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COST ANALYSIS OF THE DANFA (GHANA) PROJECT FAMILY PLANNING COMPONENT

by

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In the decade following independence in 1957, the Government of Ghana maintained a noncommittal attitude toward family planning. While recognizing that rapid population growth might be inimical to national development goals, then-President Nkrumah also recognized the pro-natalist tradition of major segments of the population. Perhaps more importantly, he also associated national population size with degree of political influence on the continent. However, following a change in government in 1966, Ghana became the first sub-Saharan nation to officially adopt (in 1969) a policy promoting family planning (1). The Ghana National Family Planning Program (GNFPP) was established within the Ministry of Economic Planning and Finance and has remained active through several changes of government since that time.

I. THE DANFA RURAL HEALTH AND FAMILY PLANNING PROJECT

A. Purpose

In 1965 it was determined that the several-year-old Ghana Medical School should have a facility for training medical students to deal with the particular problems of supplying health services in the rural areas where the majority of Ghanaians lived. A site 23 miles north of Accra was selected, and with land donated by the village of Danfa, materials supplied by the Ministry of Health, and labor volunteered by the people of 6 nearby villages, the Danfa Rural Health Center was finished late in 1969. The Danfa Rural Health Center represented, along with 50 sister

rural health centers, part of the Ministry of Health's attempt to extend primary health services into the rural areas of the country. In Danfa's case, although staff were supplied initially by the Ministry of Health, supervision of the health center staff and operations was delegated to the Ghana Medical School, specifically the Department of Preventive and Social Medicine (later re-named the Department of Community Health).

While the health center was being built, the Medical School approached USAID with a proposal to conduct research on the design of a comprehensive health services delivery scheme, including family planning, for the rural area. The UCLA School of Public Health Division of Population, Family, and International Health was selected as collaborator for a feasibility study, and in 1970 the same two partners, with USAID funding, organized the Danfa Rural Health and Family Planning Project.

The purpose of the Danfa Project was:

1. to investigate the physical and social factors which made for effective participation in the health care system;
2. to carry out operations research aimed at enhancing the effectiveness of the human and other resources available or potentially available to the health care system in the rural area; and
3. to train health care staff at all levels specifically for their role in rural health work.

Since family planning services were to be a prominent part of the comprehensive package, it was agreed that a major task of the Project would be to shed some light on the then unsettled question of how free-standing family planning programs, such as GNFP, compared in terms

of cost-effectiveness to family planning programs established in the context of a wider range of health services, a model which was also under consideration for the country.

B. Operations Research and Evaluative Methods

It was agreed that the UCLA staff in residence would devote itself to the greatest possible extent only to the research aspects of the project, while Ghana Medical School personnel would work both on research and on supervision of the health center and other service operations. However, GMS staff also were to provide no direct service to patients other than that which would be appropriate to the next level above the rural health centers in the Ministry of Health scheme. This division of labor within the project had important cost implications which are discussed later. The first activity under the project was a census which served both to enumerate the population and as a basis for assignment of unique identification numbers to each individual. A continuous vital events registration program was also set up. The census was re-done each year to provide a record of demographic change by village and household and to supplement data on vital events being obtained by registration. A series of sample surveys were done to provide baseline data on knowledge, attitudes, and practices concerning maternal and child health care, sanitation, nutrition and family planning, plus a retrospective fertility history and 2-week morbidity recall. The KAP surveys were done twice more at 2½ year intervals to form a longitudinal record.

An electronically-based record and information system was designed and installed for the project. All service encounters were recorded on direct-punch-printed cards so that, by means of the individual I.D.

number, a complete service history could be constructed for each person. Conventional clinical records were also maintained for the benefit of the service staff. A mother-retained record of the Morley type was also used for children under 5 years.

The electronic record facilitated OR studies on various aspects of service delivery such as geographic and demographic coverage, complaints/diagnoses, treatment, formulary, and costs. Task analyses were carried out to optimize distribution of the work-load and serve as a basis for in-service training of the service staff. Community organization activities also were undertaken within the context of the comprehensive health care package for Area 1 (described below), as was a program for upgrading the skills of traditional birth attendants and bringing them into the Danfa service system.

II. FAMILY PLANNING COMPONENT OF THE DANFA PROJECT

A. Goals, Organization, and Implementation

The family planning component of the Danfa Project had two purposes. First, since close-interval and high-order births have a significant impact on the health of children and mothers, it was felt that no package of health services could be considered comprehensive without offering services for spacing children and limiting numbers. Second, as noted earlier, it was agreed that the Danfa Project not only would serve as a demonstration of family planning services, but, in a quasi-experimental setting, would compare the cost-effectiveness of this approach with other possible approaches to provision of such services.

To carry out the experiment in comparative cost-effectiveness of family planning services, the entire Project area was divided into 4 sub-areas (2). Each area was approximately 100-125 square miles in size

and contained 12,000-15,000 people. Area 1 included the Danfa Rural Health Center and was an area in which a comprehensive package of health services was provided. This package included therapeutic care, preventive services (e.g., immunization); extended coverage by means of satellite clinics; health, sanitation, and nutrition education; and family planning motivation, and education, and provision of contraceptives (3). Area 2 comprised health and family planning education, plus family planning services. Area 3 offered only family planning services, and Area 4 served as a comparison in which no project services were offered but similar outcome measurements were made. The only general health services available in Area 2 were those provided by a very small 2-nurse clinic run by the Mennonite church; even this limited range of services was accessible to perhaps only one-quarter of the population of the area, based on the spatial distribution of the population and what we know of patterns of utilization from studies in Area 1. For the duration of the experiment, Area 3 had no general health services (in 1976 a small government health post did open), nor did Area 4. However, traditional healers of various kinds were in practice in all 4 areas.

In order to minimize confounding factors in determining the impact of these different programs, the family planning inputs to Areas 1, 2 and 3, and the health/family planning education inputs to Areas 1 and 2, were standardized. For health education, 2 teams of 4 persons each were trained and the personnel rotated through both areas. For family planning, 1 team of 3 trained people plus a driver and vehicle was assembled. The team leader was a nurse-midwife who had taken the 8-week training course provided by the Ghana National Family Planning Program.

In the field, she performed pelvic examinations, inserted IUDs, could initiate pills, screen for, and evaluate complications, and provide education and motivation. She was also administratively responsible for maintaining patient and inventory records. The family planning assistant was a certified nurse (more junior than the nurse-midwife) who also had taken a special training course. She screened new female patients who were to be seen by the nurse-midwife, taking history, weight, and blood pressure, and doing hemoglobin and urine tests. She also performed an educational/motivational function, could initiate condoms and foam, and could resupply orals. The other member of the team was the clerk. She did the initial identification of the patient and completed part of the patient encounter record. Following some project-designed training, she could also discuss the pros and cons of different contraceptives.

Initially, 3 family planning clinic sites were selected in each of the 3 areas. On a rotational basis each of the 9 sites was visited by the family planning team once every two weeks, i.e., over 9 working days; the tenth day was used for administrative duties in the office. In Area 1, the 3 sites were the Danfa Rural Health Center and 2 of its satellites. In the other areas, large villages were selected to maximize exposure. However, within a year of service initiation, it was apparent that the capacity of the team was not fully utilized and a new schedule was worked out which maintained the basic 9 clinics but permitted brief stops at other villages along the way. The new stops were selected to provide services in villages which together comprised approximately 70% of the population in each area. At the secondary

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stops motivation and education activities were carried out, condoms and foam were initiated, and pills resupplied.

This approach was maintained until mid-1975. At that time the Project underwent a major review. One of the determinations of the review was that the experiment in relative cost-effectiveness of the three modes of delivery of family planning services had been rendered moot by the adoption of integrated delivery as a policy by the Government of Ghana (4, 5). USAID and the Project operators, UCLA and UGMS (University of Ghana Medical School), therefore drew up a new protocol which, for family planning, would emphasize maximal effectiveness in delivery of services, removing constraints imposed by the research design which required comparable inputs in each area. In operational terms, this meant, in Area 1, involvement of the health center staff in motivation, education, and service delivery, and the addition of a family planning motivation/education element to the training course then being given to the traditional birth attendants who were cooperating in the delivery of obstetrical services. Toward the very end of the period in which the UCLA team was active in the field, even village volunteer health workers were doing motivational work in family planning; we have no data on their effectiveness, however.

III. COST ANALYSIS

A. Components of Cost

1. Personnel: The 3-person family planning team (not counting the driver) was employed by the Medical School. Data on their salaries and other benefits, e.g., social security, transportation, housing and cost-of-living allowances, were compiled annually from the accounting.

ledgers of UGMS.

2. Transportation: The family planning team had regular use of vehicles from a pool maintained by the Project. Each year, fuel, maintenance, repair and insurance costs, plus depreciation, were compiled from UGMS and UCLA records (each paid specific costs). Since destination/mileage logs were kept for each vehicle, total fleet mileage for the year was known and a cost per mile figure could be developed. The total personnel cost for the driver pool for the year was added to the other costs so that a driver and vehicle together constituted a single mileage cost figure for transportation. In order to approximate a more realistic cost for transportation if the service program were to be completely separated from the research program, transportation costs attributed to each service program which was drawing on the research vehicle fleet were increased by 25% to account for the benefit of being able to draw upon a fleet. In other words, it was as if each service program had at its disposal $1\frac{1}{2}$ vehicles to fill in for down-time of its regular vehicle and maintain service without interruption.

3. Materials: Contraceptives were supplied to the project by USAID free of charge. However, each year the current cost of each type of contraceptive, including shipping, was supplied by USAID and the cost of dispensed contraceptives was calculated and included in program costs. The family planning team maintained an inventory log from which annual usage of each type of contraceptive was extracted.

4. Attributable from Other Project Components: As described earlier, the family planning program received support in Areas 1 and 2 from the health education team in the form of motivation and education of the population with regard to family planning. The health education

team members maintained an "administrative" log to show the apportionment of their time among their various duties. From these logs a proportion of the annual cost of the health education team could be re-attributed to the family planning program in these Areas. Following the 1975 review and the subsequent removal of constraints imposed by the original research design, the Danfa health team took on a greater family planning role in Area 1. In area 2, the Mennonite nurses at the health post also began to deliver family planning services under project auspices. Thus, each of these "cost centers" also generated attributable costs. At Danfa, the proportion of time spent in family planning activities was obtainable from administrative time logs. For the Amasaman Health Post, the nurses supplied time estimates and helped work out operating cost estimates.

B. Measures of Effectiveness

1. Coverage: Coverage was defined as the proportion of the population for whom family planning services were made accessible. Based on early studies of acceptance patterns, "accessible" was defined as those living within 3 miles of a clinic site (6).

2. Acceptance and Continuation: New acceptors were recorded and continuation rates in months calculated for each area. Since the Danfa Project area did not have a fence around it and the Project staff felt it would be unethical to deny any type of health service to anyone who asked for it even if they did not live in one of the Project villages, a number of people from outside the project area did use its services, including family planning. As will be discussed, this presents a conceptual problem in calculating cost-effectiveness.

3. Birth-rate and Fertility: Data on births (and deaths) were obtained by means of an annual census and, simultaneously, by continuous registration. Keeping the two systems independent of one another permitted the Chandrasekhar-Deming method to be used to estimate missing events.

4. Change in Knowledge and Attitudes Regarding Family Planning:
A longitudinal survey was performed over a 5-year period to assess changes in knowledge, attitudes, and practices concerning family planning. Questions were designed to evaluate the effectiveness of family planning education and motivation activities.

C. Results

All costs are shown in U.S. dollars using a conversion of \$1 = 0.15 (1.15 Ghanaian cedis). This was the official rate of exchange throughout the years 1973-76, the full years in which cost data were monitored. Also, it should be noted that all costs shown are annual operating costs. The issues of depreciated capital costs and training costs are discussed in a later section. Table 1 summarizes the operating costs of the family planning component.

Table 1. Operational Costs in U.S.\$, All Areas Combined

	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>
Personnel	\$3,928 (32%)	\$6,020 (28%)	\$7,709 (27%)	\$7,550 (25%)
Transportation	3,949 (32%)	5,806 (27%)	8,410 (29%)	10,671 (35%)
From Health Ed.	2,390 (20%)	2,797 (13%)	3,983 (14%)	4,386 (14%)
From Health Center/Post	---	---	651 (2%)	2,815 (9%)
Contraceptives	1,705 (14%)*	6,403 (30%)*	7,387 (26%)*	4,790 (16%)*
Miscellaneous	261 (2%)	435 (2%)	522 (2%)	522 (2%)
TOTAL	\$12,233	\$21,461	\$28,662	\$30,734

*Includes costs of contraceptives supplied non-Danfa area residents

The most striking changes in operational costs are those for transportation and contraceptives. In 1973 the family planning component of the project was just being introduced operationally after a

period of preparation. The number of acceptors was relatively small and so was the number of contraception-months; hence the small cost for 1973. The cost of contraceptives dropped dramatically in 1976 because of a decided shift away from the use of foam, which was very expensive, and toward orals. The rise in transportation costs reflects the rapidly increasing price of gasoline in Ghana as well as increases in vehicle purchase and shipping costs. (In conformance with U. S. law; all vehicles had to be purchased in the U.S.)

Table 2, using 1976 as an example, demonstrates how annual costs for family planning activities were calculated for each area. Table 3 summarizes costs by area for the years 1973-1976.

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Table 2. Family Planning Operational Costs by Area, 1976

Personnel	\$7,550
Transportation ($\$20,800 \times 0.41$) = 8,537 (1.25)	10,671
Miscellaneous	600
Base cost each area (18,821/3)	6,274
Health Ed. (Areas 1 & 2, each) ($20\% \times 21,930/2$)	2,193
Danfa RHC (Area 1) (5% cost w/o drugs)	2,070
Amasaman HP (Area 2) (10% x cost w/o drugs)	857

	<u>Area 1</u>	<u>Area 2</u>	<u>Area 3</u>
Total cost w/o contraceptives	\$10,511	\$9,298	\$6,248
Cost per WRA*	3.57	3.41	1.57
(New acceptors)	(244)	(102)	(70)
Cost per new acceptor	43.08	91.16	89.26
Contraceptive cost	1,518	635	435

Woman of Reproductive Age, defined as 15-44

Table 3. Operational Costs by Area, 1973-76 Aggregated

	<u>Area 1</u>	<u>Area 2</u>	<u>Area 3</u>
Cost w/o Contraceptives	\$27,420	\$26,859	\$18,622
(Mean no. males 15-49 per yr.)	(3,066)	(2,814)	(3,422)
(Total male acceptors)	(247)	(306)	(270)
(Mean no. WRA per yr.)	(2,724)	(2,473)	(3,671)
(Total female acceptors)	(629)	(373)	(185)
Cost per male 15-49, ave. per yr.	\$2.24	\$2.39	\$1.36
Cost per accessible male (70%)	\$3.20	\$3.41	\$1.94
Cost per WRA, avg. per yr.	\$2.52	\$2.72	\$1.27
Cost per accessible WRA (70%)	\$3.60	\$3.89	\$1.81
Cost per acceptor (M or F)	\$31.30	\$39.56	\$40.93
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Cost w/contraceptives	\$32,849	\$31,289	\$21,219
Contraception-months	(22,203)	(16,367)	(11,682)
Cost per contraception-month	\$1.48	\$1.91	\$1.82

In the 5-year period during which data were collected, Area 1 showed a significant negative slope for birth rate and general fertility rate, while the other areas did not. However, the data, while statistically significant, varied so from year to year that it did not seem useful to construct values for "births averted" and attach cost-effectiveness figures to them.

IV. ISSUES

A. Non-recurring Costs

The most common type of non-recurring costs, those for capital items, play a minor role in the family planning component of the Danfa Project. For reasons explained elsewhere (7,8), capital costs are not included in costs attributed to the Danfa Rural Health Center, but would add little, in any event. Transportation is an important cost item, but vehicle depreciation is included in the annual mileage cost. Clinics were held in a borrowed room in each village once every 4 weeks, but the rooms were otherwise virtually unused; since there seemed to be little or no opportunity cost to the owners, no cost was imputed. Equipment used by the family planning team was minor in cost and essentially covered in "Miscellaneous" each year.

Much more important was the initial cost of training the family planning and health education teams. These were, respectively, \$61,194 and \$86,552 (9). Together they would add about \$79,000 to the total direct outlay for family planning, or an additional 75-80% for the period beginning late in 1972, when these activities began, through 1976. However, we are faced with the usual dilemma: over what period should training costs be amortized. Our main interest in costs is in replicability, and in this case most of the cost of these training

programs is attributable to the heavy use of expatriate staff (i.e. UCLA) whose time was relatively expensive. The use of equivalent Ghanaian staff, had that been possible, would have reduced the cost of family planning training by 72%.

B. The Role and Cost of Expatriate Staff

As noted earlier, the resident UCLA staff avoided direct delivery of health services in the Project. However, since the Danfa Project was to a considerable degree a research project which also delivered service, it was impossible for the UCLA people to remain aloof from the planning required to construct the system or from some level of management once it was under way. In the family planning component of the Project, the UCLA advisor on MCH/FP was very active with his Ghana Medical School counterparts in designing the service scheme, helping to hire staff, evaluating process and outcome, and modifying the service program on the basis of early results. Counting all costs to the UCLA/USAID contract of a UCLA staff person's time (direct salary and benefits plus housing, R & R, shipment of household goods, etc.), the cost of a UCLA person-month was eight times that of his UGMS counterpart. To have shown such costs as indirect charges to one of the service components would have utterly confounded the issue of replicability by the Ghana government. This was one of the main reasons that operational costs, which included only Ghanaian staff time, were shown separately in Project reports. The cost of training operational staff was shown in the final report of the Danfa Project, both as an actual figure which accounted for expatriate staff costs and a recalculated figure showing potential cost substituting senior Ghanaian staff for UCLA.

C. The Role and Cost of Research and Development

The Danfa Project was both a service delivery and a research and development undertaking. In such a project the R & D is intended to feed directly into the service by the provision of information and techniques capable of enhancing the effectiveness and efficiency of service operations. In the family planning component, for example, the results of various studies were used to produce more effective motivational/ educational messages (10, 11, 12). The electronically-based service record system -- more elaborate than it would have been for a purely service program -- facilitated early analysis of utilization patterns which led to improved coverage and more efficient use of the family planning team's time (6). The record system also facilitated follow-up. Underlying the electronic record system was the intensive demographic effort described earlier. Once again one is faced with the dilemma of fixing the time period and pool of beneficiaries against which costs should be imputed. In addition there is the problem of how to apportion the cost of the census system to any one of the service programs.

The Danfa solution to these issues was to deal with research and development costs as one-time investments which would not have to be made again to replicate the improved service program. In the Danfa final report they are not integrated with operational costs, but are shown separately (9).

Not accounted for is the possible benefit derived from the potential "Hawthorne Effect" in the service programs, that is, the improvement in the staff's performance which derives simply from being part of a highly visible and prestigious enterprise. Such a feeling

could hardly have been avoided, what with the UCLA and UGMS people circulating in the project area and the Danfa Rural Health Center receiving a constant stream of recognizable Ghanaian officials and foreign visitors, including such notables as the Director-General of WHO and assorted U.S. ambassadors and other high officials, who often came with large retinues and press coverage.

D. Services Absorbed by Non-Project Area Residents

Although the four Danfa areas were selected so that travel between them was difficult, they were not impervious to people from outside who wished to use services offered by the Project.

The comprehensive services offered in Area 1 proved particularly attractive to non-residents. The policy was to not turn anyone away. As a result, 32% of all female family planning acceptors came from outside the project area, and 45% of male acceptors. The only cost component which is reduced to compensate for this is the cost of contraceptives in Tables 2 and 3, since contraceptives are a variable expense directly proportionate to acceptance/continuation in each area. The cost of providing the basic service was taken as a fixed expense attributable to each area. Most of these outside acceptors were received in Area 1 and if they were considered in the calculation in Tables 2 and 3, not only would the cost per acceptor be reduced, the disparity between Area 1 and Areas 2 and 3 would appear greater.

E. Valuation of the Ghanaian Cedi

In this paper, all local currency costs are converted to U.S.\$ at the rate $\text{C}1.15 = \$1.00$, the official rate set by the Bank of Ghana in 1972 and maintained until 1978. However, in the 4-year period 1973-76 Ghana suffered an annual compound inflation rate of 57% (13), during

which time the open market (or black market) value of the cedi fell from about 1.25 to the dollar to about 8-10. At the same time the government raised salary scales by 80-120%. Thus, the true value of 1 hour of Ghanaian staff time was by the end of 1976 roughly one-fourth of what it had been at the beginning of 1973. This illustrates the conceptual problem inherent in converting local currency costs to a standard currency, in this case the dollar, for comparison to other national programs, since, if cedi values had been converted at the market rate rather than the artificial rate, dollar costs would have been quite different.

V. CONCLUSION

As noted, the original experimental design aimed at studying relative cost-effectiveness of 3 modes of delivery of family planning services was abandoned in 1975. The attempt to maintain accurate cost records separately for each area was not, however. Thus, the comparative cost by area shown in Tables 2 and 3 are still instructive. In Table 3, it may be seen that when costs are aggregated for the 4-year period 1973-76, cost per acceptor is somewhat lower for Area 1 than for Areas 2 and 3. For three-quarters of this period (1973-75) the project was operating in its original format and the intensity of the family planning effort was similar in each area. As shown in Table 2, by 1976, when a more intensive--and more costly--effort was put into Area 1, the difference in cost per acceptor between it and Areas 2 and 3 was even more pronounced. Moreover, if contraception-months is taken as the more direct measure of potential reduction in birth-rate, then Area 1, though more costly, was nevertheless more cost-effective in this regard.

As a result of these data and the half-year data available for 1977, the project staff concluded that family planning services integrated with other primary health services probably are both more effective and more cost-effective than family planning services alone in producing couple-years of protection in the rural Ghanaian context. The statement is qualified because of the possibility that, even though the statement holds true when the sociodemographic factors considered in the project (age, sex, education, religion, tribe, and type of conjugal relationship) are accounted for, other unmeasured factors may also be important determinants of acceptance and continuation. One such possibility is economic level of the household, though education is something of a surrogate and was considered. The conclusion that integrated services are more effective is also promoted by anecdotal evidence of the family planning field staff.

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