaced by: Dr. David D. Nicholas Family Planning/MCH Advisor	3/72 - 7/77	7/77 - 8/79	
Dr. JoAnn Cannon Health Educator	8/70 - 7/72		
Replaced by: Dr. William B. Ward Health Educator/ Anthropologist	1/73 - 7/75		7/75 - 8/79 Part time
Dr. Stewart N. Blumenfeld Health Systems Analyst	3/73 - 7/77	7/77 - 8/79	
Mrs. Harriet S. Lourie Administrative Assistant	7/71 - 4/78		

B. At Los Angeles Campus

1. Codirector and UCLA Campus Principal Investigator -- Dr. Alfred K. Neumann, Danfa Feasibility Study, September 1969 - April 1970 and Danfa Project, May 1970 - August 1979

2. Faculty -- Dr. H. M. Lieberman, Dr. Charlotte G. Neumann, Ms. Olive Johnson, Dr. C. Hopkins; all were part-time or without salary consultants throughout the Project.

3. Administrative Assistants -- Ms. Alva Pryor, Ms. Lily Knutson

4. Training Officer -- Ms. Margaret Ross-Price, Ms. Larrie Lance

5. Editors -- Ms. Debra Boyd, Mr. Gregory Apparcel, Ms. Beth Wassenberg

6. OCOP -- Ms. Janet Bardin and OCOP staff, including fiscal affairs specialists, secretarial and shipping support staff.

7. Additional UCLA Support Resources -- Personnel and fiscal staff in the School of Public Health, contract specialists, accounting experts, purchasing and travel agents, the staff of African Studies Center, and the staff of the Chancellor's Committee for International and Comparative Studies.

III. UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

A. Mission Directors

Mr. R. Cashin
Mr. H. North
Mr. I. Coker

B. Health and Population Officers

Dr. J. Prince
Dr. F. Zerzavy

C. Project Officers

Mr. F. Gilbert
Mr. M. Feldstein
Ms. J. Bryson
Mr. G. Flores
Mr. J. Wiles

IV. U.S. PEACE CORPS VOLUNTEERS

There were two computer programmers, David Johnson (September 1974 to July 1976) and Richard Winegardner (September 1976 to July 1977).
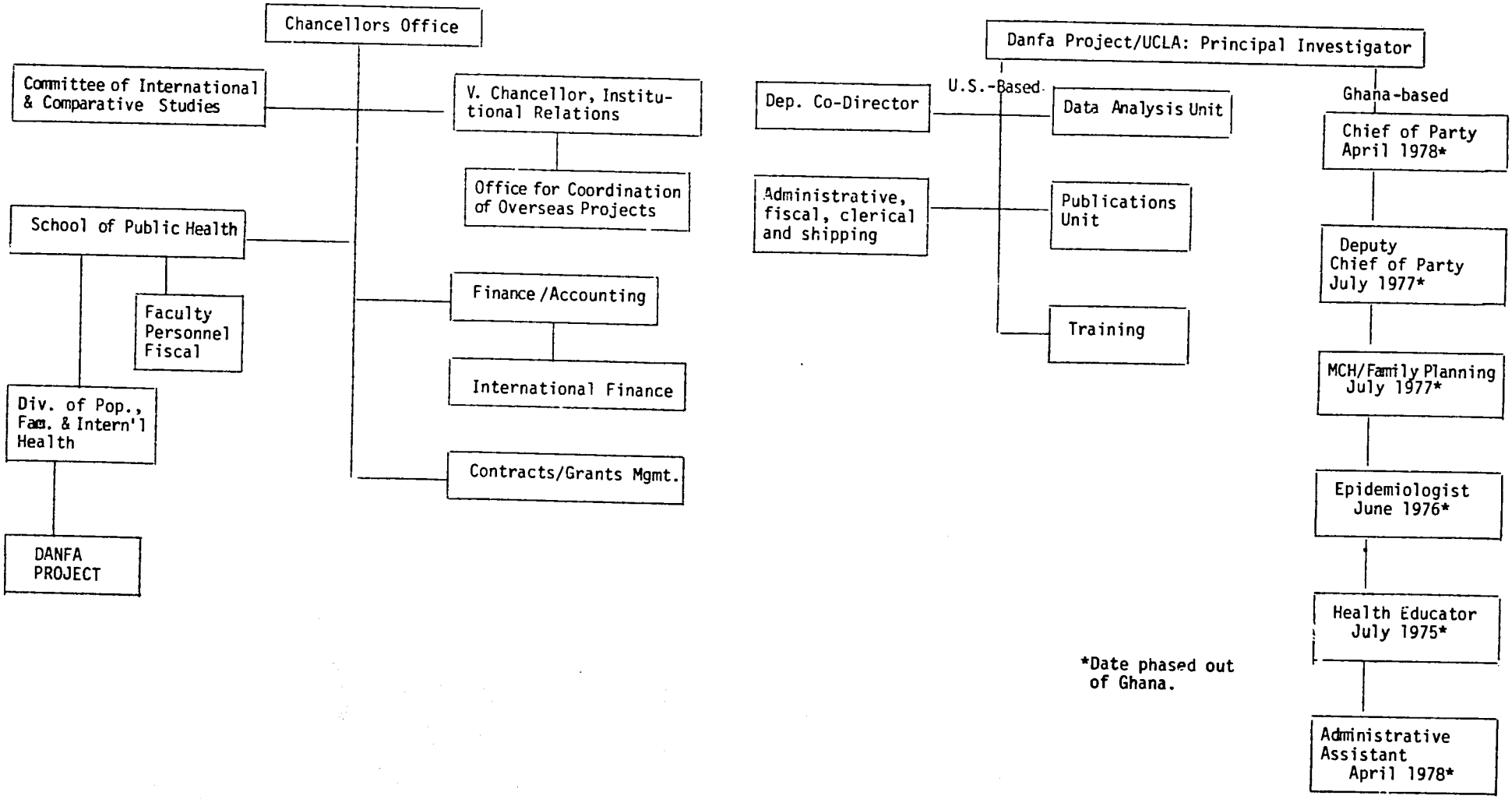
Figure A10-1: UCLA Organization/Danfa Comprehensive Rural Health and Family Planning Project: Ghana