AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION
A. PRIMARY: Social Science
B. SECONDARY: Development Planning

2. TITLE AND SUBTITLE
A Framework for Evaluating Long-Term Strategies for the Development of the Sahel-Sudan Region. Annex 2. Health, Nutrition, and Population

3. AUTHOR(S)
Stanbury, John B. and Childs, Judith A.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
December 1974	315p.	ARC AFR-309.2-M414-4

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Massachusetts Institute of Technology
Center for Policy Alternatives
Cambridge, Mass. 02139

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)
This volume consists of working papers for the main report, "A Framework for Evaluating Long-Term Strategies for the Development of the Sahel-Sudan Region", and is not essential to the main summary report.

9. ABSTRACT
The health-care system of the Sahel-Sudan region is fragmented and severely undermanned at all levels. Health resources are inequitably distributed, with a strong trend toward urbanization. Curative medicine receives an inappropriately large fraction of available resources; investment in preventive medicine would give the maximum cost-benefit advantage.

Communicable diseases of many kinds are highly prevalent and their impact is heightened by a chronic state of undernutrition in many regions.

Improvements in health will require improvements in nutrition, water supply, waste disposal, public health programs and hygiene, education, and transportation, as well as in the health-care delivery system.

Programs for improvements in infant and child feeding and for vaccination against measles could significantly reduce the infant mortality rate. An immediate result of such programs, however, would be an expansion of the dependency ratio (proportion of dependent children) and a further strain on available food resources, schools, and other services geared to the young age-groups. These considerations must be taken into account in long-range planning for the area.

While many recommendations can be made for improving the health-care system, the principal ones are integration of all components of the system, improvements in monitoring disease, reorientation of the system toward preventive medicine, with emphasis on mother- and child care, use of all communications media in health education, and strenghtening health education in order to amplify health-care delivery.

10. CONTROL NUMBER
PN-AAB- 216

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Health, Nutrition, Population, West Africa, Sahel-Sudan

13. PROJECT NUMBER
625-11-995-907

14. CONTRACT NUMBER
AID/AFR-C-1040

15. TYPE OF DOCUMENT
Annex Report

AID 590-1 (4-74)

AFR
309.2
M414
ANNEX 2

A FRAMEWORK FOR EVALUATING LONG-TERM STRATEGIES FOR THE DEVELOPMENT OF THE SAHEL-SUDAN REGION

Annex 2

HEALTH, NUTRITION, AND POPULATION

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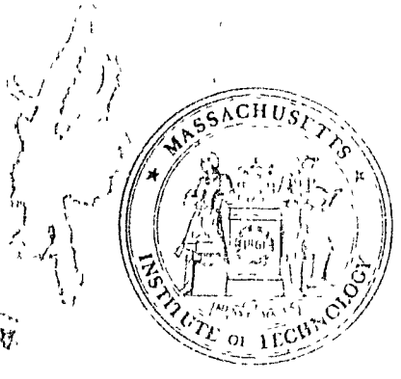


A.I.D.
Reference Center
Room 1656 NS

December 31, 1974

DOCUMENT INFORMATION SHEET

1. Performing Organization

CENTER FOR POLICY ALTERNATIVES
Massachusetts Institute of Technology
Cambridge, Massachusetts 02139

2. Report Title A Framework for Evaluating Long-Term Strategies for the Development of the Sahel-Sudan Region
Annex 2. Health, Nutrition, and Population

3. Descriptive Notes A final report covering the period September 1, 1973 through December 31, 1974.

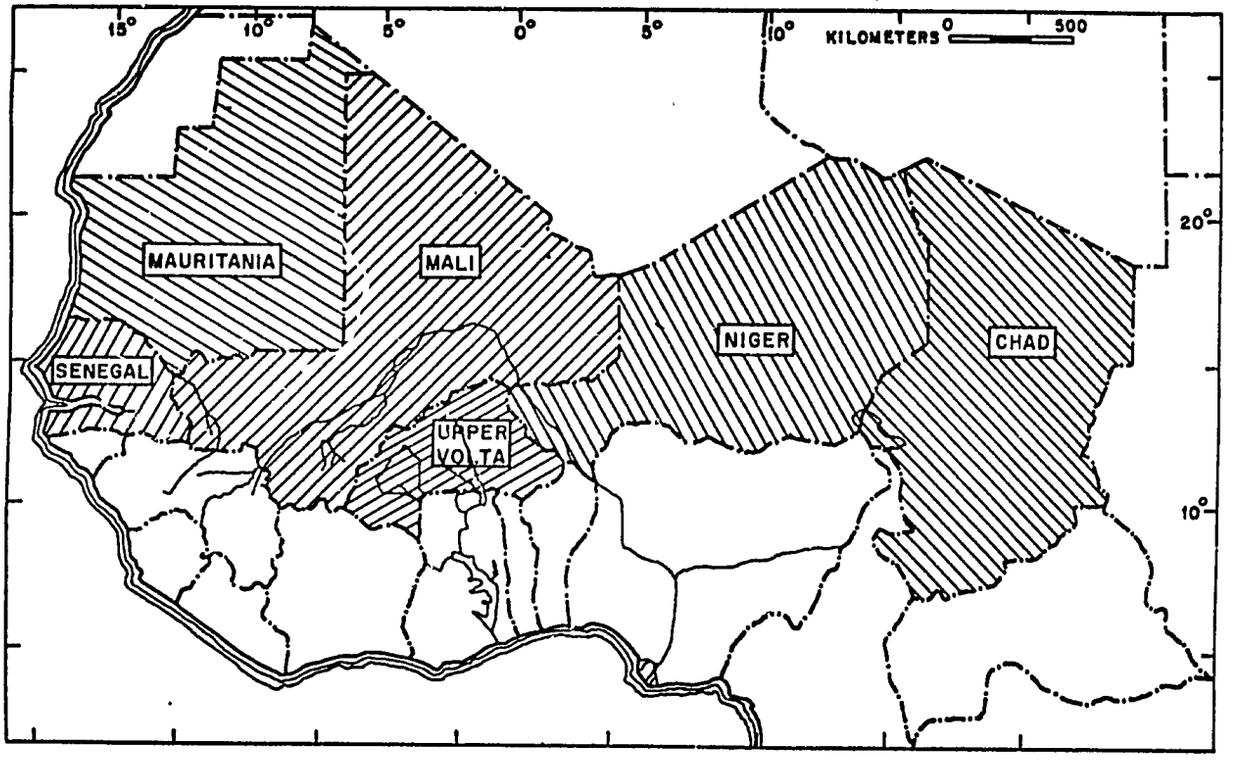
4. Author(s) John B. Stanbury, Judith A. Childs

5. Report Date	6. Total No. of Pages	7. No. of Refs
December 31, 1974	315	64

8. Sponsoring Organization	9. Center for Policy Alternatives Report No. CPA 74-9	
United States Agency for International Development	11. Other Report No(s)	12. Price
10. Contract or Grant No. AID/afr-C-1040	13. Supplementary Notes Annex 2 of a two-volume report with ten annexes.	

14. Descriptors Health, Nutrition, Population, West Africa, Sahel-Sudan

15. Abstract



Volume 1. Summary Report: Project Objectives, Methodologies and Major Findings

Volume 2. ISYALAPS, A Framework for Agricultural Development Planning

This work was supported by the United States Agency for International Development under contract afr-C-1040 and was administered by the M.I.T. Office of Sponsored Programs. This report represents tax-supported research.

The contents of this report reflect the views of the Sahel-Sudan Project at the Massachusetts Institute of Technology and do not necessarily reflect the official views or policy of the Agency for International Development.

FOREWORD

This report results from a one-year effort by a multidisciplinary team of analysts to establish a framework for evaluating long-term development strategies for the African Sahel-Sudan area.

By June 1973 it had become evident that the suffering caused by the drought was the most severe the area had experienced in the last half century. A meeting of donor organizations and U.N. agencies, called by the U.N., was held in Geneva to discuss the problem. It was clear that, while the area required immediate assistance to meet the problems of drought relief, there was also need for long-range assistance if the region were to become self-sustaining and begin an era of positive economic development and widespread improvement in the quality of life of its people. The U.S. delegation offered to undertake the first steps necessary to "identify the methodology, the data requirements and the possible alternative lines of inquiry from physical, economic, social and cultural points of view" on which to base "a comprehensive examination of technical problems and the major alternative development possibilities" for the region.* The United States Agency for International Development (A.I.D.) offered to take responsibility for this task and determined that it should enlist the assistance of the academic community in carrying out the work. A.I.D. then approached M.I.T., and a study effort was formally initiated with the signing of a contract covering the period September 1, 1973, through August 31, 1974. This contract was subsequently extended to January 1, 1975.

The goal of the U.S. effort is to develop a methodology for evaluating long-term development strategies for the Sahel-Sudan region. The

* Final Report on the Meeting of the Sudano-Sahelian Mid- and Long-Term Programme 28-29 June, 1973, Geneva. Special Sahelian Office, United Nations, New York. Statement by Donald S. Brown.

specific focus of the M.I.T. study has been on the development of an effective framework within which to appraise specific projects and programs. The term framework, in this context, refers to the accumulation, development, organization, integration, and analytical evaluation of information on the natural resources, economic resources, and human resources, including the social and political institutions, of the region. The framework is constructed in such a way that alternative strategies for the region can be identified and evaluated, in terms of both their requirements and their impacts, intended and unintended. The M.I.T. study has not been oriented toward detailed sector studies, prefeasibility studies, or project studies. Nevertheless, in the process of developing a methodology we have examined many kinds of information and a number of specific projects and have identified areas requiring further research to fill information gaps that impede long-range planning and evaluation of specific development proposals.

It is hoped that this framework will assist decision-makers in the Sahel-Sudan countries and in donor organizations in arriving at informed judgments concerning strategies for the long-term (20 to 25 years) social and economic development of the region.

The study was conducted under the direction of the M.I.T. Center for Policy Alternatives and was carried out by a multidisciplinary group. The Summary Report and the volume on agricultural development planning have drawn upon a number of working studies on specialized aspects of the problem prepared by the staff, i.e. (1) Economic Considerations for Long-Term Development, (2) Health, Nutrition, and Population, (3) Industrial and Urban Development, (4) Socio-Political Factors in Ecological Reconstruction, (5) A Systems Analysis of Pastoralism in the West African Sahel, (6) Technology, Education, and Institutional Development, (7) The Role of Transportation, (8) An Approach to Water Resource Planning, (9) Energy and Mineral Resources, and (10) Listing of Project Library Hold-

ings and Organizations Contacted. The basic elements of these studies have been drawn together in the two volumes of the final report.

In addition to M.I.T. personnel, individuals from a number of other organizations participated in the effort. Participants from the University of Arizona, in particular, made major contributions; they had primary responsibility for developing the analysis of the agricultural sector strategy. Professor John Paden of Northwestern University was a major contributor to the work on socio-political factors. Members of the Société d'Etudes pour le Développement Economique et Social (S.E.D.E.S.) in Paris provided valuable insights into various aspects of the Sahel-Sudan area. Several members of the Centre de Recherches en Développement Economique (C.R.D.E.) in Montreal developed sections on monetary policy, urbanization, and relationships between Niger and Nigeria. A list of individuals who participated in the study is included in Volume 1 of this report.

Numerous other individuals acted as consultants to the project, provided advice as the study progressed, and reviewed draft material for the reports. Help and advice were given by officials of the governments of the Sahel-Sudan countries, the Comité Permanent Inter-Etats de Lutte Contre la Sechêresse dans le Sahel (C.I.L.S.S.), members of United Nation organizations, members of the International Bank for Reconstruction and Dévelopment, and, especially, officials of the Secretariat d'Etat and various socio-economic and technical study groups in France. Finally, representatives of A.I.D. arranged meetings in Africa and reviewed the the progress of the study. All this assistance is gratefully acknowledged.

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ACKNOWLEDGEMENT

This sector report of the M.I.T. Sahel-Sudan Project concerns the health, nutrition, and population components of the region. It is not addressed to immediate solutions to problems which have existed or which have been generated by the drought, but rather to the possibilities for long term changes in the social order which might ameliorate some of the present limitations in the life quality of the people. It is based primarily on existing information from earlier accounts, surveys, occasional papers, monographs, published symposia and statistical reports. Other, more general, analyses of the health, nutrition, and demography of developing countries provided useful data for background and orientation. A brief visit of a small consulting group to three of the countries provided much additional information.

Several consultants have been most helpful. Among these were Professor Vis of the Free University of Brussels whose career experience with nutrition in Central Africa is unparalleled. We also benefited from the counsel of Professor David Rutstein of the Department of Preventive Medicine of the Harvard Medical School; Dr. Angela Molnos of International Planned Parenthood, London; Dr. Anne-Marie Rambault of the Centre International de l'Enfance, Paris; and Ms. Marie Boulvard, Dr. James Levinson and Dr. Nevin Scrimshaw of the Department of Nutrition and Food Science at M.I.T. We are indebted to Mr. Henry Cole and Dr. William McFarlane of the Tempo project of the General Electric Company, Washington, for the demographic data. We also wish to thank Drs. William Seifert and Nake Kamrany of the M.I.T. project for much helpful guidance. To all of them we express our gratitude, but responsibility for errors which may be found here is ours. The opinions, the conclusions, and the suggestions are entirely our own, and for them we accept full responsibility.

Unhappily the short time frame for this project and the time commitments which we were able to offer have necessarily limited the scope and depth of this inquiry. Our experience with the project as a whole and with the investigators who have donated so much of themselves to it, together with our growing recognition of the enormity of the human problem of the Sahel-Sudan, lead us to hope that in some way means may be found to enable the initial goals of the project to be realized. Indeed, it is difficult to believe that major advances in the region can occur unless this comes to pass.

J. B. Stanbury

Judith A. Childs

ABSTRACT

The health-care system of the Sahel-Sudan region is fragmented and severely undermanned at all levels. Health resources are inequitably distributed, with a strong trend toward urbanization. Curative medicine receives an inappropriately large fraction of available resources; investment in preventive medicine would give the maximum cost-benefit advantage.

Communicable diseases of many kinds are highly prevalent and their impact is heightened by a chronic state of undernutrition in many regions.

Improvements in health will require improvements in nutrition, water supply, waste disposal, public health programs and hygiene, education, and transportation, as well as in the health-care delivery system.

Programs for improvements in infant and child feeding and for vaccination against measles could significantly reduce the infant mortality rate. An immediate result of such programs, however, would be an expansion of the dependency ratio (proportion of dependent children) and a further strain on available food resources, schools, and other services geared to the young age-groups. These considerations must be taken into account in long-range planning for the area.

While many recommendations can be made for improving the health-care system, the principal ones are integration of all components of the system, improvements in monitoring disease, reorientation of the system toward preventive medicine, with emphasis on mother-and-child care, use of all communications media in health education, and strengthening health education in order to amplify health-care delivery.

In the past, severe nutrition deficiency has not been a serious problem in the region. However, a chronic protein-caloric deficit has probably existed for a long time, at least in the younger age-groups. This

deficit has increased the mortality from common communicable diseases, especially measles.

The drought has caused substantial short-falls in food and resulted in significant and severe malnutrition among some nomadic groups, especially those who have moved near urban centers because of the drought. Deficiencies in the transport system have exacerbated the problems of supplying relief food to outlying regions. However, adequate information about the precise impact of the drought on food availability and the extent of nutritional deficiency is lacking.

Nutrition is a central component of national development. Governmental recognition of its centrality could take the form of support of a strong national bureau for nutrition which would maintain surveillance of nutritional conditions, guide programs for improvements in nutrition, and develop policies for improvements in food supply and consumption. Our analysis suggests that this bureau would be most effective if structured within the existing health system, but it should have ties to agriculture and transport. Alternatively it could be in a planning commission, but with ties to health, population, and economic planning.

The low average population density in the countries of the Sahel-Sudan has meant that demographic issues have not been of overriding concern. Some argue that development of the area is hampered by its low population. The present stagnation of economic development, high rate of unemployment, prevalence of undernutrition, and dependence on foreign aid suggest, however, that under current circumstances population is in excess of the optimal land-population ratio.

The present average population growth rate of 2.2 percent per year, together with the fact that nearly half of the total population is below 15 years of age, means that the population will double in 32 years or less unless the growth rate falls and that, in any event, the momentum of current growth will carry forward for many years. These facts must be

taken into account in long-range planning.

At the same time, although policies and laws of the Sahel-Sudan countries have generally been pronatalist, change is occurring. In several of the countries family planning activities are in evidence. For example in Mali the old French anticontraceptive laws have been repealed.

Because planning for development requires information on the population base, and because the optimal rate of population growth may be lower than the present rate, a demographic bureau for each of the countries could be an effective instrument of development. Such a bureau could be closely allied to the health-care structure and could take responsibility for monitoring population movements and growth and for extending family-planning education and services.

While the advice and support of international agencies both public and private should be fully utilized in promoting health, nutrition, and an optimal population growth, specific programs should be worked out in the context of the several countries, their culture, and their own aspirations.

Annex 2

HEALTH, NUTRITION AND POPULATION

CONTENTS

INTRODUCTION

Health, nutrition, and population are intimately related factors in the human ecosystem. They are critically important in regional and national development, and they interact with other components of the system, and so on. Although they interact, to an important degree they are also independent of or orthogonal to other components of the social matrix. The special status of these factors arises in part because the priorities accorded them rest on humanitarian considerations. Furthermore, the time scale of health, nutrition, and population change is long. Even if a program of intervention in these fields should prove highly successful, its consequences for the total system would not be apparent for years. An investment in health, nutrition, or population management is not likely to provide any obvious short-term benefits, but nevertheless, no developing country is likely to enter the modern world unless its people are reasonably healthy and well fed and unless its people are restrained so that it does not absorb and negate economic and social advance.

The health, nutrition, and population (HNP) section of the M.I.T. project has undertaken to provide a base for an evaluative framework by organizing available data in these three fields and by identifying information gaps that need to be filled if accurate analyses and projections are to be made. This report suggests possible institutional structures for continuing data-gathering and also points to several implications that present trends have for long-term planning.

This report is based largely on published information on population, health-care systems, and health and nutrition in the six countries of the Sahel-Sudan region. The information available is limited, often contradictory, and frequently based on estimates rather than on enumeration.

It has been notably difficult to obtain meaningful data on the impact of the current drought on death, disability rates, fecundity, and nutritional status. Field studies of the project were limited to one brief survey trip to Mali, Niger, and Upper Volta in January 1974. Much more information is needed.

In this report we describe first the current state of health and the health-care systems of the Sahel-Sudan region. We consider the health-care options open to each country and the consequence of each as we see them. A summary of additional information needed and a listing of opportunities for research are provided. Finally the report presents a set of suggestions for realizable goals. The sections on population and nutrition follow this same general format.

It is hoped that the information provided here and the suggestions that are made will be useful in allocating federal and external resources and in developing strategies for improving the life of the people of the Sahel-Sudan region. Other sections of the M.I.T. Sahel-Sudan report are closely related to the issues raised here. A systems dynamics model of a village was developed as a technique for visualizing the interactions of forces in the microeconomy, the sensitivities to change of its components, and the time frame within which change can occur. Population projections may be found in the sociopolitical report (Annex 4) and in the country profiles of the population section (Appendix C) of this annex. These analyses illuminate the possible outcomes of policy decisions in the fields of health, nutrition, and population.

PART I: Health and the Health Care System

The countries of the Sahel-Sudan region have a medical infrastructure which to varying degrees is both weak and unbalanced and is grossly undermanned to meet the medical needs of the people. During the French administration, prior to independence, the health system consisted of three organizations which were relatively independent of one another. While there is evidence of some consolidation, fragmentation, dispersed responsibility, and limited planning at the national level seem to be the rule.

These countries are the victims of enormous health problems which lie primarily in the domain of public health and preventive medicine. Among the most devastating are malaria, tuberculosis, enteric infections, the common parasitoses, and the epidemic infectious diseases such as measles and meningitis (see, for example, Appendix A for W.H.O. disease statistics for 1962 to 1973). The impact of these diseases is made much more severe by the chronic state of malnutrition of large segments of the population. Paradoxically much of the expenditure on medical care is directed toward curative medicine for which the cost-benefit ratio is usually far higher than in preventive medicine.

The medical care system in most instances is an urban enterprise, whereas most of the people are rural farmers, transhumants or nomads. This means that only a small fraction of the population has any access to medical care of any kind. Vast distances and an underdeveloped transportation system compound the problem of delivery of medical care in the rural areas.

Health professionals at all levels are in extremely short supply. Training programs are limited. Many of the most promising students go abroad for further study and never return, and the well trained who return find it decidedly to their economic advantage to stay in the cities and attend upon the small groups of people of means. Work in the rural areas is also unattractive because of the limited physical and laboratory resources. Even in the cities there are only a handful of institutions where even

routine laboratory determinations can be obtained.

Developing a minimally adequate health care system in the Sahel-Sudan region will be slow and will be to a considerable degree dependent upon the help of international agencies. If resources are wisely used, major improvements in health can be achieved.

1. HEALTH PROBLEMS OF THE REGION

The problems of health of the people of the Sahel-Sudan are staggering. Some of them are particular to specific countries or regions and others apply to the area as a whole. A country-by-country analysis may be found in Appendix B. There descriptions may be found of the national health organizations, health budgets, health infrastructure and manpower, health personnel training, and the principal diseases. The impact of the drought insofar as is known is detailed also, and the role of external agencies in the health field is noted. Many of the health problems are abstracted in the following paragraphs.

(a) A broad spectrum of diseases which have been largely eliminated from the West but are highly prevalent in Africa. Among these are malaria, leprosy, tuberculosis, intestinal parasitism, and schistosomiasis.

(b) A high case fatality rate for many diseases because of poor nutrition and poor living conditions. Foremost among these is measles, which also has a universal attack rate, but the other common infectious and parasitic diseases have an immense case fatality rate.

(c) Poor to primitive water supply except for a few urban centers. This promotes the spread of water-borne endemic diseases such as amoebiasis, typhoid fever and infectious hepatitis.

(d) Primitive methods of sewage disposal.

(e) Poorly developed system of transport and communication.

(f) Severe maldistribution of health care professionals at all levels.

(g) Tendency to spend resources on expensive curative medicine rather than on preventive medicine.

(h) Fragmentation of the health care system.

(i) Severely limited allocations for national health from the national budget.

(j) Existence of many customs and taboos which are inimical to

health. Food taboos, for example, may limit the dietary flexibility of the pregnant women, and traditional ceremonies at childbirth and puberty sometimes lead to tetanus.

(k) A level of nutrition which is suboptimal, and often highly season-dependent.

(l) A low level of health education and awareness among the people.

(m) A system of education for health care personnel at all levels which is grossly inadequate for the needs of the countries.

(n) A physical plant -- hospitals, dispensaries, medical care centers -- which is inadequate in size, distribution and resources. Thus laboratory back-up for medical care is minimal at best in a region of the world where this is unusually important in diagnosis and treatment.

(o) A health care system which has been patterned after and is highly dependent on foreign sources. Accordingly, little of an indigenous cadre of professionals and administrators has developed.

From this imposing list of deficits it is apparent that there is ample opportunity to upgrade and extend the existing medical care system and the level of health of the Sahel-Sudan people. Some of the changes of small cost and large effect could be accomplished without major change in the socioeconomic structure; others would be difficult to implement without a general rise in some elements of the economy such as agronomy.

For examples, national health, nutrition, and sanitation education programs employing radio; reordering of national health priorities; and centralization and coordination of administration in health and health related affairs could pay off dramatically in improving the general welfare at very little cost whereas provision of improved water supply; national measles vaccination programs, construction of health facilities, and health professional education would be valuable but more expensive.

Considerable help from external donor agencies is flowing to the health care systems of all of the Sahel-Sudan countries and will doubtless

continue to do so. While some of this is necessary for immediate humanitarian purposes, it seems essential for the long range that this help be channeled into projects which will sponsor the self-sufficiency of the recipient countries. Most important is the creation or promotion of health educational institutions at all levels. For the foreseeable future this should be primarily for the education of nurses, midwives, and local health service volunteers.

The question always arises regarding the desirability of a medical school. They are extremely expensive and cannot possibly make an impact on health for the next decade or two comparable to that which would derive from an equivalent effort put into paraprofessional education. Thus, it seems that at present medical schools should be accorded a low priority.

Foreign assistance can be useful in international programs for control of certain diseases which the resources of any one country could not possibly encompass. Foremost among these is the program or eradication of the vector of onchocerciasis. This project has been thoroughly researched, its feasibility established, and the eradication program actually begun under the sponsorship and with financing by a consortium of international agencies (FAO, IBRD, UNDP and WHO 1973). The infested area overlaps several countries of the Sahel. When completed million acres of potentially excellent farming land will be opened up. There will remain the risk that schistosomiasis, malaria, and trypanosomiasis will become problems as this area is occupied.

Generalized malaria eradication is probably not possible in the near future. The anopheline mosquito is widely distributed and is active in the drier regions and continuously present where water is more plentiful. The parasite is extremely heavily and widely distributed in the human hosts as reservoir. Possibly universal prophylaxis coupled with effective screening of domiciles and treatment of mosquito breeding sites could eliminate the disease, but these measures are not practicable

now.

On the other hand, it would be highly practicable to suppress or even eliminate malaria around selected regions of population concentration where it would be socially or economically desirable to do so. Spraying, elimination of breeding sites, and distribution of weekly proplylactic medication would work so long as these measures would be continued. Programs require continuing monitoring, management and animation by responsible authorities. Such programs should have considerable appeal to international donor agencies.

Tsetse fly control can be achieved, but at the cost of considerable labor. Control by the sterile male technique is being investigated intensively at present, but the generation rate of the flies is slow (LeRoux n.d.). African trypanosomiasis, carried by this vector, is an important disease among cattle, but the disease rate in man has been low in recent years. The incidence rate is highest in March.

Schistosomiasis is an exceedingly widespread disease in the reigon. Its economic impact is quite unknown. Control is very difficult -- there have been few successful control programs anywhere. While the disease may have considerable health impact in the Sahel-Sudan, in one recent impact study infestation with the parasite appeared to have little influence on well-being or economic productivity (Weisbrod et al. 1973). Its socio-economic role in Africa needs to be ascertained.

Many of the important diseases of the people of the Sahel-Sudan occur because of inadequacies in the water supply and lack of sewage disposal facilities. Enteric fever, infectious hepatitis and amoebiasis are the principal ones in the group. Also the water-borne epidemic disease cholera has appeared, and can always be expected whenever conditions of crowding and sewage-contaminated water coincide. Leprosy is importantly, at least in part, related to poor personal hygiene, which in turn is related to lack of soap and adequate water supply.

Many of the most important diseases of the Sahel-Sudan region are closely related to the state of nutrition. Among these are tuberculosis and measles. Case mortality rates for measles appear to be slightly elevated in the most recent year of the drought, especially in Upper Volta, and there appears to be a rise in case attack rates as well, but from statistics available over the past 15 years, the case fatality rate, while very high by standards of developed countries, has changed little. The most probable interpretation of this is that there has been a state of chronic malnutrition among children over this entire period of time, and this has been the cause of the high mortality from the disease.

Nutrition and infection cannot be viewed in isolation; they interact strongly, and also with water supply and sanitation. Thus poor sanitation and impure water promote diarrheal disease and nutritional loss, and poor nutrition increases susceptability to fecal pathogens. The system disintegrates as a vicious cycle. While it has been shown that the most effective point of impact for interrupting the cycle is at nutrition, proper sewage disposal and clean water can hasten the change in direction of the cycle for the better.

From the foregoing it is seen that most of the major medical problems of the region are related to social and environmental deficiencies which do not fall within the domain of the practitioner of medicine. Improved nutrition (which will be largely dependent upon improvements in agronomy and the economy) improved water supply, improved personal hygiene, provision of better sewage disposal, and national and international programs such as the Volta River onchocerciasis program, are the types of change that will get at the root causes of some of the major illnesses of the region. Nevertheless, relatively simple health measures, if extended through the Sahel-Sudan countries, could have a dramatic effect on the infant and childhood mortality rate, on life expectancy at birth, and on maternal mortality. For example, one might mention measles vaccina-

tion programs, improvements in infant and child feeding -- especially at weaning and in the nutrition of the pregnant woman - - tetanus vaccination, and education in elementary hygiene. Should these measures be implemented, one would expect a significant fall in the infant mortality rate, lengthening of life expectancy at birth, and an expansion of the dependency ratio. This would occasion a further strain on available food resources, and an increase in those services, such as schools, which are particularly geared to the young age groups.

With improved chances for infant survival, one might anticipate the possibility of a falling fertility rate (the "demographic transition") but this has not happened in some other African countries where dramatic declines in infant mortality have occurred. Thus, an extension of the present medical care system in the Sahel-Sudan region, with more emphasis on maternal-child health would undoubtedly improve the probability of survival and cause an increase in population. It would also demand an increased allocation of the GDP for those goods and services required by additional population. Thus a high fertility rate, and a rising rate in population growth beyond the presently existing high rates, are likely to follow introduction of related simple health and nutrition improvements, unless other changes occur, such as urbanization, female industrial employment, education, or a vigorous and effective fertility control program, or some combination of these.

If one looks to the advanced western countries for the causes of the low morbidity and mortality rates and the lengthened life expectancy at any age, several important factors are apparent. Most important are nutrition, programs of prevention of the major communicable diseases such as smallpox, improved environmental living conditions, availability of medical care, education in personal hygiene, and improvements in public water supply and sewage disposal. No one of these can be identified as the "cause" of improvement; they are all interrelated and inter-

dependent causes. Thus, provision of a good water supply is not likely to have a major impact if nutrition is not also improved, and an improvement in general nutrition may have little effect if hygiene and sanitation do not improve. These factors in turn operate in an interdependent mode with other components of the economy, such as agronomy, general education, and so on. All of this seems to indicate that we cannot expect to see dramatic and sustained changes in health unless there is a general co-ordinated improvement in many aspects of the socioeconomic order. There are, of course, exceptions. The dramatic elimination of smallpox from the Sahel-Sudan as a result of vaccination shows that it is sometimes possible to realize highly effective programs without antecedent economic development.

2. THE HEALTH SYSTEM OPTIONS

A number of options are open to the Sahel-Sudan countries in the health field. The three general possibilities are considered in the following paragraphs. It will be recognized that many of the programs suggested here and later are already planned or being executed in some countries or are underway as pilot or demonstration projects.

2.1 Continuation of Present Systems and Programs

Little change has occurred in the incidence of the major diseases in the Sahel-Sudan countries since records have been kept, but there has been a slow fall in infant mortality and rise in life expectancy at birth as certain health measures such as smallpox vaccination have been introduced. With no modification in the present health care system these trends may be expected to continue as preventive medicine programs continue, and if the nutritional state and the economy of the region improves. If, on the other hand, nutrition deteriorates, there will surely be a rise in mortality rates. Help from foreign agencies may have some modest effects if channeled into health and sanitary education, training of health paraprofessionals, and into preventive medicine.

Urbanization, which is proceeding at an extremely rapid rate of eight or more percent per annum, can have a mixed effect on health. Since medical care is primarily available in the urban centers, urbanization will extend the availability of prophylactic programs and medical care to more people. On the other hand, crowded and unsanitary living conditions, and severe strain on the water supply and sewage disposal may serve to increase morbidity and mortality.

It is extraordinary that, to date, the drought seems not to have caused an increase in incidence of the major communicable diseases, except for an increase in measles cases and case fatality rates and con-

tained outbreaks of cholera. This statement must be accepted with some reservations, however, because recent health information is limited, and prevalence rates of disease as in the past are based on sampling or only on information from selected centers where some records are kept, and in many instances on diagnoses made by paraprofessionals with little experience and with no laboratory confirmation. Thus "malaria" in a mortality column could be any number of diseases or combination of diseases, and final assignment of this diagnosis might require great skill and chemical laboratory measures which are available at few places in the countries of the Sahel-Sudan region, judging from the observations of the Kenya team survey of Mali (AMRFI 1972) and our own team in Mali, Niger and Upper Volta.

Continuation of present policies, organization, and budgetary allocations in the health field therefore is not likely to change rates. The countries will continue to be burdened with high disability rates from disease and the consequent lowered work efficiency, although this latter may not be very important for the economy as a whole so long as unemployment is high. Continuing high natality rates can only further burden the system and reinforce debits in nutrition, per capita health services, and the level of sanitation (water supply -- sewage disposal).

Finally, what can be expected if the drought continues and no change is made in health policy? Two principal consequences will be deterioration in nutrition, and a rise in those diseases which derive from dislocation and resettlement of people. Further decline in nutrition will promote an enhanced susceptibility to and case fatility rate of the usual communicable diseases, and this will probably have its most severe impact on children under five, especially the weaning children. Dislocation and resettlement of people will tend to overburden the rudimentary sanitary systems and promote the spread of communicable disease, as already mentioned. A counterbalance to these effects might be a fall in the rate of population increase. Dislocation might also lower the

fecundity rate, but information on this point is lacking. Out-migration of men in the labor force might also be promoted by the drought and also result in lowered fecundity. This reduces the food producing labor force, but this may not be important if the drought is limiting agricultural production or if there is a large labor surplus.

2.2 Consolidation and Extension of Present Programs in Preventive Medicine, PMI*, and Sanitation

At the present level of development the lowest cost-benefit ratio would doubtless be achieved by extension of planning and programs in maternal and child health and prophylactic medicine which are already in effect in several of the countries. This implies local training programs for physicians' assistants, nurses and midwives who would implement such programs. Present scarce resources should not be expended on major curative institutions or on schools for training physicians.

Because of widely varying population density and the remoteness of many groups in the rural areas and because of difficulties in transport, it seems inevitable that there must be two modes of medical care outside the cities, i.e., fixed centers including rural hospitals and outlying dispensaries or health units, and mobile teams. Nevertheless, these should not be permitted to develop as separate entities. Rather their activities should be closely coordinated. The role of the mobile units is primarily prophylactic. They are engaged in vaccination programs and in occasional health care delivery. The focus of the stationary health institutions should be PMI in a framework which includes education in hygiene and nutrition as well as medical care and family planning services.

The point has occasionally been made that emphasis on PMI will lead to increased survival rates, a rapidly expanding population depen-

*PMI: Protection Maternelle et Infantile

dency base, and to a consequent deterioration of nutriton and health. The argument proceeds to suggest that health care should reserved primarily for survivors of the first 5 years. This argument neglects the economic wastage of pregnancy, childbirth and early rearing of children who do not survive, and also ignores the humanitarian considerations involved. Child-spacing would seem to be a more satisfactory solution, both from the humanitarian and the economic points of view.

The World Health Organization (1974) has recently published a set of proposals for controlling the repercussions of the drought on public health. This document is primarily concerned with the uses to which international agencies such as WHO can direct their efforts with respect to the problems of health in the Sahel-Sudan region and particularly those engendered by the drought. The program includes an initial evaluation by a team of local and international experts, followed by evaluations of problems and progress by a mixed international and local team at regular intervals. The program has been spelled out in some detail and cost estimates are provided. Its goals are to rehabilitate within a short period of time the fixed and mobile health units, to upgrade and animate existing health schools; to promote organization of the teams; to standardize treatment; to improve the administration and management of health services; and to promote, insofar as possible, the active participation of the communities in the health care system. One cannot fault this admirable set of proposals, except that its implementation appears to depend heavily on foreign assistance which could conceivably perpetuate a dependency position. Perhaps this is inevitable for the foreseeable future.

An important point of the WHO document relates to the importance of health education in its broadest sense. For the medium- and long-term, their point is that "While curative medicine will not benefit from an increase in its technical standards and the means available (in

particular for nutritional rehabilitation) as well as its reorganization in the direction of integration, matters are very different in regard to preventive medicine. Its main aspect is the health education of individuals and communities. It must be essentially based on education with a view to the prevention of disease and malnutrition among children and on individual and community hygiene."

"It must enlist the services not only of the nutritionist, the epidemiologist and the hygienist, but also of public health doctors and sanitation workers and room must be found for health auxiliaries also, who once given sufficient motivation, recruited and trained locally, will extend in the field of the activities of the medical staff." (WHO 1974)

It should be emphasized that this educational process, or animation, must extend in time throughout the population in order to upgrade the level of personal hygiene that is so important in the improvement of health. This process should employ all levels of communication through the schools, health centers, and through the public media, such as radio. Unfortunately it is difficult to upgrade personal hygiene when there is an extreme lack of water and means for safe disposal of sewage. Nevertheless, these problems can be solved to a useful degree by elementary and available engineering.

A set of recommendations made by the Kenya survey team for Mali are sound, generally implementable, and concordant with the WHO recommendations. They point out the importance of better utilization of existing facilities and the importance of developing a cadre of administrators. They also deplore the disproportionate expenditure of resources on sophisticated, curative medicine. Two examples of this are highly sophisticated units, one for neuro-surgery and one for cardiac surgery, which have been donated to these countries. The cost-benefit of these installations must be vastly different from that for equivalent sums spent in preventive programs, such as proper sanitation for a single village or a local measles

vaccination program. The report properly emphasizes the importance of communication in the health field, both by radio and by land transport. The set of recommendations, while highly relevant and useful, would doubtless require a substantial infusion of foreign aid. The survey, which was only done for Mali, could be done by the same team for the other countries.

Another important point made by the Kenya team relates to the role of physicians in the health care system of these countries. Their point is that the physician should be primarily concerned with health administration and education. The needs of the people are too vast for it to be otherwise. The report leaves unanswered how this can be effected without regimentation, which in turn might lead to physician emigration.

One of the serious deficits in the health care system of the Sahel-Sudan countries lies in health information. No country has an adequate system for reporting. Available statistics over the past years represent under-reporting estimates and sampling from local regions. In some instances the existing system has been adequate to alert the authorities to the presence of dangerous epidemic disease, such as the focal outbreaks of cholera in Mauritania, and this has led to adequate containment. Programs of medical care, and especially emergency medical care are dependent on surveillance of health needs of the people. Thus, a fundamental need of the health care system in each of these countries is an agency devoted to the collection of vital statistics. This agency should be part of the Ministry of Health, and should communicate closely with its other components.

Under item 2.5 below are listed a number of research projects which could be done in the region and which in many instances would provide useful information on which health planning and health related projects could be based. Here are listed a few of many projects which could be begun, or which could be extended from projects already in

process, and which could have not only local benefit, but serve as models for the rest of the countries.

(1) Establishment, with donor agency help, of model PMI centers complete with health education resources, facilities for prenatal and infant care, and with material for conception planning.

(2) Pilot project on malaria suppression, with help from UNESCO, etc.

(3) Federally supported programs of community latrine construction, taking advantage of unemployed male labor, backed up with a radio education program.

(4) Spot educational radio programs in elementary sanitation and nutrition.

(5) A pilot project subsidized from the government or donor agencies in weaning feeding, using a locally produced product.

(6) Measles or multivalent vaccination program in urban and suburban centers.

(7) Projects for development of local sources of purified water wherever possible near population aggregates. These projects, which would contribute so much to health, would require the conjoined effort of persons of several disciplines.

(8) Localized projects when feasible for iron supplementation: of flour or salt.

(9) Trial project in introduction of high lysine maize in groups who use maize.

(10) Pilot projects on training and use of local volunteers in health care delivery.

(11) Supplementation or refitting of mobile PMI centers for vaccination agains measles (freezing units), smallpox, and immunization against tetanus, together with medical care, and family services.

2.3 Promotion of a Curative Medical Care System Modeled After Urban Medical Care in the United States and Europe

A number of developing countries have expended valuable resources on showcase hospitals. These installations contribute little to the total medical care of the country or to the training of rural health care workers, yet in the countries of the Sahel-Sudan region, 80 to 90 percent of the population is rural. Further, the physicians working in these hospitals could provide vastly more service to the country at large if they were used for medical administration and education and in the fields of preventive, rather than curative medicine.

If physicians are in such short supply, how then can one object to the development of a medical curriculum especially if that curriculum is to be evolved in accordance with the needs of the countries rather than in conformity with European or American standards? Each of the Sahel-Sudan countries could absorb the graduates of its own medical schools. The difficulty is that medical schools are extremely expensive, and the product does not become available for a minimum of six or seven years after a school has actually begun. At present the school in Dakar and the one that is just now beginning to graduate students in Bamako should provide the backbone of medical teachers and administrators for the region. The actual delivery of medical care should be dependent on paraprofessional personnel including nurse midwives, physician assistants, and persons selected at the village level for special training for primary medical care as a part-time occupation, perhaps modeled somewhat after the "barefoot doctor" of China. Only when one can see substantial economic progress in the future should one plan for a medical school in the four countries where they do not exist at present, namely Upper Volta, Mauritania, Niger, and Chad.

3. NEEDED INFORMATION

The quality and quantity of health-related information available from the Sahel-Sudan countries varies widely, but in no instance can it be called adequate for a satisfactory definition of the health care status or the health care system. The statistics on disease incidence have been based on sampling techniques or under-reported statistics. The diagnoses doubtless have often been incomplete or in error. Furthermore, the population bases for these statistics have been estimates rather than precise censuses. No full census of any one of the Sahel-Sudan countries has ever been made, although these are planned for the comming year.

Several recent surveys have attempted to gauge the impact of the drought on health. Most notable is that of the Center for Disease Control in July and August of 1973. This survey was limited in scope. Other surveys have been attempted but those reports have not been published or have not come to our attention. We understand that teams from the Center for Disease Control have made a survey in 1974, and that a team of epidemiologists from Yale has also made a survey. Clearly what is needed most in order to understand the state of health and health needs of the Sahel-Sudan countries is a central bureau or clearing house for information. This may be difficult or impossible because of political problems or country rivalries, but it could be a most useful function for an international agency such as WHO. With such a resource, it would be possible to know something of the current state of health of the people of these countries and to plan in some logical form the allocation of health resources from external agencies.

In planning for health-education programs and education in elementary hygiene, information regarding education resources would be most helpful. The the availability of school time and of radio time would be helpful, as would more information regarding the general levels of

awareness of health-related problems in order that culturally compatible techniques of health propaganda could be generated.

Much information is needed regarding the attitudes of the respective governments toward health-related problems and the willingness of these officials to assign their limited financial reserves to health. Information is needed regarding their interest in and tolerance for international agencies which are concerned with health operations in these countries. While much information is available, much more is needed regarding the professional and paraprofessional resources of these countries, their training and their distribution. The health care system physical plant of each country needs better description. Further, more demographic information is required in order to plan for better distribution of existing resources such as PMI's, regional centers, and mobile teams.

Much of the information which is needed for improving health care in the Sahel-Sudan region is simply not available and will only derive from well-defined and executed research projects. A listing of possible projects will be found in the next section.

4. SUGGESTED RESEARCH

The list of research projects which could be pursued in the Sahel-Sudan region is virtually endless. The variety of diseases, the epidemiological situations, the biological problems and the social and economic complexities would seem to make this an ideal region for research which would have not only theoretical, but practical results. Unfortunately, difficulties of terrain, communication and of climate make this a difficult area for the investigator. Nevertheless, it may be remembered that some of the most important achievements of twentieth century medicine have been made under equally difficult and unpromising conditions.

There follows a list of suggested research projects which would require varying degrees of sophistication and external aid. They appear in no particular order of priority or difficulty.

4.1 The level of knowledge concerning the economic impact of a number of communicable diseases is surprisingly inadequate. What are the economic consequences of chronic malaria or schistosomiasis, of filariasis, or chronic amoebiasis? These problems have been little studied. One of the best is on the impact of iron deficiency on economic productivity in Indonesia (Basta and Churchill 1974). A study of schistosomiasis in St. Croix (Weisbrod al. 1973) indicated surprisingly little impact of infestation with the parasite when impact was measured in terms of work time loss, fertility, or attendance at school, but this does not necessarily apply to the Sahel-Sudan region because the parasite is different and other factors such as nutrition may modify the impact of the disease. There is virtually no information on the economic impact of intestinal parasites. One presumes that these parasites exact a significant toll on the energies of the host. Man has been living with these parasites for countless millinea and in many instances has reached a reasonable accommodation with them.

Economic impact studies are difficult, principally because of the problem of choosing a suitable index of the impact. Nevertheless, intuition is not good enough, and before vast sums of money are spent on complicated eradication or preventive programs, one should be clear that the benefit will be worth the cost. Thus, one may know intuitively that an onchocerciasis program is worth the cost, praticularly in Upper Volta where vast numbers of people are blinded by the disease and vast acreage is unused because of the vector. It is not nearly so clear what deleterious effect on economic productivity is caused by chronic malaria in the well-fed adult.

Thus, an important area of research could be economic impact studies of such disorders as intestinal parasitism, chronic malaria, schistosomiasis, onchocerciasis, iodine deficiency, anemia, and chronic malnutrition. Studies of this kind are expensive, exacting and would certainly require external support and groups of scientists well-trained in these disciplines.

4.2 One of the important deficits in information regarding health in the Sahel-Sudan region is <u>disease prevalence</u>. It may be a long time before internal agencies develop sufficiently to provide accurate information. Until that time the possibility exists that the state of affairs can be closely approximated by sampling techniques. The Center for Disease Control in Atlanta has developed a sampling technique which has been carefully studied in northern Nigeria. An invaluable research could be a study of sampling techniques for information gathering in the countries of the Sahel-Sudan region, coupled with validation of the sampling results by a precise census and ascertainment within defined regions. These sampling techniques could be studied both for their reliability in providing census information and in providing disease incidence and prevalence rates.

4.3 One would like to know whether vitamin C deficiency is a contributing factor in the blindness of onchocerciasis. Fruit is relatively uncommonly consumed by the people in the Sahel-Sudan region. Although overt vitamin C deficiency is not often seen, subclinical deficiency might contribute to the damage done to the sclerae by the parasite.

4.4 The economic value of an anti-malarial prophylactic medication given to exposed adults could be interesting. Thus, in a controlled mode one could test whether weekly administration of an anti-malarial prophylaxis could increase the productivity of adult males as measured by any one of several parameters, such as earnings, days worked, days lost, weight gain, fertility or perhaps other measures. The results of such a study could be useful in determining the cost-benefit ratio of a prophylactic program.

4.5 Thyroid disease is frequently mentioned as one of the problems of the region. The indicator is goiter, but in the surveys which we have studied, widely varying criteria have been used, so that it is very difficult to know the extent of iodine deficiency. This needs to be measured directly by present day techniques, such as surveys for plasma triiodothyronine and thyroxine concentrations, radio-iodine uptake, plasma thryotropin levels and the presence of goiter estimated by a uniform international set of standards.

4.6 A host of useful research projects could relate to the change in health which occurs with the suburbanization resulting from the drought. For example, has the drought occasioned changes in disease incidence patterns, dietary habits, and fecundity patterns? Has a change arisen in the pattern of intestinal flora? Have weight gain and height gain changed among children?

4.7 The effectiveness of education programs of various kinds can be measured and is important. For example, given an intensive radio campaign on personal hygiene, is it possible to measure its impact in changing behavior patterns in the target population.

4.8 Little information appears to be available regarding the cause of death of the elderly in these countries. Do they have hypertensive vascular disease? Do they have plasma lipid patterns which reflect their diet? Are there distinctive plasma lipid patterns between the herders and the agriculturalists? Are there different disease patterns between these two groups, such as differences in musculo-skeletal disorders, or cardio-vascular disease? Would the plasma lipids of a recently arrived group in an urban center from a nomadic existence be different after a year? Are plasma lipid and plasma protein differences appreciable between those groups who are primarily vegetarian and those whose protein comes from meat, fish, and milk? What are the causes of death among the young?

4.9 The only technique which has been useful in assessing chronic malnutrition at the field survey level has been a determination of the height/weight and height/age ratios. Thus, chronic malnutrition is indicated when height for age is low. If is often said and frequently reported that in many regions of the Sahel precise age of children is not known. At times this difficulty can be circumvented by relating time of birth to important events which can be dated, but this is a time-consuming technique which is subject to considerable inaccuracy. It would be useful to have a technique for measuring chronic malnutrition which does not depend on age. This can perhaps be done by normalizing the age distribution of randomly selected children in a population group, provided the technique is not too sensitive to assumptions concerning distribution of age-specific death rates. This has not been tested, but could be a subject for an

interesting research project. If it proved feasible, then one would have a technique for assessing chronic malnutrition in a population where the age of children is unknown.

4.10 Very important to the problem of infant mortality and the post-weaning mortality syndrome are the patterns of nursing and weaning. Much information is needed regarding the use of milk from goats, cows, or camels, the mode of preparation and handling of the milk, and how it is used in infant feeding and in weaning in order to gain some understanding of the root causes of the very high infant mortality in these countries.

4.10 Among farmers in Australia, skin cancer is extremely common. Is this true also of the people in the Sahel-Sudan who have a high solar exposure rate? Or does skin pigmentation protect them from skin cancer?

4.12 The technique of systems dynamics could be applied to a number of aspects of the health care systems. These models are useful because they crystallize and sharpen a block of information, because they provide an opportunity to test the correctness of one's concepts about a system and because they enable one to test the sensitivity of the system to any particular change which might be made. Thus one could model a district in the Sahel with a primary focus on health, nutrition and population. One could then incorporate an arbitrary input of economic development in order to answer the question of sensitivity to nutrition or population intervention of the health of the people.

One might also use a model to study the carrying capacity of the land. Carrying capacity is a difficult concept to define. It is not an arbitrary constant, but rather it varies widely with circumstances. It is limited by many environmental and socioeconomic factors. One of these is protein availability; another might be water availability, and so on.

With the model of a village or region one could test, by computer simulation, the consequences of various policies regarding health or population or nutrition. Using a similar model one could perhaps study the consequences of shifting from a pastoral to an agricultural life style and answer the question whether in a given region this would sustain more or fewer people. With such a model one could also study the consequences of aid from donor agencies, or one could study how external relief could be transformed into development capital, and the effects of unrestrained population growth on the effectiveness of that capital. Given a working systems dynamics model of a region, one could study the time lag for benefits from education, capital infusion and population growth. Given a satisfactory generalized working model one might be able to demonstrate graphically the result of policy alternatives on health or on particular aspects of the health care system or on population or nutrition.

4.13 Much of the information regarding the interaction between sickle-cell trait and malaria has come from Nigeria. This interaction has not been developed for the Sahel-Sudan region. One would like to know the importance of sickle-cell disease in these countries.

4.14 What is the effect of maternal malnutrition on transfer of immunoglobulins to the nursing child? This problem has interesting implications to the infant death rate in regions of protein-calorie deficiency.

4.15 Among the various groups and in the regions of severe drought, what has been the effect on placental and neonatal weight? Is there evidence of placental insufficiency, and is there evidence of prematurity resulting from the drought, and the attendant dislocation, malnutrition and disease?

4.16 In order to institute an effective health program, much socio-

logical information is needed regarding food taboos, how stringently these are held, what it is that native practitioners do, whether they can be retrained in more scientific and useful pursuits, and what services, in fact, they perform. Do they use drugs which might be interesting for investigation? How transferable are the medical problems of the indigenous population from the practitioner to a practitioner of western medicine? What techniques are most practicable in effecting this tranfer?

4.17 Have the anophilines of the region been completely identified and their biological properties studied in order that more effective means of control can be employed?

5. GENERAL PROPOSALS AND SUGGESTIONS: HEALTH SECTOR

5.1 Integration of the entire health care system into a single governmental bureau or ministry. This ministry should include a division of human resources which would be concerned with demography.

5.2 Integration from top to bottom including all aspects of the health services, nutrition and family health and child-spacing services.

5.3 The establishment within the Health Ministry of a strong agency for monitoring disease and nutrition. This agency should work closely with the demographic section.

5.4 Emphasis on PMI services and preventive medicine, and extension of these services into the rural areas in preference to urban curative centers.

5.5 Utilization of physician resources in administration and teaching by deemphasizing their role in curavtive medicine.

5.6 Rapid extension of education in the health-nutrition-population domain. This means strengthening and extending institutions for training of paraprofessional personnel, such as nurses, nurse midwives, and local health practitioners, as well as intensive animation of the general public in hygienics, health, nutrition and family-planning, child-spacing.

5.7 Full cooperation with the health agencies such as WHO in accordance with the proposal of WHO for the region (WHO 1974). While this is highly desirable and external help should be fully utilized, at the same time every effort should be made toward ultimate self-sufficiency in matters of health, nutrition, and population.

5.8 It would be highly desirable if a central clinical laboratory could be established at a main health facility in each country. The purpose of this would be to standardize and objectify diagnosis in order that disease incidence and prevalence could be known as guides to health program management.

5.9 A number of suggestions for projects which could have significant impact on health care are listed at the end of section 2.2, and a series of research projects appears in section 4.

PART II: Nutrition

1. THE NUTRITION PROBLEMS OF THE REGION

The nutritional patterns and problems of the people of the Sahel-Sudan countries have been well described in the past (May 1968a,b). These are outlined in Appendix C. A description for each country may be found there of dietary habits for various subgroups of the population and a description insofar as is available for the results of the drought and current nutrition of these people. The state of federal attention to nutrition and nutrition planning is noted.

In general the dietary patterns can be divided into two types. The pastoral people generally subsist on milk and milk products and some meat, whereas the rest of the population subsists principally on grains and tubers.

In the past, specific and florid nutritional deficiency has not appeared to be a particularly important problem in this region. On the other hand, a chronic and moderate protein-calorie deficit has existed for a long time, at least in the younger age groups. The evidence for this is the virtually constant and high case mortality rate for the common communicable diseases, especially measles, and the low height for age pattern. Only in the past two years has there appeared to be both an increase in the incidence rate and a rise in the case mortality rate which could conceivably be a result of the malnutrition attendant upon the drought. Other factors may have been responsible for this persistent high case fatality rate, such as coincident chronic malaria and diarrheal disease. Intestinal parasitism and poor general hygiene may have been contributing factors, but in general the consensus is that the principal contributing factor has been a chornic state of malnutrition.

Studies performed by the C.D.C. (Center for Disease Control, Atlanta, Georgia) team in 1973 indicated a low weight for height ratio. This indicated acute malnutrition. Because of the difficulty in ascertaining age of young persons it has been difficult to determine whether

the age for height ratio is low, and accordingly on this ground to gain evidence for chronic malnutrition.

It has been singularly difficult to obtain information regarding the impact of the drought on nutrition. Grain estimates have indicated shortfalls in the availability of food for several years. The high loss rate for cattle has added to the nutritional deficit of the pastoral people. The C.D.C. survey in July and August of 1973 directed its efforts to those pockets where it was suspected there might be malnutrition, and indeed this was found to be the case. It may be said here that significant and severe malnutrition was generally found among the nomads and especially the nomads who had just become suburbanized as a result of the drought. The malnutrition pattern conformed more closely to that of marasmus, but some instances of edema were found. The M.I.T. team which visited Upper Volta, Niger and Mali in January, 1974, included Professor Henri Vis, who has spent much of his career studying malnutrition in Zaire, Rwanda and Burundi. He found little evidence of malnutrition, and on his visit to the hospitals saw no patient conforming to kwashiorkor. It was his impression that the general state of nutrition in the Sahel-Sudan region is considerably better than that in rural Zaire or Rwanda.

Estimates of supplementary nutritional needs resulting from the drought vary widely from one report to another. These are abstracted in the appendix. As is well known, monumental difficulties have been encountered in attempts to supply and distribute grains to the Sahel-Sudan region. This is due in part to administrative difficulties and in part to deficiencies in the transport system. There is a pressing need for some form of surveillance in order that information may provide a basis on which nutritional needs can be projected, resources allocated, and meaningful distribution planned.

Study of the nutritional problems and projects for the Sahel-Sudan region leads one to the inevitable conclusion that health services,

nutrition, and population policy are inextricably intertwined. Health is dependent to a very considerable degree on nutrition, and nutritional projections cannot be made without population projections. Nutrition must be integrated with the health care system and with population.

Until recent times the governments of the countries in the Sahel-Sudan region have not given nutrition much visibility at the policy level, and only recently has there appeared to be much concern on the part of international agencies. The drought has changed this and perhaps opened the way to some highly desirable new policies which could conceivably be beneficial not only for the current emergency situation but for the long-term as well. The nutritional problems which these countries are facing as a result of the drought derive from dislocation of people, transportation problems, difficult communications, remoteness, and lack of precise information regarding requirements and availability of food. Not the least of the problems has been the hammer blow of the gasoline shortage followed by the vicious rise in gasoline prices.

2. NUTRITION OPTIONS

This document is directed primarily toward long-term solutions beyond the time in which the drought will be an acute problem. The current emergency will have to be dealt with by international agencies and groups constituted within the individual countries. For the long term, a continuum of policy options is open. We present here a simplified binary summary, which is either to do nothing substantial or to undertake any one or all of a series of policy developments in the nutrition sector.

2.1 No Substantial Change in Present Policy

It would be impossible on the basis of present available evidence to predict the future trends in nutrition, particularly in view of the drought and the meager information regarding its impact, and no foreknowledge as to agricultural recovery. Some observers have indicated that there is ample food in the region, and that there is only a maldistribution of food. Others predict major short-falls in the available food within the next year. The forecasts of needs are outlined in the country profiles in Appendix C.

The drought may have had a major impact on mortality through malnutrition. In the report by the C.D.C. team from mid-1973, an estimate was made of the excess mortality resulting from the drought. This was based on admittedly dubious assumptions, but taken at face value, the indications were that by that time approximately 100,000 people may have died as a result of the drought. The principal assumption was that the increase in mortality from all causes for the current year compared to previous years was a result of the drought. While this figure has been widely quoted in the press without the guarded interpretation of the C.D.C. group, there appears to be in fact little solid statistical

information except for that deriving from the limited published surveys. Clearly there has been acute malnutrition in focal areas in the childhood group.

In more stable times in the past it appears that serious malnutrition has not been a major problem in the region, but the high case fatality rate for measles extending back through approximately 20 years of records indicates the existence of at least a modest state of undernutrition. The existence of acute malnutrition is indicated by the low weight for height ratios obtained by the C.D.C. group.

If the governments of the various countries elect to make no significant changes at the government level with respect to nutrition, then the nutritional state of the population from a long-term point of view will depend on the marketplace and can probably be expected to deteriorate, especially if there is no check on present population growth rates.

With no change in federal policy, any change which might be effected will be dependent to a degree on the activities of outside agencies such as FAO and WHO and the input from food donating countries and agencies. Without full government cooperation and willingness to change and implement, the impact of external international agencies is probably going to be small. Furthermore, major food donation can be counter-productive if a dependency economy is created without policy changes designed toward self-sufficiency.

2.2 Development of National Nutrition Programs

There are two important issues among others in a national nutrition program. These are first, establishment of a well-funded nutrition bureau, and second, the establishment of a system for monitoring on a continuing basis the nutritional status of the people of the country. The latter issue is a function of the former. The federal nutrition bureau could be an intimate part of the health ministry and should work closely with the

sections of the ministry concerned with health and population. Alternatively, as has been successfully done in some countries, the nutrition bureau could be an entity located within a national planning commission, but with strong ties and communication with those bureaus involved in health and population. The nutrition bureau should also have lines of communication with those agencies of the government dealing with agriculture and transport. They must have contacts with food manufacturers, those offices of the government and the private sector dealing with food imports and exports, and they must have close liaison with the representatives of international food donor agencies. The nutrition bureau should be concerned with the following issues:

(1) A vigorous program on nutrition education employing the communications media and operating through the schools, the health care system and the PMI's.

(2) Implementation of infant, child-food supplementation studies and programs.

(3) Development and subsidization of a weaning food.

(4) Subsidization of food supplementation programs with iron, iodine, vitamins and protein as needed and as suitable vehicles are identified.

(5) Development of experimental stations for improving food production.

(6) Study of land use for optimizing agriculture and promotion of improved land use policies, in cooperation with federal agencies concerned with agronomy and economic development.

(7) Study of food and agriculture pricing policies in order to promote and ensure proper distribution of food into areas of greatest need.

(8) Monitoring of the food production and export sector to ensure that adequate food is produced and retained for proper nutrition within the country.

(9) Promotion of back-yard gardening of comestibles for home consumption in the rural areas which would help to mitigate the effects of the soudure and provide a better balanced diet throughout the year.

(10) Development of food storage techniques in order to avoid seasonal shortages.

At some later stage in economic development the following could be useful:

(11) Favorable tax incentives to firms which produce low-cost nutritious foods or fortified foods.

(12) Favorable import policies regarding agricultural heavy equipment.

3. NEEDED INFORMATION

The principle information which is needed in the nutrition sector is the actual state of nutrition of the population by regions on a continuing basis. Information regarding the nutritional needs of the populations based on reasonable projections is also needed. This kind of information is needed both for adults and for the infant-child group, and particularly for pregnant women and for those members of the population who have been resettled as a result of the drought.

Information is needed regarding the patterns of nutritional deficiency in various regions and among various groups. Estimates of need for protein and need for calories are needed by regions.

More information is needed on existing dietary patterns and on the trauma and difficulty which attend forced changes in the dietary patterns. As indicated in the health section, observations on placental weights and weights of newborns would give some indication of maternal dietary deficiency.

Information regarding the channels of public information which could be used for educational purposes in nutrition would be useful in guiding programs of animation. Food taboos and customs frequently impede nutrition programs and compound the difficulties imposed by food shortages. Information on these taboos and deleterious customs would be valuable, as would information regarding the possibilities and difficulties in overcoming these constraints.

Finally, whenever nutritional information is collected, parallel information related to socio-psychological and economic factors should be sought in order that nutritional programs can be optimally implemented.

4. SUGGESTED RESEARCH

Many programs for research on nutrition in the Sahel-Sudan area are implicit or noted explicitly in the list of projects in the health section. Several others may be mentioned as follows:

4.1 Effectiveness of Propanda Instruments

A formal study of the effectivenss of a propaganda instrument in changing dietary habits could be informative. Thus, one might measure the use of flip charts, or video-tape cassettes, or slides in a PMI center in changing the attitudes or practices with respect to infant feeding.

4.2 Cottage Industry -- Infant Food

An important practical research project could be the development of a very low cost cottage industry type infant food for food supplementation for use during weaning and thereafter. Possibly a sorghum-peanut mixture could accomplish this purpose and could be produced at the home or backyard or community level.

4.3 Nutrition Supplements

Studies on the impact of specific nutritional supplementation such as: iron, protein, iodine or vitamins on productivity could be done among factory workers or field workers.

4.4 Antihelminth Program

The effectiveness of an antihelminth program on nutritional state could be studied. The dependent variable could be the height/weight ratio over the course of several months. The same could be done with malaria prophylaxis.

5. SPECIFIC PROPOSALS: NUTRITION SECTOR

5.1 Perhaps the most important proposal which can be made is that nutrition be recognized as a key factor in the health and welfare of the Sahel-Sudan region. Many of these people are at marginal or sub-marginal nutritional levels. Their socio-economic progress is going to depend on improved nutrition, and, on the other hand, deterioration in nutrition will either be followed by social disruption or socioeconomic collapse. Nutrition should be recognized as an integral part of health and the health care system and the population sector.

5.2 There needs to be within the federal framework a well financed program of surveillance of nutritional status on a continuing basis. Frequent regional surveys, especially in the rural and resettlement zones should feed in information on the basis of which decisions regarding food acquisition and distribution can be made. Initially such an agency would doubtless require the help of international groups such as WHO and FAO. This federal bureau should have close ties of communication with the agricultural bureau and the private food marketing sector.

5.3 A principal concern of the nutrition sector should be animation for nutritional improvement at all levels, but particularly at the level of the PMI's. All possible channels of education should be explored and exploited with this end in view.

5.4 Steps should be taken at once to repair nutritional deficits wherever they can be identified, especially in the maternal-child group. Every effort should be made to channel local and international food supplements to this group.

PART III: Population

1. THE POPULATION PROBLEMS OF THE REGION

No countrywide census has been carried out in any of the countries of the Sahel-Sudan. Population figures have been published by several agencies -- all these are based on estimates. It is understood that under WHO sponsorship full enumeration censuses will be carried out in several of the countries during the coming year.

The data on population which have been made available over the past years are tabulated in the socio-political report (Annex 4) of the M.I.T. Sahel-Sudan project. Distribution diagrams of the population indicate widely varying concentrations of the population in varying parts of the individual countries. The density in the northern regions are among the lowest in the world, and the density figures for the countries are low by comparison with many other regions. Density figures, however, are only meaningful in terms of the local economy and resources.

One of the striking features of these countries is the age structure of the population. In common with most of the developing countries of the world, there tends to be a heavy concentration of the total population in the young age groups. Thus, nearly half the total population is below 15 years of age. The effect of the age structure from the point of view of population projections is illustrated in the age-structure pyramids of Appendix D of this report. These "age trees" illustrate a high dependency ratio and the inevitability of a continuing high rate of population growth, even if there should be a dramatic fall in fecundity. Thus, in the decades to come in all these countries, an expanding cohort of those who are now children will be moving into the reproductive age groups. Thus even a hypothetical immediate shift to 2 children per couple would be reflected in no significant change in the labor force for the next two or three decades. Furthermore, there would be no perceptible change in population growth for about the same period of

time, and for many decades after that there would be only a slowly declining growth rate and an increasing net population, until stabilization would be reached in about three-quarters of a century. These points are important because they indicate the need for population policy now. Once a policy is instituted, its effects are decades away. It is too late to wait for near disaster before adopting population policies. The implication of these age trees cannot be ignored, especially in countries where rapid population growth gives a wide base in the childhood group. Furthermore, any fall in death rate in the younger age groups -- where it is most likely to occur -- will further compound the problem.

The population growth rates among the six countries vary. The slowest growth rate is that of Mauritania, and the most rapid, Niger. The mean growth rate for the region is approximately 2.2 percent per annum according to the best available figures, but these figures are probably underestimates. This gives a doubling time of about 32 years. There is every reason to believe that the population of these countries was stable until one or two generations ago. The recent introduction of simple hygienic methods, vaccination programs and perhaps the breakdown of certain cultural restraints has resulted in a spurt of population growth.

Policy alternatives regarding population must be guided by an understanding of the carrying capacity of the land under various assumptions. Carrying capacity is not a fixed constant but depends on the economic and social development of the region under scrutiny. It can only be viewed in the context of reality, not in terms of what might be. Thus, the carrying capacity of many of the Sahel-Sudan regions might be quite high if certain conditions of economic and social development could be met, but there is no certainty that these will be achieved.

A review of the present prevalence of malnutrition and unemployment, coupled with the demand for massive aid, indicates that at least

under the present circumstances the carrying capacity of much of the Sahel-Sudan region has been exceeded. If this is true and if the lot of the people of the Sahel is to improve, it will be necessary that economic development proceed at a more rapid pace than population growth. Economic development requires capital investment; population growth also requires capital investment just to keep the standard of living from deteriorating. Thus, schools, health facilities, housing and transportation must grow with the population or else the standard of living by definition deteriorates. A number of calculations have been made to show the impact of population growth on economic growth in Africa (UNESCO 1971; Schultz 1971 and 1973). These studies clearly point out that given present rates of population growth, a fraction of the GDP must be invested just to maintain the present standard of living leaving that much less for investment in economic growth. Any population growth constitutes a drain on the potential capital for investment. This is particularly true when, as in the Sahel-Sudan region, there is a long lag between the entry of the new members in the population group into the productive ages. On the other hand, it must be said that population growth may have either an enhancing or a deleterious impact if the growth group is comprised primarily of a laboring force, as in an emigration or immigration setting or if it is a rapidly growing dependency group in a subsistence agrarian economy.

Concern for the possible deleterious effects of rapid population growth on the society and its economy has scarcely been recognized in the region. There are a few family planning clinics and family planning associations in Senegal. Through supreme court decree, Mali has recently abrogated its old French anti-contraception laws, but these still stand in the other five countries. There are a few efforts directed toward child-spacing and family planning elsewhere in the Sahel-Sudan countries, and in many cities a married woman with a

doctor's permission may obtain contraceptives. Details regarding these matters may be found in the country profiles in section 3 below.

By and large federal policy and the point of view of policy makers in these countries is pronatalist. The prevailing view is that the Sahel-Sudan countries are underpopulated and that an increase in population is required for economic development. The assumptions on which this view is based require thorough reexamination. A careful and remarkably perceptive study of the relationship between population and economic growth has been done in a neighboring country, the Sudan (Henin 1971), and was presented at the Population in African Development Conference held in Accra in December, 1971. For Sudan it was shown that approximately 8 percent of the GDP was required just to keep pace with population growth. This would limit to this degree the available investment capital for economic growth.

The magnitude of the population problem can be well demonstrated by projective studies according to various assumptions regarding population growth. These studies demostrate the interplay between population growth and economic development and explore the constraints which unrestricted population growth has on economic development (see Annex 4 of this report).

F.T. Sai, Assistant Secretary General of the International Planned Parenthood Federation and former Director of Medical Services, Ministry of Health in Ghana, has expressed his concern that policital leaders in Africa are often blind to the inevitable consequence of too rapid population growth in developing countries:

> "The demographic problem being faced by all the developing world is unique, and history has very few lessons to teach us. Never before have nations had to cope with a possible doubling of their populations every 20 to 25 years. Many political leaders do not recognize that this is a new and very serious problem. In the developing countries politicians are reluctant to admit even the most obvious aspects of the

> problem -- that of people and their food supply, a problem which nomadic tribes have recognized for their animals from time immemorial. Political leaders hide behind simple comparative figures of population density per unit area of land surface and cloud the issues. Even the problem of increasing food supplies and improving nutrition takes on new and formidable dimensions in the face of rapid population increase." (1973)

In the paragraphs related to health care earlier in this document, we have noted the reinforcing effect which improved health care will have on population growth. The probabilities are overwhelming that, no matter what is done, there will be a rapid rise in population in the Sahel-Sudan countries. Only a relatively high infant and childhood mortality rate is moderating an explosive population rise. Much has been made in the past of the so-called demographic transition, by which is meant a fall in fecundity which follows a falling death rate and an improved economic position. One could be comfortable if he could be assured that this will indeed happen in the Sahel-Sudan area. But there is evidence that a demographic transition has not occurred elsewhere in Africa, and that in other places it has occurred only after a long delay. The problem is whether unlimited population growth will negate any efforts at economic and social improvements in the region.

If any plans for population management are to be made they must include first of all mechanisms for monitoring demographic trends in addition to accurate population statistics. Population planning programs in these countries should be based on the kind of information from selected groups provided in Dr. Angela Molnos' "checklist" which appears in Appendix E.

The pronatalist attitude of most of the officials in the Sahel-Sudan countries, coupled with the persistent anticontraceptive laws of the French administration, have discouraged active advocacy of population concerns of these countries. Yet, population is too important to be

allowed to drift. Irrespective of individual prejudices against conception control, accurate demographic information is necessary for health planning, for nutrition, for economic growth, for improvements in water supply, or for virtually any other aspect of the total economy. The possibility that population growth, with its built-in momentum, will eventually exceed the carrying capacities of these countries must be anticipated long before it happens, and suitable corrective policies instituted. The concerned officials in the respective governments should reconsider on a continuing basis the desirability of family planning programs.

2. POPULATION PROJECTIONS

The population projections and analyses appear as Appendix D.

3. CHANNELS FOR DEMOGRAPHIC CONCERN

3.1 Chad

Very little information exists regarding family planning efforts in Chad. The French anti-contraception laws are still valid, and the government is generally opposed to population control efforts. At the Third Inter-Agencies meeting on Family Planning (held in Mali, 1973), mention was made of a group called AFRICARE which at that time was studying the possibility of introducing an integrated PMI and family planning program in the four countries of the Lake Chad area, including Chad, Nigeria, Cameroun, and Niger. AID was considering a planning grant for such an operation. A major limitation was the shortage of medical personnel in these countries (UNFPA 1973).

3.2 Mali

Mali is the only country in the Sahelian region which has repealed the anti-contraception laws instituted in 1920 by French officials. Since their repeal in 1972, a Family Planning Association (Association pour la Protection et la Promotion de la Famille), funded by a grant of $252,000 from the International Development Research Center of Canada (IDRC), has been established under the Ministry of Social Affairs. The Association, with the assistance of Mr. Andre Laplante, has organized a pilot family planning project; the project got underway in April, 1972, with the opening of the Family Planning Center in Bamako. By May, 1973, the Center had served over 1,000 patients. At that time the second step envisioned by project members was to expand the services through five satellite clinics in the rural areas. By November, 1973, eight doctors and ten midwives were working part-time in the service. The two methods of contraception which had proved most popular were the IUD and the condom (UNFPA

1973). An important research effort has been undertaken in conjunction with the pilot project to ascertain the kinds, effectiveness, and use of traditional methods of contraception, of preparations for preventing or correcting sterility, and of aphrodisiacs.

With the repeal of the anti-contraception laws, the climate has been set for extensive efforts in the field of family planning, including integration of PMI and family planning programs, individual family planning clinics, and seminars for interested groups. With respect to the latter, two such seminars were held in Bamako during April and May of 1973. Both seminars were financed jointly by the American Friends Service Committee (AFSC) and the IDRC; the first one dealt with sex education and the second, requested by labor union members from all parts of Mali (as well as two people from Mauritania), dealt with several aspects of family planning, including sex education, sterility, abortion, traditional contraception, and women's emancipation. Participants in the second seminar (most of whom were women) drew up a remarkable list of resolutions which highlighted the broad-range impact and importance of a well-conceived family planning program (AFSC 1973).

3.3 Mauritania

It was reported in a 1972 International Planned Parenthood Federation (IPPF) Situation Report that there were no organized family planning programs in Mauritania. At that time, the government was opposed to any efforts to control population growth. Nevertheless, during the Inter-Agencies Meeting on Family Planning held in Mali in May, 1973, the AID representative announced that the agency and the Ministry of Health in Mauritania were considering the establishment of a pilot project for integrated PMI and family planning services

(UNFPA 1973). Oral contraceptives are available at a price, and the PMI center in Nouakchott advises patients on contraception for medical reasons or upon request.

Representatives from Mauritania have participated in various colloquia on family planning held in other west African countries. These colloquia have included, among others, the Colloque sur le Planning Familial (Dahomey, November, 1971), the Population in African Development Conference (Accra, December, 1971) and the Labour Seminar on Family Planning (Bamako, May, 1973) (IPPF 1972).

3.4 Niger

Dr. John C. Caldwell, who was appointed as a representative to Ibadan for the Population Council in January, 1973, recorded notes and observations on family planning channels in Niger and Upper Volta in trip reports prepared in January and February, 1973. Most of our information regarding family planning in Niger comes from his report (Caldwell 1973a). Information regarding specific changes in the field which have resulted from the 1974 military overthrow of the Niger government has not come to our attention.

There was some evidence that the drought had increased governmental awareness of the need to adopt measures for controlling the increasing population growth rate in the face of decreasing resource capacity. Consequently, efforts in the field of family planning had become acceptable to many governmental officials, and were being actively supported by some of these, notably the director of PMI in the Ministry of Health, Madame Dupuis. According to Dr. Cardwell, Madame Dupuis was the country's strongest advocate of family-size limitation and her support of family planning activities would very likely prove instrumental to their continuation and expansion in the future.

As of January, 1973, there were no government family planning operations. Despite this, and despite the country's anti-contraception laws, efforts in the field of family planning by private agencies were eliciting a favorable response from government officials. For example, the American Jewish organization ORT, with the assistance of the AID Area Development Office in Niamey, was given a mandate on January 10, 1973, by the Ministry of Health to devise a rural PMI program which would include family planning. Subsequently, a pilot project was set up in the town of Say, thirty miles southeast of Niamey on the Niger River.

An AFRICARE project to integrate PMI and family planning was based in Niger at Maine-Soroa. There was some difficulty in raising enough funds to cover the costs of a family planning program within the framework of the PMI. At the time of Caldwell's writing, money-raising activities were being conducted by the former Peace Corps Director of Africa, C. Payne Lucas, and by the then-President of Niger, Hamuni Diori (who was also the President of AFRICARE). We are not informed on the current status of that project.

At the Third Inter-Agencies Meeting on Family Planning, AID reported that it was financing a family planning film which was being prepared by the Ministry of Education. No details were given (UNFPA 1973).

Dr. Caldwell felt that the government was generally receptive to the possibility of a census. In 1972, a UN team prepared a census outline for use by the regional group of countries consisting of Niger, Upper Volta, Mali, Dahomey, Ivory Coast, and perhaps Mauritania. Part of the funds for the census were to be provided by UNFPA, but counterpart funds from each country were also required. Although Niger had promised the required amount, it was uncertain whether the

other countries would do so. The regional aspect of the project was unappealing to many of the countries, because it was feared that such a project would not evoke national pride, and therefore would not be continued by the individual countries in the future. Although the acute need for such a census was recognized, the above constraints and others would require careful reconsideration on the part of UN agencies concerned with the effort (Caldwell 1973a).

3.5 Senegal

To a significant degree, promotion of family planning services in Senegal has developed from the dedication of a single individual, Mrs. Phebean Whest-Allegre. Her initial interest in the field was sparked by a visit to the United States in 1965, and since 1966 she has devoted herself to the advancement of family planning within the field of maternal health. At the maternity clinic, "Clinique la Croix Bleue", where she is the director, she began a family planning service which has been funded by the Pathfinder Fund since 1968. Working out of Dakar, personnel from the clinic travelled to M'Bour, St. Louis, and Diourbel to provide family planning services. In 1970, Mrs. Whest-Allegre, with financial backing from IPPF, began a family planning association called "Mouvement Senegalais de Planning Familial" (MSPF). Its first efforts were directed toward a modest education campaign.

Technically speaking, family planning activities are illegal; however, the French anti-contraception laws of 1920, which are still on the books, are not enforced. In fact, in 1970 the President, the Prime Minister, the Minister of Rural Development, and the Minister of Health expressed their unofficial support of family planning efforts (IPPF, 1970). At the Third Inter-Agencies Meeting on Family Planning it was reported that the Senegalese government was creating an

association called "Orientation Familiale". No details were provided.

In the area of research, Dr. Pierre Cantrelle conducted a sample survey on pregnancy intervals in 10,000 women, and a detailed KAP study of 2,000 women. His research was funded by ORSTOM, WHO, and the Population Council (IPPF 1970). In addition a demographic survey was conducted in 1970, and in 1973 UNESCO had drawn up plans for a survey of immigration and emigration in Dakar. UNESCO also sponsored a population dynamics meeting in Dakar in 1971, where a methodology for treatment of the population problem within the framework of development strategy was proposed (UNFPA 1973).

The Regional Office for Africa of the International Development Research Centre (Canada) and the Regional Office for West Africa of the American Friends Service Committee were both located in Dakar as of July, 1973. Both organizations have initiated and supported family planning programs in several of the francophone African countries.

3.6 Upper Volta

Our most recent information regarding family planning channels in Upper Volta is from Dr. John C. Caldwell's trip report on that country in February, 1973, and from the Third Inter-Agencies Meeting on Family Planning held in Bamako, Mali, in May, 1973.

In the past the government of Upper Volta has maintained an official position opposing any form of population control. Nevertheless, possibly as a consequence of the devastation by the drought, there was a passage in the 1972 - 1976 Five Year Plan which implied that family planning would probably become a governmental concern at some future date (Caldwell 1973b). In the meantime, family planning activities on the level of private medical practice are not opposed by

the government, although the French anticontraception laws have never been repealed. Furthermore, prior to her departure from Upper Volta in early 1973, Madame Combari, Director of Social Affairs, was one of the country's strongest advocates of family planning. In 1972, she organized a seminar on family planning which was sponsored by the Association of Voltaic Women. At the Third Inter-Agencies Meeting on Family Planning, it was reported that the Association had drawn up plans for a center for family planning information ("Centre Voltaique pour la Promotion et la Protection de la Famille"). Although their plan had received approval from the Minister of the Interior, it had been opposed by the Minister of Health (UNFPA 1973).

The Upper Volta government had demonstrated some interest in obtaining census data for development planning. The UNFPA-ECA Census Mission proposed a census project for Upper Volta in 1972. Funding by the government was still a problem when Caldwell wrote his report in 1973. At that time there was some hope that a census might be carried out for Mali, Upper Volta, and Niger within the framework of the Liptako-Gourma project, which is a cooperative development effort encompassing areas in all three countries (Caldwell 1973b).

In the area of research, two projects appeared to be particularly noteworthy. One was a migration survey being financed and conducted by ORSTOM. The French team of investigators was using a unique approach to data-gathering for determination of migration patterns. Their report is expected to be completed by September/October, 1974. A second project was an AID-funded disease survey being conducted by Dr. Neil Ewen of the Center for Disease Control in Atlanta. Dr. Ewen was surveying 18,000 people of the Mossi population in 120 villages. Many of the questions he had prepared dealt directly with

demography and were expected to provide some important data regarding fertility and mortality (Caldwell 1973b).

4. POPULATION OPTIONS

4.1 No Change in the Present Existing Policies

The consequences of this option have been discussed in the preceding section and in Appendix D and are implicit in the figures of Appendix D. The restraints on capitalization imposed by population growth have been discussed and the implications of age trees have been described. The option to do nothing would appear to impose a major restraint on economic progress from many points of view. Demographic pressures already cause the export of a substantial fraction of the labor force, with deleterious consequences to economic productivity at home. The argument that population growth is necessary in order to force economic growth would only be tenable if there were visible resources, such as oil or minerals or industrialization which could respond to demographic pressure. There is little or no evidence for such resources in the Sahel-Sudan countries. (In the foreseeable future perhaps only in agriculture could a response occur.) The argument that these countries are underpopulated by comparison with many others does not apply if one considers the existing population in terms of the real carrying capacity of the land under the present and foreseeable circumstances. Low income and high unemployment attest to this low carrying capacity.

4.2 Establishment of a Demographic Division within the Federal Government

Such a division would be responsible for the census and for gathering vital statistical information upon which policies related to population management can be based. This agency could guide the

establishment of future population policy. It should be closely integrated with health and nutrition. It could furnish valuable information to those sectors of the government dealing with economics, agronomy, industrialization, transport, water supply, etc. It is compatible with option 4.3 below.

4.3 Adoption of Policies to Promote an Optimal Population Growth Rate, Less Than the Existing Growth Rates

This policy option requires the adoption of a positive government policy which can be directed along the following lines:

a) Child spacing and sex education programs utilizing the facilities of public information systems and the PMI's as well as the rest of the health care delivery system.

b) Implementation of pricing policies favoring commercial distribution of contraceptive devices.

c) Repeal of existing restrictive legislation.

d) Withdrawal of pronatalist taxation and benefits schemes.

e) Encouragement of private sector activities in child-spacing and family planning.

5. NEEDED INFORMATION

1. Accurate census
2. Accurate vital statistics
3. A broad spectrum of information on knowledge, attitudes and practices regarding conception, fertility, and child rearing (KAP surveys).

6. SUGGESTED RESEARCH

6.1 The KAP* information noted in the preceding section should be done in selected areas in order to provide cross-sections of the related cultural matters from representative groups throughout the population. A few KAP surveys have been sponsored already by external agencies such as the Population Council. These should be extended.

6.2 Research on change of fertility patterns and attitudes which occur with suburbanization.

6.3 The effectiveness of various methods of information propogation in educating target groups. For example, how effective are flip charts, video cassette tapes, cinema in various modes, or personal encounters in educating target groups?

6.4 In local areas, cost effectiveness studies of child spacing programs.

6.5 The effects of lactation on pregnancy rates.

6.6 Causes for difference in fertility among different ethnic groups.

6.7 The effect of under-nutrition on fertility among displaced persons. Similarly, the causes of sterility with particular reference to the incidence of neisserian infection as a cause of sterility.

6.8 Validation of demographic projections by comparing projections based on earlier demographic information with the actual events. Thus one could use the data from 1950 to 1960 to predict demographic trends using the same techniques as those used for later projections, and then compare the results with those which have actually occurred.

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*KAP: Knowledge, Attitudes, Practice, an acronym referring to information sets obtained in surveys regarding reproductive behavior.

7. GENERAL PROPOSALS AND SUGGESTIONS: POPULATION SECTOR

7.1 The most important proposal made in the population sector of the HNP section is that a demographic division be established within the government which would be either part of or closely related to the health and nutrition divisions. Its tasks would include surveillance of population densities, migrations, growth, and age and sex structure. It would be part of or closely related to the section of the health division concerned with the assemblage of vital statistics. It would be responsible fcr periodic censuses.

7.2 The government should establish a population policy, subject to periodic review and change which would be guided by the philosophy of the opinion makers of the country in establishing policy regarding growth rates, irrespective of whether these should be encouraged or impeded.

7.3 Integration within the health department and the PMI's of family planning information, coupled with provision of contraceptive means where these may be indicated.

7.4 Development of a program of sex education employing schools, radio and the health care system.

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Please consult Appendix F for sources used but not cited in the text of this report.

APPENDIX A: THE INCIDENCE OF VARIOUS COMMUNICABLE DISEASES IN THE SAHEL-SUDAN DURING RECENT YEARS

TABLES

Tables Ia - Ig:

Figures for infectious diseases in west Africa are from World Health Statistics Annual volumes, prepared by the World Health Organization. Figures for measles in Mali, Mauritania, Niger, and Upper Volta are from a nutritional survey conducted in those countries by the Center for Disease Control of the U.S. Department of Health, Education, and Welfare.

Table II:

The source for population figures is the U.N. Demographic Yearbook 1971. All figures for health care establishments and health personnel are from U.N. Statistical Yearbook for the years covered.

Notes for Tables I and II:

* Estimated figures

—— Negligible

--- Figures unavailable

\+ Figures not yet available

Σ U.N. estimates

[1]Thyphoid fever only

[2]Tuberculosis, all forms

[3]Government establishments only, administered by government authority

[4]Imported cases

[5]All cases treated, old and new

[6]Including other Salmonella infections

[7]Case fatality rates estimated at 10%

[8]Estimate based on first half of year

TABLE Ia: Tuberculosis

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D.	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962																					
1963	[5] 3422	146	4	[5] 2096	126	6	1074	54	5	* 960	39	4	3321	64	2	615	67	11	2450	396	16
1964	1469	45	3	[5] 1908	123	6	728	40	5	907	41	5	2670	93	3	* 717	* 71	10	2234	346	15
1965				* 1393	* 90	6	1307	9	1	717	16	2	2200	15	1	833	85	10	2136	325	15
1966	1252	55	4	1548	125	8	* 1610			862			3838	16	<1	625	102	16	1916	299	16
1967																					
1968	1421	84	6	1318	90	7				[2] 895	[2] 24	3	[2] 2661	[2] 140	5	[2] 963	88	9	[2] 2321	364	16
1969	[2] 1421	[2] 74	5	[2] 2361	[2] 207	9	* 2798			* 1114	8	1	[2] 2707	[2] 191	7	[2] 200					
1970																					
1971																					
1972																					
1973																					

TABLE Ib: Typhoid & Paratyphoid Fever

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAUPITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	55	4	7	236	7	3	20	2	1	14	1	7	101	3	3	90	4	4	1113	3	<1
1963	35	2	6	183	16	9	37	2	5	37	3	8	77	2	3	89	5	6	916	2	<1
1964	*126	3	2	132	9	7	15	2	13	4	2	50	210	10	5	*133	*7	5	1016	--	
1965	*25	*5	20	*91	*5	5	7	--		70	--		150	8	5	352	19	5	72	1	1
1966	71	9	13	90	13	14				18	3	16	99	4	4	211	4	2	44	1	2
1967																					
1968	[1] 41	[1] 6	15	269	7	3				6	1	17	268	3	1	172	[1] 2	1	95	1	1
1969	59	10	17	460	33	7	*9			40	--		184	6	3	395	28	7	64	+	
1970	197	+		447	+		121	+		16	+		+	+					44	+	
1971	252	+		*441	+					47	+		153	+					45	+	
1972	99	+		---	--		13	+		--	--		131	+					56	+	
1973				+	+					+	+								+	+	

TABLE Ic: Meningococcal Infections

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	936	154	15	283	34	12	27	6	22	15365	1405	9	278	36	13	1900	254	13	180	14	8
1963	384	99	26	514	80	16	19	6	32	2585	272	11	169	24	14	1044	235	23	138	15	11
1964	* 128	* 3	4	384	58	15	5	--		2878	407	14	90	15	17	* 1263	* 240	19	148	19	13
1965	* 388	* 43	11	* 516	* 71	14	7	1	14	* 4288	241	6	81	10	12	1275	240	19	229	34	15
1966	575	43	7	329	50	15	21			947	80	8	351	14	4	1259	265	21	164	29	18
1967																					
1968	785	105	13	752	109	14	--	--		2231	134	6	1477	116	8	962	174	18	118	13	11
1969	287	42	15	13228	1346	10	177			3074	199	6	1363	184	13	3024	377	12	107	+	
1970	3721	+		4574	+		* 158	+		9907	+					18832	+		98	+	
1971	927	+		1706	+		* 152	+		75	+		1323	+		* 5561	+		107	+	
1972	4866	+		--	--		10	+		---	--		1131	+		2929	+		92	+	
1973	+	+		+	+		+	+		+	+					+	+		+	+	

TABLE Id: Measles

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	6045	91	2	23974	499	2	6937	174	3	15053	1447	10	18647	210	1	27924	1027	7	26065	13	<1
1963	5784	80	1	34063	442	1				10493	320	3	21446	454	2	7109	293	4			
1964	*6085	*84	1	32153	929	3	3672	146	4	14410	579	4	22263	679	3	7129	194	3	19038	2	<1
1965	*9715	*123	1	*17588	*426	2	882	--		*24421	*519	2	24301	851	4	21225	635	3	30405	8	<1
1966	9215	141	2	21241	*237	1	*1642			6982	145	2	34099	840	2	18175	372	2	2792	1	<1
1967										5548	111	2				13647	206	2			
1968	3048	25	1	26262	838	3	10860	---	(7)	10513	200	2	16354	443	3	4742	190	4	22042	5	<1
1969	4380	82	2	43512	1927	4	3450	---	(7)	*25068	*632	3	15405	462	3	14959	848	6	11893	+	
1970	1814	+		9071	267	3	2389	+	(7)	1755	105	6				10204	602	6	13196	+	
1971	7285	+		16594	700	4	4890	+	(7)	5148	+		16508	+		19174	881	5	+	+	
1972	10195	+		37861	1692	5	8997	+	(7)	29050	--		31185	+		21251	670	3	18490	+	
1973	+	+		25554	997	4	[8]14338	+	(7)	[8]33532	[8]1172	3				[8]61029	[8]3479	[8]6	+	+	

TABLE Ie: Hepatitis

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	2541	--		667	17	3	37	4	11	649	--		1892	3	<1	411	13	3	709	5	1
1963	944	--		1767			1031	6	1				1007	31	3	1007	31	3	708	4	1
1964				1519			235	24	10				1548	147	9				987	5	1
1965							195												1236		<1
1966	4558	100	2										673	87	13	1086			1463	2	<1
1967																					
1968	7017	147	2	--	--		--	--		275	--		737	41	6	146	--		1803	4	<1
1969	9438	203	2	2279	301	2	--	--		930	22	2	1165	59	5	402	30	7			
1970																					
1971																					
1972																					
1973																					

TABLE If: Malaria

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	89641	118	<1	31322	2176	1	30048	63	<1	138998	*221	<1	227596	79	<1	83043	603	1	[4]14	--	
1963	79231	88	<1	62736	3075	5				*76238	*188	<1	226581	135	<1	110958	448	<1	[4]11	--	
1964	82376	97	1	138723	3420	2	37848	43	1	[5]93398	154	1	269982	209	1	*132734	*387	1	15	2	13
1965	107335	156	<1	346029	483	<1	48455	70	<1	101564	74	<1	280243	156	<1	228748	289	<1	13	--	
1966	101042	149	1	397775	474	1	39036			166043			373969	249	1	553571	368	1	16	1	6
1967																					
1968	99006	140	1	469539	595	1	--	--		119572	61	1	386911	1103	1	105349	66	1	24	--	
1969	125498	163	1	664335	2970	1	28370	--		148552	119	1	539158	2055	1	582937	--				
1970																					
1971																					
1972																					
1973																					

TABLE Ig: Trypanosomiasis

Infectious Diseases: Cases, Deaths, Case Mortality Rates

Year	CHAD			MALI			MAURITANIA			NIGER			SENEGAL			UPPER VOLTA			SWEDEN		
	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %	C	D	CM %
1962	280	4	1	25	--		--	--		--	--		101	--		463	--		--	--	
1963	1485	5	<1	796	93	12	--	--		--	--		73	2	3	--	--		--	--	
1964	91	--		[5] 538	44	8	--	--		--	--		35	3	9	* 53	--		--	--	
1965	* 96	* 5	5	* 338	* 21	6	--	--		--	--		35	3	9	199	97	49	--	--	
1966	135	8	6	* 334	* 31	9							37			189			--	--	
1967																					
1968	61	--		328	21	6	--	--		--	--		26	2	8	148	22	15	--	--	
1969	50	--		602	19	3	--	--		--	--		16	3	19	262	---				
1970																					
1971																					
1972																					
1973																					

TABLE II

Population, Health Care Establishments and Health Personnel

Year	CHAD Population in 000's	CHAD Number of Hospitals	CHAD Population Bed	CHAD Population Physician	CHAD Number of Nursing Personnel	MALI Population in 000's	MALI Number of Hospitals	MALI Population Bed	MALI Population Physician	MALI Number of Nursing Personnel
1962	3100			62000		4260				
1963	3170					4350				
1964	3240	68		72440	544	4440	---		40040	
1965	3310					4530	103		49200	1180
1966	3380	161	900			4610	114	1330	50710	1231
1967	3460			71460	266	4700				
1968	3540					4790	109	1570	56320	1443
1969	3620					4880			61000	1243
1970	3710		700	63966	591	5020				
1971	3800	191		60137	718	5140	543[3]	1382	41452	1285

Year	MAURITANIA Population in 000's	MAURITANIA Number of Hospitals	MAURITANIA Population Bed	MAURITANIA Population Physician	MAURITANIA Number of Nursing Personnel	NIGER Population in 000's	NIGER Number of Hospitals	NIGER Population Bed	NIGER Population Physician	NIGER Number of Nursing Personnel
1962	990					2995				
1963	1010	---		27000	---	3330				
1964	1031	---		39130	---	3420	38		66060	550
1965	1050	21	3720	30000	---	3510				
1966	1070					3610	55			
1967	1100					3710			56140	465
1968	1120					3810				
1969	1140			25909	321	3910	67	1903	56667	704
1970	1170	---	5247	17206	271	4020				
197	1200	6	2727			4130				

TABLE II (Continued)

Population, Health Care Establishments and Health Personnel

	SENEGAL					UPPER VOLTA				
Year	Population in 000's	Number of Hospitals	Population Bed	Population Physician	Number of Nursing Personnel	Population in 000's	Number of Hospitals	Population Bed	Population Physician	Number of Nursing Personnel
1962	3250					4580				
1963	3330			20000		4670				
1964	3400			19320		4760			63470	
1965	3490	79		18760		4860				
1966	3570			16730	935	4960	93^{3}		76230	1125
1967	3620	83^{3}	720			5050	41^{3}	2360	74320	1290
1968	3690	40^{3}	730	16980	1017	5180				
1969	3780	40^{3}	740	15120	1217	5280	138^{3}	1640	89460	1290
1970	3930 Σ	86^{3}	728	14943	1634	5380	148^{3}	1671	92759	1243
1971	4020 Σ					5490 Σ				

	SWEDEN				
Year	Population in 000's	Number of Hospitals	Population Bed	Population Physician	Number of Nursing Personnal
1962	7560			960	
1963	7600				
1964	7660				
1965	7730	655		910	
1966	7810	722	70	880	
1967	7870			850	24950
1968	7910	729	70	800	34260
1969	7970	735	67	768	38380
1970	8040	730	67	734	40520
1971	8110 Σ				

APPENDIX B: COUNTRY PROFILES

of

HEALTH CARE SYSTEMS

APPENDIX B.1: CHAD

NATIONAL ORGANIZATION OF HEALTH CARE SYSTEM

The presence of a National Sanitation Service within the Ministry of Health and Social Affairs is a noteworthy aspect of Chad's health administration. Coordination between this service and other branches of government, such as the Ministry of Environmental Planning and the National Service of Public Works, has been an important first step in planning means for providing safe water to the urban and rural populations. Recently a bureau of health statistics has been established.

Health Budget

Table 1 gives a comparative listing of expenditures in health during the period 1970 to 1972. It is clear that the overall budget was much less in 1972 than in 1971 and that the percentage of the budget allotted to personnel increased substantially between 1970 and 1972.

The average per capita expenditure on health for civilians in 1972 amounted to approximately 85 cents. This kind of figure, as well as average doctor/patient and bed/population ratios should always be used with considerable caution. Per capita expenditures in a developing country with widespread and uneven distribution of population and with poor transportation accessibility are not indicative of health resources at any particular location.

Medical Infrastructure

Three types of medical facilities provide in-patient service: hospitals, medical centers and infirmaries. The quality of medical care varies greatly from one facility to another, so that a more accurate assessment of services would indicate the average bed per population ratio for a perfecture as (1) hospital beds per patient and (2) medical centers and infirmary beds per patient.

TABLE 1: Distribution of Health Budget in Chad, 1970 - 1972.

Year	Personnel	Material	Total*	Percent of Health Budget Spent on Personnel	Percentage of National Budget
1970	404,766	373,494	778,260	52.0%	5.79%
1971	446,767	374,094	820,858	54.4%	6.10%
1972	430,838	152,756	583,594	73.8%	4.41%

*Does not include health services for army and national security personnel.

Source: Data from Ministère de la Sante Publique et des Affaires Sociales, Chad, 1973.

It is apparent from Table 2 that only 4 of the 14 prefectures have hospitals; medical centers and infirmaries appear to be more evenly distributed, while the number of maternities and dispensaries varies significantly from one prefecture to another.

Well over 60 percent of Chad's medical personnel are employed in the four urban centers (N'Djamena, Sarh, Moundou, Abéché) which comprise less than 8 percent of the total population. The following list gives the actual percentage of individuals from each personnel category found in these four cities (Ministère de la Santé Publique et des Affairs Sociales, Chad, 1973):

1. 67 percent of the doctors
2. 100 percent of the dentists
3. 100 percent of the pharmacists
4. 80 percent of the state nurses
5. 100 percent of the state midwives
6. 48 percent of the nurses (Brevetés)

The hospitals in these cities provide medical services not only to urban residents, but to many patients from the surrounding rural areas who have been referred to the hospitals for treatment as well.

Personnel

Table 3 provides a comprehensive overview of medical personnel distribution in Chad.

Personnel training: In the past several years considerable effort has been made to train a cadre of paramedical personnel. The National Nursing School in N'Djamena in 1970 was training a total of 80 nurses and midwives, and had scheduled the retraining of 190 nurses, midwives and technicians during the period from March, 1971, to November, 1972. The emphasis on promoting services within the framework of "santé de base" has brought about the training and employment

TABLE 2: Distribution of Public Health Facilities in Chad, 1972

Prefectures	Population 1972 ($\times 10^3$)	# of Beds	Pop/Bed*	Hospitals	Maternities	Medical Centers	Infirmaries	Dispensaries	Total
Batha	333	143	2,328		1	1	2	6	9
BET	82	109	752		1	1	2	6	9
Biltine	147	98	1,500		1	1	2	2	5
C. Gaguirmi	506	756	524	1	2	1	4	17	23
Guera	179	200	895		1	1	1	6	8
Kanem	191	136	1,404		1	1	2	3	6
Lac	127	24	5,292		–	1	1	3	5
Log. Occidental	251	356	705	1	1	1	-	8	10
Log. Oriental	279	143	1,951		1	1	2	9	12
Mayo Kebbi	555	286	1,941		4	3	2	11	16
Moyen-Chari	426	501	850	1	4	1	4	17	23
Ouaddai	349	326	1,070	1	1	1	3	9	14
Salamat	93	64	1,453		1	1	1	1	3
Tandjile	273	150	1,820		2	1	1	6	8
TOTAL	3,791	3,292	1,152 (ave.)	4	21	16	27	104	151

These provide essentially the same services

* Incomplete

Source: Data from Ministère de la Santé Publique et des Affaires Sociales, Chad, 1973.

TABLE 3

Distribution of Medical and Paramedical Personnel by Prefecture and by Category, 1972

Category \ Prefecture	Batha	B.E.T.	Biltine	Ch-Baguir	Guera	Kanem	Lac	Log.Occ.	Log.Or.	Mayo-Kebbi	Moyen-Chari	Ouaddai	Salamat	Tandjile	Total for each Category of personnel
Population (x 10^3)	333	82	147	506	179	191	127	251	279	555	426	349	93	273	3,791
Doctors	2	1	-	30	2	-	1	4	1	5	10	3	-	1	60
Administrators	-	-	-	7	-	-	-	2	-	1	-	1	-	1	11
Pharmacists	-	-	-	2	-	-	-	-	-	-	1	-	-	-	3
Dentists	-	-	-	1	-	-	-	-	-	-	1	-	-	-	2
Laboratory Tech.	-	-	-	7	-	-	-	-	-	-	-	-	-	-	7
Health Inspectors	-	-	-	4	-	-	-	1	-	2	-	1	-	-	8
State Nurses	1	-	-	26	1	3	2	6	4	2	10	1	1	2	59
State Midwives	-	-	-	10	-	-	-	-	-	-	2	1	-	-	13
Principal Technical Agents	1	-	1	21	-	1	-	2	-	3	5	2	1	-	37
Technical Agents	2	-	-	29	1	1	3	3	5	1	7	5	-	2	59
Nurses (Brevetés)(1)	15	8	4	161	10	12	6	15	38	35	49	36	8	7	404
Nurses (not Brevetés)	6	6	3	91	5	9	7	30	15	27	47	16	1	15	278
"Matrônes"	3	2	4	26	7	1	2	3	6	2	13	3	-	2	74
Health Engineers	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Sanitation Technicians	-	-	-	3	-	-	-	-	-	1	-	2	-	1	7
Sanitation Assistants	-	-	-	5	-	-	-	-	-	-	-	-	-	-	5
Agents of Hygiene	1	-	-	11	1	1	-	3	3	4	6	3	-	1	34
Radio Operators	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
Office Staff (2)	1	-	-	23	-	1	-	1	-	3	1	-	-	-	30
TOTAL	32	17	12	460	27	29	21	70	72	86	152	74	11	31	1,094

Source: Bureau du Personnel, Chad.
(1) Including obstetrical nurses
(2) Does not include auxiliary personnel

of numerous technicians, particularly in the field of sanitation. Several students who have attended the National Nursing School have continued training abroad in the fields of sanitation and health inspection.

Recycling medical personnel has become an integral part of the health training program. With the establishment of a Bureau of Health Statistics, public health officials have a much better perspective on health status in Chad. As a consequence, they are better able to determine which areas should be emphasized in the training and retraining of personnel.

Principal Diseases

Table 4 lists the major diseases and their respective incidences as recorded by the health centers during 1972. The figures serve only as first approximations, since diagnosis is often uncertain or unestablished, often noted only on hearsay or by nonprofessionals. Disease is often unreported, and the population base on which incidence rates might be calculated is usually not known with certainty. These considerations also apply to the health statistics which appears in Appendix A.

Impact of the Drought

According to a 1974 W. H. O. publication the most severely affected prefectures in Chad are those above the 500 millimeter isohyet, namely Kanem, Lac, Batha, Biltine, and B. E. T., total population: 900,000, (W. H. O 1974). The inhabitants in these areas include members of transhumant and nomadic groups. At present little is known of the impact of the drought on the health of these people. Even in normal years large numbers of nomads and livestock have migrated south to the Sudan and Lake Chad in search of grazing land. The migration patterns of the people have continued, although many livestock have been lost. To date there has been no report of dramatic increases in urban population as a result of the drought, but one cannot assume that disease

TABLE 4

Diseases	Total
Tuberculosis -- all forms	2,188
Recent Syphilis	10,102
Gonorrhea	26,718
Typhoid fever	99
Other Salmonella infections	4
Brucellosis *	8
Amoebiasis	49,107
Bacillary dysentery	1,002
Scarlet fever	1
Diphtheria	15
Whooping cough	4,026
Meningococcal infections	4,861
Leprosy	1,602
Tetanus	604
Anthrax	54
Acute Poliomyelitis	17
Encephalitis	14
Smallpox	--
Measles	10,195
Mumps	478
Infectious hepatitis	12,356
Rabies	5
Typhus and other Rickettsia	3
Malaria	142,506
Schistosomiasis Vesicale	26,587
Schistosomiasis Intestinalis	3,985
Onchocerciasis	2,985
Dracunculosis	1,577

*Presumably Undulant Fever; see below

TABLE 4 (cont.)

Diseases	Total
Undulant fever	739
Yaws	127
Chickenpox	7,789
Dengue	1
Trachoma	4,712
Cutaneous Leishmaniasis	224
Trypanosomiasis	15
Hookworm	9,825

Source: Ministère de la Santé Publique et des Affaires Sociale, Chad, 1973.

patterns associated with the crowded and unsanitary encampments in the other Sahel-Sudan countries are not yet manifest in Chad.

Health Planning

In recognition of the need to provide health care for all the people, the emphasis in health service planning for the past five years has been on "santé de base." The establishment of a "Service des Statistiques Sanitaires" in 1970 with the technical and material assistance of the World Health Organization (W.H.O.) was a first step in understanding the medical needs of the people. This has made clear which diseases are most prevalent in designated areas, and during which seasons.

In 1964, the government of Chad, with the assistance of W.H.O. and the United Nations Development Program (U.N.D.P.) undertook a project entitled, "Development des Services de Santé de Base." The goals set forth in the official document included: (1) provision of centers for "Protection Maternelle et Infantile" (PMI), and (2) sanitation. Thus, a pilot PMI project was begun at the health center in Chagoua, and was continuing as planned in July, 1972. At that time the health center was providing integrated medical services to 6,000 people. Among the services were training in sanitation and personal hygiene, clinical training for nursing students, health and nutrition animation, as well as those services generally ascribed to PMI's. The medical personnel at the center had developed a program for assessing demographic changes in the area, and a system of family health files has been devised.

Some progress has been made in sanitation during the past 10 years. An original project was expected to provide piped water to the four major cities (N'Djamena, Sarh, Moundou, Abéché), and additional funds from Germany have covered the cost of piped water to six other towns: Mao, Moussoro, Bongor, Fiango, Kélo, and Doba.

In the rural areas, where in 1964 there were a total of 367 wells, Peach Corps volunteers and the National Service of Sanitation had increased the number to 542 by 1972.

A sewage system for N'Djamena was in the planning stages in 1972, while in 10 of the 14 prefectures an extensive effort to construct latrines has been made (W. H. O. 1972).

The pilot zone of Farcha, a suburb of N'Djamena comprised of 8,561 inhabitants in 1971, was set up to serve as an example of medical service integration. The project was a cooperative effort on the part of the "Organization de Coordination pour la Lutte Contre les Endemies en Afrique" (O. C. E. A. C.), member nations, W. H. O., and volunteer organizations. The specific goals included:

1. Investigations of (a) attitudes toward health and hygiene, (b) disease patterns, and (c) nutritional patterns;
2. A school health program for both primary students and teachers;
3. Organization of "Community Development" councils made up of village chiefs, teachers, missionaries and other local people qualified to assess public opinions and attitudes.

Emphasis was placed on health instruction for all levels of medical and non-medical personnel. School teachers were given special training in how to instruct young students on matters of health and hygiene. The team dealt with explicit details in all aspects of the project. For example, an investigation to ascertain student preferences in colors and shapes helped team members to develop effective visual aids to be used in the primary schools (Marinier and Romain 1973).

Foreign Aid

There are numerous multilateral and bilateral sources of aid for the health projects in Chad. Among the multilateral groups are W. H. O., U. N. D. P., UNICEF and OCEAC. Germany, the U. S. A., France, and

Switzerland have provided bilateral assistance. See Appendix F for further details.

APPENDIX B. 2: MALI

National Organization of Health Care System

Information regarding Mali's health care system is both fragmentary and often outdated. The most comprehensive statistical reports were done in 1969-1970. In this presentation we have relied heavily on a survey of Malian health services conducted in 1972 by the African Medical and Research Foundation International (AMRFI) and on a project proposal for UNESCO written in March, 1973 (UNESCO 1973 a).

Within the Ministry of Health there are four divisions: (1) "Médecine de Soins", which is responsibile for curative health facilities; (2) "Médecine socio-préventive", which is responsible for preventive health measure and controls the activities of the PMI's and mobile units, as well as being in charge of nutrition and sanitation planning; (3) the pharmaceutical service; and (4) the military health program.

It was reported by the AMRFI team that health care services in Mali were grossly inadequate with respect to 90 percent of the population, i. e. the rural sector. Administrative problems coupled with a lack of communication and transport facilities have led to the centralization of most medical personnel and supplies in Bamako. Rural areas, and particularly Region VI are largely neglected. So-called health facilities in these areas frequently lack the most common drugs and supplies. Preventive measures are, at best, haphazard; availability of vaccines varies with transport accessibility.

Health Budget

The annual expenditures on health appear in Table 5.

An analysis of the national health budget gives further evidence of the gross imbalance between health services in rural areas and in Bamako. Of these yearly amounts, approximately three-fourths is provided by the central government to cover the cost of the following services: "Services Centraux de Bamako," which include the Central Health Administration,

TABLF 5: Total Health Expenditures and Percent of National Budget for Mali, 1965-1969, 1971

Year	$U.S. Spent (x 10^6)	Percent of National Budget
1965	2.84	9
1966	3.04	10
1967	3.90	12
1968	4.65	12
1969	5.17	11
1970	8.16	16

Sources: 1. Frometin 1969
2. AMRFI 1972

the Central Laboratory and Pharmaceutical Services, and Mali's medical training facilities; the two national hospitals, the two secondary hospitals, and six regional hospitals. Of these ten hospitals, which are listed in Table 6, the two largest and most modern are both in Bamako. The remaining one-fourth of the health budget goes primarily to the regional administration and covers the cost of the 43 major dispensaries and 300 minor ones spread throughout Mali.

Impressive as an average per capita health expenditure of $1.70 may seem for a developing country, a closer look at distribution indicates that the average per capita rate in Bamako is closer to $8.40, in contrast to $1.10 for rural inhabitants. The disparity lies not only in provision of equipment and supplies, but particularly in the distribution of medical personnel, all of whom are paid by the government. Well over one-half the health budget is spent on salaries, and most of the highest paid personnel, i.e. doctors, are in Bamako. Table 7 gives the numbers of medical personnel in Bamako and in the rest of the country. One should bear in mind that the population in Bamako, when these figures were collected in 1969, was 397,000, and that the remainder of the country had a population of 4,403,000.

An overall inhabitant/physician ratio of 48,000 to 1 for Mali is misleading. In reality the ratio is 6,615 to 1 in Bamako and 113,000 to 1 in the rest of the country.

Personnel Training

Health training is provided at three levels: medical, paramedical, and auxiliary. A medical school in Bamako began operations in 1969 and graduated its first class of 28 medical assistants in 1973. This is a 4-year program for training only Malians in the hope that they will remain in Mali, rather than emigrate. After a period of serving in various assigned positions, the medical assistants may return to school

TABLE 6: Hospital Facilities in Mali, 1969

2 National Hospitals: (707 beds)	
Point "G" in BAMAKO	642 beds
Hôpital de KITA	65 beds
6 Regional Hospitals: (1,031 beds)	
BAMAKO "Gabriel Toure"	362 beds
KAYES	210 beds
SIKASSO	111 beds
SEGOU	158 beds
MOPTI	110 beds
GAO	90 beds
2 Secondary Hospitals: (160 beds)	
NIORO	40 beds
MARKALA	120 beds

Source: Fromentin 1969.

* * *

TABLE 7: Numbers of Medical Personnel in Bamako and the Rest of Mali 1969

	Number of Personnel		
Category	Bamako	Rest of Mali	Total
Doctors	60	39	99
State Nurses	79	96	175
Nurses Brevetes	338	685	1023
Midwives	51	44	95
Pharmacists	9	1	10
Lab Technicians	12	7	19
X-ray Technicians	3	8	11
Matrones	2	155	157
TOTAL	554	1035	1589

Source: AMRFI 1972

to complete the M. D. program. Clinical training for the assistants is conducted in Bamako's Point "G" Hospital, and it was the impression of the AMRFI team that the training was of superior quality; they predicted that their contribution in Mali's health services in the years to come would be considerable.

Paramedical and auxiliary personnel consist of midwives, nurses and traditional birth attendants. Point "G" Hospital and École Sécondaire de la Santé provide training for these as well as for laboratory and sanitation technicians. The concluding remarks of the AMRFI survey with regard to Mali's medical training programs indicated that although more of each kind of personnel is needed, the emphasis should be placed first on providing more and better organized health facilities in the rural areas, so that cadres of well-trained individuals can be effective. As long as dispensaries are without drugs and hospitals without electricity, no amount of training will increase a medical person's effectiveness beyond a minimum level.

Principal Diseases

Table 8 lists the most common causes of death for various age groups in Mali. Malaria is the number one killer of people of all ages. Measles takes its toll among the 0-4 age group; malnutrition causes many dealths in the 1-15 age group.

TABLE 8

Principal Causes of Death at Different Ages in Mali

Infant 0-1 Year	Pre-School Age 1-4 Years	School Age 5-14 Years	Adults 15 & Over
Malaria	Malaria	Malaria	Malaria
Measles	Measles	Dysentery	Tubercu-losis
Gastro-Enteritis	Malnutrition	Trypano somiasis	Dysentry
Broncho-pneumonia	Gastro-enteritis	Malnutrition	Trypano-somiasis

Source: Frometin 1969

Generally speaking, the fatal diseases listed in Table 8 are common to all six countries. However, certain diseases are more prevalent in some countries than in others. For example, trypanosomiasis is a major problem in Mali where there are hundreds of new cases detected every year (699 in 1969), while it is of relatively minor importance in Niger. Also in contrast to Niger is Mali's high prevalency rate for leprosy (2 percent of the total population) and its high incidence of onchocerciasis, particularly in the regions of Bamako, Sikasso and Kayes: 11,059 new cases in 1969 (AMRFI 1972).

Impact of the Drought

Very little information of a statistical nature is available for Mali with respect to the drought. According to a 1973 report by the Center for Disease Control (C.D.C.), the following geographical areas in Mali are hardest hit:

The "cercle" of:

Yelimani and Nioro in Kayes Region
Nara in Bamako Region
Niono and Segou in Segou Region
Niafunke, Tenenkou, and Douenza in Mopti Region
All of Gao Region (C.D.C. 1973)

The population in these areas is 1,500,000. The nomads seem to be the most severely affected because of the considerable loss of livestock. Tens of thousands of the nomads in Gao have migrated to the stretch of the Niger River between Gao and Tombouctou.

Measles incidence in Mali has been extremely high for the past six years, with the exception of 1970. It is difficult to say whether the drought is responsible for the high incidence in the past two years, or whether other factors which have been responsible in the past continue to maintain the epidemic proportions of the disease. It is likely that the

drought and other factors are not mutually exclusive.

TABLE 9

Incidence and Case Fatality Rates for Measles in Mali, 1968-1973

Year	Cases	Deaths	Case Fatality Rate
1968	26,262	838	3.2%
1969	43,512	1,927	4.4
1970	9,071	267	2.9
1971	16,594	70	0.4
1972	37,861	1,692	4.5
1973	25,554*	997	3.9

*Estimate Based on January-May data

Source: C.D.C. 1973

* * *

One cannot look at data such as these without being impressed that the attack rates and the case fatality rates, while varying widely from year to year, are not obviously or strikingly higher during the recent drought years than at odd times in the past. The high case fatality rate over the years probably indicates a chronic and prevailing state of undernutrition throughout the years.

Mortality rates observed in encampments around Tombouctou were not dramatically higher at the time of the survey than the usual rates reported for Mali (27 deaths per 1,000 people per year).

Health Planning

A ten-year health service plan for Mali began in 1966 with the objective to insure optimal health coverage in both preventive and curative medicine. This goal has not been achieved, and until the existing structure of health care services is completely revised, it is

likely never to be achieved. The main difficulty is one which is common to many developing countries today: health care has been structured in a westernized fashion; that is, it is centered in hospitals whose function is primarily curative in nature. Such a system in countries with minimal health budgets and poor transportation networks necessarily requires a centralization of facilities, usually in the capital city, and at the expense of the rural people who receive the barest form of medical assistance, if any at all. Doctors generally confine their activities to practice while their efforts should be directed towards educating para-medical and auxiliary personnel and to administration of health facilities.

In Mali a central focus in recent years has been the provision of health care to pregnant and nursing women and infants. An alarming 80-90 percent of all births take place outside of maternity wards, and without professional assistance. The role of the traditional midwife is limited to post-natal care. She does not assist with the actual birth of the child.

In spite of the yearly graduation of 20-25 midwives from the national schools for the past ten years, there are several cercles in the country which have none. In the region of Sikasso health officials have responded to the situation by developing a Rural Animation program which alerts village women to the benefits of good pre- and post-natal care. The villagers are encouraged to build their own maternity wards and volunteers for training are selected from among the young women. The program has resulted in the construction of 88 rural maternities from 1970-1973. The cost of each ranged from $5,000 to $7,000.

Special arrangements were made with the director general of pharmaceuticals to supply each arrondissement with medicines at a reduced price. Profits from this, in addition to private contributions from villages and from women's bureaus, are used to pay for supplies and qualified personnel in the maternities. Untrained staff from the

village work as volunteers (Diallo 1974).

In an effort to perfect methods for providing preventive medicine to many people, Mali has established the Banguineda pilot zone. This is located near Bamako and comprises 60 villages (total population of 25,000). The area is used for clinical field work by students from Bamako. The most appropriate and least costly methods of health care delivery which are developed in this pilot zone will hopefully be expanded to cover all of Mali (UNESCO 1973a).

Foreign Aid and Health Care

Bilateral aid in Health programs has been extensive since Mali gain independence. France, the U.S., the Soviet Union and China are among the largest contributors of monetary and technical assistance. The two most active multilateral donor organizations are W.H.O. and UNICEF (see Appendix F). Assistance from these U.N. programs covers a wide range of health, education, and nutrition needs.

APPENDIX B. 3: MAURITANIA

Federal Organization of the Health Care System

Within Mauritania's Ministry of Health and Social Affaris there are two distinct branches, namely the Direction of Health and the Direction of Social Affairs. Development of PMI's in recent years has been a major task of the latter branch to the quasi-exclusion of the health branch. Each branch functions autonomously and on its own budget, so that integration of the two has been quite weak -- to the detriment of the PMI program.

Under the Direction of Health are all other forms of health care service as well as administration of training programs. For several years after independence health care facilities were distinguished by their function, i.e. curative or preventive medicine, but efforts are being made to promote integration of the two functions in the programs of "Santé de Base". The tendency toward unification which is apparent in all the Sahel-Sudan countries is due largely to the propensity of the World Health Organization to assist "Santé de Base" programs. The Organization provides not only material assistance for these projects, but also technical instruction and supervision as well.

There is no provision within the Ministry of Health and Social Affairs for the collection of accurate health statistics. Most of the tables and figures in this report have been taken from a working document entitled, "Ressources Humaines - Santé" which was prepared in 1973 by consultants for the Ministry of Planning and Industrial Development (Ministere de la Planification et du Developpement Industriel 1973)

Health Budget

Table 10 gives the breakdown of health expenditures for material and personnel, and percentage of the national budget allocated to the Ministry of Health and Social Affairs for years 1960-1973.

TABLE 10

Health Expenditures in Mauritania, 1960 - 1973

Year	Budget for Public Health & Social Affairs (1) (FCFA x 10^6) material	personnel	total	Percent of Health Budget spent on Personnel	National Budget (FCFA x 10^6)	Percent of National Budget for Health	Health Expenditures Per Capita (current FCFA Values) (2)	Health Expenditures Per Capita (FCFA Values in 1960) (3)
1960	97	114	211	54	3038	6.9%	225	223
1961	93	133	226	59	3412	6.6	233	222
1962	101	148	249	59	4535	5.5	251	228
1963	85	148	233	64	4287	5.4	229	199
1964	83	162	245	66	4117	6.0	235	196
1965	72	172	244	70	4154	5.9	228	182
1966	117	180	297	61	4390	6.8	273	210
1967	149	194	343	57	4916	7.0	310	230
1968	144	206	350	59	5179	6.8	311	222
1969	174	230	404	57	6379	6.3	353	243
1970	214	247	461	54	6751	6.8	396	264
1971	209	272	481	57	744	6.5	406	262
1972	217	324	541	60	9001	6.0	448	280
1973	286	372	658	57	10345	6.4	536	325

(1) Outside of the health budget are the hospitalization and subsidization expenditures provided by Social Security (approximately 16 million FCFA in 1970), the expenditures of local collectives, the expenses of private institutions, technical assistance, and external contributions of materials.

(2) The demographic figures used were obtained by multiplying by 1.5 and 1.8 percent the figures for nomadic and sedentary populations furnished by a SEDES survey on non-urban inhabitants (1964-65), and by 8 percent the figure for urban population, conforming to the projections of the Direction of Statistics. The rate of natural growth of the urban population has been estimated at 3 percent, the suplementary 5 percent resulting from the exodus of the rural populations.

(3) Assuming a linear increase in the cost of living of five units per annum, the rate of inflation is less than 5 percent per annum.

Source: Ministere de la Sante, Mauritania, as cited by Ministere de la Planification et du Developpment Industriel 1973.

The percentage of the national budget allocated to health and social affairs is less than in the other Sahel-Sudan countries. However, Table 10 does not give figures for the amount of foreign aid which Mauritania receives for health care. The country relies heavily on external systems at all levels of the health care program: medicine, personnel, and infrastructure.

Medical Infrastructure

At present there are five types of public health facilities which provide preventive or curative medical care or, in some cases, both. The seven hospitals, 11 dispensaries, and 75 health stations (bush dispensaries -- small and poorly stocked) are primarily concerned with curative medicine, while the mobile teams ("Équipes Nomades") and PMI's function as preventive units. Table 11 gives the number of each type of facility found in each region of Mauritania. In addition to the public health sector there are three private hospitals or polyvalent clinics which are financed by mining companies and which provide complete medical care to miners and their families.

It should be pointed out that many of these unites -- particularly the health stations -- are of questionable value. Only the national hospital in Nouakchott has sufficient funds to cover its needs (25 percent of the total health budget).

Personnel

In 1973 there were a total of 72 doctors in Mauritania. Sixty-five were paid by the government and seven were private practitioners. Of this total only seven were Mauritanians; 34 percent of the doctors in the public sector were working in Nouakchott. The distribution of health care professionals in the country in 1973 appears in Tables 12 and 13.

TABLE 11

Health Infrastructure by Region and for all of Mauritania, 1973

Region	Medical Circonscriptions (1)	Hospitals (2)	Prefecture Dispensaries	Health Stations	PMI	Mobile Nomad Units	Private Hospitals or Polyvalent Clinics	Population 1972 (3)
I	1	1		9	1	2		188,000
II	1	1		4	1	1		99,500
III	2	2		13	1	2		183,200
IV	1	1		11	1	1		90,800
V	3		3	14	1	2		216,500
VI	3		3	16	4 (4)	1	1	266,700
VII	2	1	1	7 (5)	1	1	1	90,200
VII	1		1		1	1	1	28,000
Nouakchott	3	1	3	1	2 (6)	2		55,000
TOTAL	17	7	11	75	13	13 (7)	3	1,217,900

(1) In principle, each medical circonscription has either a hospital or a major dispensary.

(2) Each hospital theoretically has a dispensary.

(3) This 1972 estimate comes from the document Donnees sur la Population des Centres Urbains en Maruitanie, April, 1973, Direction de la Statistique.

(4) This figure includes a maternity.

(5) Including the Bir Moghrein dispensary, run by military personnel.

(6) One of which is a pilot PMI.

(7) Each mobile nomade unit consists of one state nurse, one nurse brevete, one nurse's aide, one workman, and a chauffeur.

Source: data from Ministere de la Sante, Mauritania, as cited by Ministere de la Planification et du Developpement Industriel 1973.

TABLE 12

Regional Distribution of Public Doctors, Brevetes and State Nurses, with Respect to Population, 1973

Region	Population (1)	Number of Physicians	Inhabitants/ Physician	Number of State Nurses	Inhabitants/ State Nurses	Number of Nurses Brevetes	Inhabitants/ Nurse Brevetes	Total Number of Nurses	Inhabitants/ Nurse
I	188,000	6	31,333	5	37,600	14	13,429	19	9,895
II	99,500	7	14,214	5	19,900	11	9,045	16	6,219
III	183,200	12	15,267	7	26,171	21	8,724	28	6,543
IV	90,800	3	30,267	9	10,089	21	4,324	30	3,027
V	216,500	4	54,125	8	27,063	21	10,310	29	7,466
VI	266,700	5	53,340	9	29,633	23	11,596	32	8,334
VII	90,200	4	22,550	6	15,033	13	6,938	19	4,747
VIII	28,000	2	14,000	3	9,333	7	4,000	10	2,800
Nouakchott (2)	55,000	5 (3)	11,000	9	6,111	28	1,964	37	1,486
TOTAL	1,217,900	48 (4)	25,373	61	19,966	159	7,660	220	5,536

(1) These demographic estimates furnished by the document Données sur la Population des Centres Urbains en Mauritania (Direction de la Statistic), April, 1973, are calculated with the use of growth rates determined by SEDES (Enquête démographique, rapport final, 1972), except for Nouakchott.

(2) The personnel for Nouakchott include those practicing in the health facilities other than the national hospital and the central services, but including the two mobile nomad units.

(3) If one subtracts the number of doctors working at the national hospital, or in the central services, there are five public doctors. Including private doctors -- two in Nouakchott, tow in Nouadhibou, two in Zouerate, one in Akjoujt, -- one finds the following inhabitants/ physician ratios: 1) 44,450 in Region 6; 2) 15,033 in Region 7; 3) 7,000 in Region 8; 4) 7,857 in Nouakchott.

(4) In addition to these 48 doctors, 19 others are connected with the national hospital or to central services,which give an overall average ratio of 18,737 inhabitants per physician for all of Mauritania. Including the seven private doctors, this number is reduced to 16,915.

Source: data from Ministere de la Sante, as cited by Ministere de la Planification et du Developpement 1973.

TABLE 13: Public Health Personnel in Mauritania, 1973

Region / Category	I	II	III	IV	V	VI	VII	VIII	Total Region	Nouakchott	Total
Doctors (2)	6	7	12	3	4	5	4	2	43	22	65
Dentists (3)									0	2	2
Pharmacists (4)									0	3	3
Anesthesiologists			1						1	1	2
State Nurses	5	5	7	9	8	9	6	3	52	33	85
Nurses Brevetés	14	11	21	21	21	23	13	7	131	63	194
Nurses Aids	5	2	25	22	21	26	14	1	116	35	151
Midwives (5)	1			1		3			5	9	14
Diagnosticians	2					2			4	6	10
"Matrônes"	3		2	3	3	7	4	1	23	7	30
Other	28	17	30	43	28	35	14	6	201	220	421 (7)

(1) If one excludes the hospital and the central services, Nouakchott has the following personnel: 16 doctors, 1 dentist, 4 midwives, 18 state nurese, 31 nurese brevetés, 19 nurses' aides, 3 diagnosticians, 2 "Matrônes" and 37 others.

(2) In addition, there are 7 doctors in private practice: 2 in Nouakchott, 1 in Akjoujt, 2 in Zouerate, 2 in Nouadhibou. Only 7 doctors are Mauritanians, 4 of whom are public doctors.

(3) 1 of the 2 dentists is Mauritanian; there is also an expatriot dentist in private practice.

(4) 1 of the 3 pharmacists is Mauritanian; there are also 4 foreign pharmacists in private practice.

(5) 5 of these are expatriots.

(6) Of these 401 people, there are 195 in the national hospital, 78 in the central services, 9 with the nomad mobile units, 21 in the social service, 98 in the non-hospital health units.

(7) This category includes the medical-social auxiliaries and the kindergarten teachers (30), the manual laborers (12), the drivers (69), the administrative assistants (35), the cooks (12), the advisors of kindergartens and accompanying education (12), the orderlies (11), the classroom children (222), plus approximately 15 other persons.

Source: data from Ministere de la Sante, Mauritania, as cited by Ministere de Planification et du Developpement Industriel 1973.

Personnel Training

In 1973, a total of 42 students were in medical schools abroad; 63 students were being trained as state nurses (six of these were receiving specialized training abroad); 26 were completing a one-year nursing program ("Infirmiers brevetés")' and two students were studying to become social assistants (Ministere de la Planification et de Developpement Industriel 1973). From the point of view of doctor/patient ratios, Mauritania falls far short of the W.H.O. suggested ratio of 1/10,000, and the situation is not likely to improve dramatically within the next 15 years. Although the suggested ratio of nurses to patients has been reached, many nurses have had only one year of training, and there are very few who are specialized. In particular, there is a substantial need for more trained midwives.

Principal Diseases

There is a dearth of health statistics in Mauritania. This is particularly true with respect to disease incidence and case mortality rates. The amount and accuracy of statistical information for health units vary with the capabilities and interests of the personnel. To avoid the obvious pitfalls associated with the compilation of "available" statistics for a given year, the authors of "Ressources Humaines" referred to a table prepared in 1967 by SEDES which gives the range of cases reported for principal diseases over a 7-year period (see Table 14).

Malaria is particularly widespread, extending from the Senegal River to the oases in the northern region; it is estimated that 70 percent of Mauritania's population contracts the disease at some time.

Respiratory diseases are a major cause of death, especially among the nomads; sand suspended in the air, and extreme variations in temperature may substantially increase their susceptibility.

TABLE 14: Morbidity in Mauritania 1958-1965

DISEASES	REPORTED CASES PER YEAR (1)
Respiratory diseases	From 15,000 to 75,000
Malaria	9,000 to 48,000
Eye diseases	8,000 to 27,000
Veneral diseases	11,000 to 26,000
Skin diseases	8,000 to 27,000
Ear diseases	8,000 to 22,000
Buccal disease	7,000 to 24,000
Rickets and other deficiency diseases	5,000 to 24,000
Bacillary & Amoebic Dysentery	4,000 to 13,000

(1) These figures were compiled from diagnoses confirmed in medical units

Source: S.E.D.E.S. 1967

The high incidence of bacterial infections and intestinal parasites is largely the result of poor hygiene and minimal sanitation. For information concerning nutritional deficiencies, see Appendix C. 3

Impact of the Drought

In Mauritania, where the deficit in rainfall was first observed, the government has to some extent regulated the resettlement of the nomads to ease food distribution. The large encampments around urban centers (Nouakchott, Akjoujt, Atar, Kaeddi, Selibab, Rosso) and the southern one-third of the 3rd region (Kiffa) are extremely congested. Health and sanitation provisions are scarce, so that contagious and water-born diseases have grown to epidemic proportions in many camps. Malnutrition has drastically reduced resistance to disease, and in some nomadic camps in Boutilimit epidemics have raised the average death rate from 23/1,000 to 65/1,000 (C.D.C. 1973) incidence of measles has increased dramatically, and localized pockets of viral hepatitis, cholera, and whooping chough have been reported. Since the majority of people in Mauritania are nomads, the impact of the drought has been greater in this country than in any of the other five countries. Most migrations have been to regions 5 and 6, and the situation there is considered the worst in Mauritania, and perhaps in the entire Sahel-Sudan region.

Health Planning

The need for reorientation of priorities in health care service has been recognized by the government of Mauritania. The limiting factor is, of course, financial resources. Until there are funds available to implement a strong program of "santé de base", the existing situation will undoubtedly continue. It is estimated that only 15 percent of Mauritania's population receives medical attention. External aid, especially from U.N. organizations has been used to promote the santé de base program, and pilot zones for PMI centers have been established.

The objectives of the program are identical to those outlined for Chad and Upper Volta: (1) integration of preventive medicine at the regional level and to some extent at the local level; (2) extension of the services of the "health centers" through rural dispensaries and mobile teams; (3) hygiene, health, sanitation and nutrition animation of the rural sector; (4) special attention to women and children (PMI's); (5) collection of health and vital statistics; and (6) equitable distribution of materials and personnel throughout the country.

Foreign Aid

The United Nations organizations have allocated large sums of money as well as technical assistance to the advancement of health care in Mauritania. For further details on recent projects financed by W.H.O and UNICEF see Appendix F.

APPENDIX B.4: NIGER

National Organization of the Health Care System

Under the French administration there were three health organizations which were relatively independent of one another: (1) the hospitals and dispensaries concerned with curative medicine, and (2-3) a prophylatic medical system that was divided into two parts: one dealing with the campaign against important endemic diseases (the "Equipes Mobiles") and the other concerned with maternal and child health (the "PMI"). Since independence there has been a trend toward unification of the three separate systems. This trend is evident in the actual existing administrative structure and the manner in which health care is carried out at the present time.

The organization of Niger's medical system exemplifies the tendency towards unification, but the three divisions are still clearly drawn (see Figure 1).

National Budget for Health

Table 15 gives the allocation and distribution of Niger's health budget for 1970 to 1972. With a population of 4,239,000 in 1972, this gives a per capita expenditure of $1.07 (as compared to over $30 in the U.S. (King 1966).

Medical Infrastructure

Niger's public health infrastructure is outlined below (Frometin 1973):

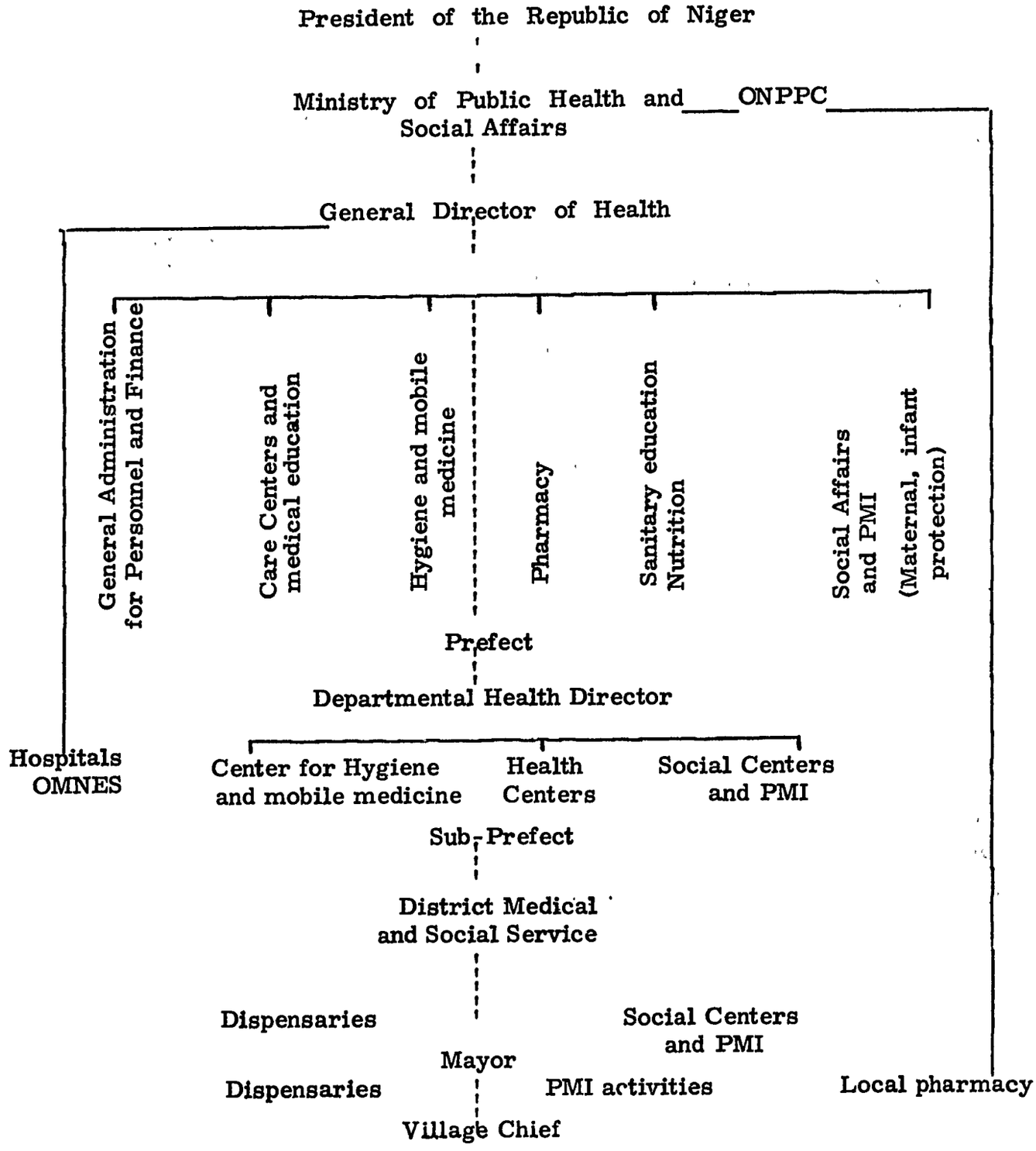
A. Medical and Social Services:

Public: In 1972 there were two National Hospitals (Niamey, 530 beds; Zinder, 377 beds), and five Departmental Centers at Dosso (41 beds), Tahoua (77 beds), Maradi (126 beds), Maine-Soroa (106 beds), Agadez (54 beds) for a total of 1,311 beds.

There was also 30 maternity wards (430 beds), 34 medical centers (440 beds) [Due to a lack of qualified personnel, there is not always a

FIGURE 1

Organization of the Medical System in Niger



ONPPC: National Office of Pharmaceutical and Chemical Products
OMNES: Niger Mobile Medicine and Sanitary Education Organization

TABLE 15

National Budget for Health in Nige

(Figures in CFA x 10^3)

Year	Personnel	Material	Total	Percent of National Budget
1970	432,960	465,115	898,075	8.3
1971	445,635	453,205	898,840	8.2
1972	483,200	467,005	950,205	8.0

SOURCE: Adapted from Fromentin 1973.

doctor at the head of a medical center, so that it is often only a dispensary, although somewhat more important than other dispensaries]. There are 114 dispensaries in the bush, 9 OMNES or EHMD (Équipes Hygiene Mobile Departmentale) Centers -- 2 in Zinder, 2 in Niamey, and one in each department, three T.B. sanatoriums (128 beds) in Niamey, Tahoua, and Zinder; nine Social Centers (PMI's), two in Niamey, one in Agadez, one in Filingue, one in Magaria, one in Maradi, one in Tchin-Tabaraden, one in Tahoua, and one in Zinder and four Centres Medico-Sociauz of the National Fund for Social Security (Caisse Nationale de Securité Sociale -- CNSS).

B. Medical and Social Services -- Private Sector

The private sector contributes to the country's health care. In 1972 there were 20 private institutions (of which there is one clinic with 20 beds in Niamey, one surgical hospital of 130 beds in GALMI of the Sudan Interior Mission (SIM), one leprosy clinic near Maradi, one maternity center at Guescheme, and some Dispensaries de Missions). These institutions have a capacity for hospitalizing patients in 2,545 beds.

The Centre d'Hygiene et de Medecine Mobile Departementale has one Centre per department, comprised of one Centre Urbain de Prévention and one Équipe Mobile (mobile unit). There is a sanitation service with a pilot zone, serving to give practical training to teams of Sanitation Engineering.

The National Office of Pharmaceutical and Chemical Products is a monopoly for the provisioning of the state health institutions, of the "collective locales" and of public establishments with pharmaceutical and medico-surgical products. Smaller pharmacies (Pharmacies Populaires) are found in Niamey, Zinder, Tahoua, Maradi, Agadez, Konni, Dooso, and Tera. Medical "warehouses" are found in Matameye, Magaria, Dakoro, Tillaberi, Ayorou, and Mehana.

Included in the private sector are the village pharmacies which are financed by the villagers and operated by volunteers.

Personnel

As in other Sahel-Sudan countries, patient/doctor ratios vary drastically from urban centers to rural areas; for example in 1969, the ratio in Niamey was one doctor to 1,765 inhabitants, whereas it was 1 to 123,800 for the rest of the country. Similarly, there was 1 nurse for 823 people in Niamey as compared to 1 for 48,868 in the rest of Niger (Frometin 1973).

Table 16 gives the number of individuals in medical fields in Niger for the years 1970, 1971, and 1972. Included in the figures are the number of personnel who are Nigeriens.

Personnel Training

By early 1973, the National School of Public Health had graduated 108 registered nurses (three-year program) and 140 certified nurses (one-year program). Since 1971, 5 certified nurses have been chosen each year to be trained as social aides. This course trains them in preventive health measures and they are destined to work in rural PMI and health centers. Within the past two years a three-year program for midwifery has been established in the school. Persons graduating from this course pursue their careers in hospital maternity wards and PMI centers.

The National School of Nursing provides instruction in registered nursing and midwifery. Due to several factors the school has lengthened its nursing program from two to three years.

1. the teaching load was simply too great to be accomplished in two years;
2. there is an increased awareness of the importance of cultural and civic education;

TABLE 16

Medical & Social Services Personnel in Niger, 1970 - 1972.

Categories of Personnel	1970	1971	1972
Physicians	69	69	97
(of whom are Nigeriens)	...(9)	...(10)	...(16)
Pharmacists	10	...	9
(of whom are Nigeriens)	...(4)		... (5)
Dental Surgeons	4	5	6
(of whom are Nigeriens)	...(1)	... (2)	... (3)
Dentists	3	...	3
(of whom are Nigeriens)	...(2)		... (1)
Midwives	30	...	36
(of whom are Nigeriens)	...(28)	...(24)	...(33)
Registered Nurses	110	165	222
(of whom are Nigeriens)	...(110)	...(145)	...(207)
Health Service Assistants	45	45	45
Certified Nurses	461	460	603
Health Engineers	2	...	1
(of whom are Nigeriens)	... (1)		...(1)
Hygiene Agents	29	29	30
Social Assistants	6	9	7
(of whom are Nigeriens	... (6)	... (7)	... (5)
Social Aides	...	9	...

-In addition: "Matrones," Hygienists and "Secouristes" (first-aid volunteers) of the village

-In 1973: 263 active "Matrones"
2 active Health Educators

Source: Fromentin 1973

3. previously there was too little time available for clinical training; and
4. a program for nursing administration has been added.

In addition to its regular nursing program, the school "recycles" graduates (120 nurses a year) during one-month sessions (Frometin 1973).

When the four-year plan for 1971 to 1974 was drawn up, the completion of training for the categories shown in Table 17 were expected.

Sanitation

With the graduation of two sanitation technicians in 1971, Niger hoped to begin a systematic effort of developing sanitation facilities and distributing information on pure water supply and latrines. As of 1970 there has been a sanitation pilot zone in the town of Dosso where several latrines have been constructed in each quarter, and clean water is distributed in schools, the maternity, the dispensary, and the market place. Efforts are made to keep the market area and produce clean. There is, in addition, a small demonstration house which has been built as an example of how to provide adequate light, ventilation, and protection from weather variations. In the rest of the country there is no sewage disposal system and latrines are not used. There is little or no protection of water supplied from fecal contamination except for some wells which are based in cement.

Principal Diseases

Disease incidence and case mortality rates are exceptionally high in the Sahel-Sudan countries, and Niger is no exception to the general situation. Infant mortality rates in rural Niger range from 250 to 300 per 1,000 live births, and out of 10 live births, only four live to be five years of age (Fourmier 1972). Children under four comprise only 19.4 percent of the total population, yet 35 percent of all consultations in the health centers are for children in that age bracket. Table 18 lists the

TABLE 17

Medical and Social Services Personnel: Number of Nigerien Students Expected to Return After Completion of Training Abroad, 1971 - 1974.

	Before Oct. 1970	Oct. 1970	Oct. 1971	Oct. 1972	Oct. 1973	Effective Oct. 1973
. Physicians	7	4	1	3	4	19
. Pharmacists	1	1	-	-	-	2
. Dental Surgeons	1	1	-	1	-	3
. Social Service Assistants	2	-	1	1	-	4
National School of Nursing						
. Registered Nurses	117	27	28	0(x)	28	200
. Midwives	13	5	3	5	5	31
. Certified Nurses	467	25	22	18	18	570

(x) due to lengthening of program from 2 to 3 years

Students in Specialized Fields:

Specialties	1970	1971	1972	1973
Hospital Inspectors	2	2	2	2
Social Assistants	-	-	-	2
Anaesthesiology Aides	3	-	2	2
Hospital Lab Technicians	1	1	1	1
Radio Operators	-	1	1	1
Kinesthesia masseurs	1	-	1	-
Specialists in endemic diseases	4	6	6	6
Neuro-Psychiatrist	-	1	1	1
Sanitation Technicians	-	2	1	2
"Puericultrices"	-	1	1	1
Social Service Aides	-	5	5	5
Ophthalmologists	2	2	2	1

Source: Fromentin 1973.

TABLE 18

Disease	Percent of Consultations
Malaria Enteric Infections	26 %
Conjunctivitis Skin Infections	25 %
Respiratory Infections	18 %

Source: Fournier, 1972

types of diseases for which children are most frequently treated in hospitals and dispensaries.

Epidemiological information is scant. It is impossible to know the exact incidence of disease among those people who do not have access to health facilities or who do not make use of those which are available. Nevertheless, Table 19 lists the number of cases and the number of deaths observed in Niger's medical facilities during 1972.

Malaria (usually caused by Plasmodium falciparum or malariae) is the leading cause of death in Niger, being responsible for 28 percent of the mortality. In the Niamey hospital, 20-25 percent of all children hospitalized during the rainy season have falciparum malaria. The northern limit for the spread of malaria is at isohyet 200. Between isohyets 200 and 500 the spread is seasonal (during the winter rainy season). Within this this zone and south of isohyet 500, the disease is semi-continuous near bodies of water, becoming continuous near isohyet 700.

Measles remains one of the important causes of death in the infant and pre-school age group (one to four years), despite wide-scale vaccination. Since the case fatality rate is an indicator of the prevalence of malnutrition, one might conclude that malnutrition has been and continues to be a serious and widespread condition among children. During the years 1967 to 1969, 644,000 vaccinations were given; in 1970, 372,809 vaccinations; and in 1971, 237,698. There were 11,059 cases of measles in 1968 (206 deaths); 24,829 cases in 1969 (635 deaths); and 5,289 cases in 1971 (99 deaths). It is still too early to judge the effect of the vaccination program since the epidemiological rhythm seems to be in cycles of four years.

The measles vaccine is expensive (approximately $1 per injection) and labile, and requires both refrigerated transport and storage. The vaccine becomes inactivated after only a few hours at refrigerator temperature ($\pm$ 4°C). It will be difficult for these countries to finance the program when they eventually take it over.

TABLE 19

Incidence of Certain Diseases as Diagnosed in Medical Facilities in Niger, 1972

Diseases	Number of Cases	Number of Deaths
Trachoma	2,241	-
Leprosy	2,477	2
Whooping Cough	3,732	5
Diphtheria	47	3
Acute Poliomyelitis	129	2
Tetanus	216	49
Infectious Hepatitis	2,807	54
Grippe	5,329	26
Pneumonia	3,044	39
Amoebic and Bacillary Dysentery	14,388	21
Tuberculosis	1,469	45
Meningitis	2,233	180
Measles	28,423	937
Chicken Pox	4,646	

Source: Fromentin, 1973.

The prevalence of active Tuberculosis in Niger is not well known, but it is estimated that 20,000 to 40,000 people have this disease. BCG vaccination program financed by UNICEF and W.H.O. were introduced extensively in most of the Sahel-Sudan countries in 1967 and 1968 (see Table 20). The vaccinations were given primarily to the under 15 age group. The value of BCG is still highly controversial.

TABLE 20

Distribution of BCG Vaccinations in 1972 in Niger

0 - 1	years	74,146
1 - 4	years	83,144
5 - 14	years	87,336
15	years & over	15,780
	Total	260,406

Source: Fromentin 1973

* * *

Trachoma and conjunctivitis are widespread in Niger, and in a single region (Maradi) 25 - 27 percent of the students have conjunctivitis and 9 -18 percent have trachoma. Treatment (tetracycline) is administered by both the school teachers and the secouristes in the villages.

Trypanosomiasis appears very infrequently in Niger; a serologic study done on 3,332 people by the Muraz Center (Upper Volta) in 1970 did not reveal any cases. It is localized in the zones of the tsetse fly.

Tetanus is frequent in Niger. There are at least four circumstances under which the disease is likely to appear: (1) umbilical tetanus of newborns; (2) tetanus of an open wound; (3) tetanus after ritual excision of the clitoris; and (4) tetanus after extraction of Guinea worms (dracontiasis). There is no systematic tetanus toxoid immunization program. If pregnant women were systematically immunized, post-partum and umbilical tetanus would disappear.

Cerebro-Spinal Meningitis is present during the cold season (December -- March) in all the countries of the Sahel-Sudan ("the meningitis barrier"). The meningitis seen is either meningococcal or pneumococcal. The population is well aware of the disease. Prognosis depends upon the speed with which proper therapy is instituted. The mortality rate 30 years ago was more than 30 percent; currently it is less than 10 percent. In Niger there seems to be an epidemic every four years. In 1968, there were 3,131 declared cases with 134 deaths; in 1969, 2,989 cases with 190 deaths; in 1970, 11,791 cases with 1,105 deaths; and in 1971, 4,142 cases with 246 deaths.

Smallpox has been eradicated in Niger as a result of an intensive five-year vaccination campaign. In 1967, there were 1,187 smallpox cases declared (87 deaths). Since 1970 there have been no new cases.

In the first half of 1971 there was a large scale epidemic of Cholera in Niger: 10,000 cases with 2,000 deaths. In January of 1974, 300 cases were declared in the region of Zinder. It is perhaps surprising that this disease has not been more evident in view of the displacement of people and crowding around cities with grossly inadequate water supplies and no sanitation.

Leprosy is a minor problem when compared with the incidence of other diseases in Niger. In 1971, for example, there were 17,800 reported cases, of which 803 were new ones. In 1972, there were 744 new cases.

Other diseases which are widespread include venereal disease, which is very common to all levels of the population, intenstinal parasites (50 - 79 percent of all hospitalized patients have parasites), filariasis and rabies. Sickle-cell anemia is a public health problem, since the number of sickle carriers seems to be very high in certain areas (approximately 25 percent in Niamey). The incidence of newborn homozygotes will be the square root of this, or 5 percent of newborns;

few if any of them will reach productive or reproductive age.

Impact of the Drought

It is an impossible task to determine exactly what effect the drought is having on the health status of the Nigerien people, since unpredictable migration patterns have resulted in numerous crowded encampments and in the attendant spread of communicable diseases. The most complete source on the effects of the drought on health, nutrition and migration has been the Center for Disease Control publication entitled "Nutritional Surveillance in Drought Affected Areas of West Africa," which was prepared in August and September of 1973 (C.D.C. 1973). To what degree their figures and percentages are still relevant to the current situation is difficult to say. No surveillance apparatus exists which is recording the day-to-day and week-to-week changes which are occurring under the present drought conditions.

According to the C.D.C. report, the hardest hit area in Niger is above the 500 millimeter isohyet, especially near Agadez, and it is the nomadic tribes who are suffering most from famine and disease. The C.D.C. team divided their sampling between 10 nomadic and 10 sedentary clusters of people (each cluster less than 5,000 population), which included both highly affected areas (mainly in the north) and less affected areas (mainly in the south).

Their statistics indicate that there are more measles cases than ever before recorded. Many adults, especially in the north, are contracting the disease, which is an indication that they have not been exposed to it before. Table 21, which was abstracted from the report indicated the abrupt increase in tne number of cases between 1971 and 1972, and again between 1972 and the first semester of 1973.

Measles, which appears epidemically in cycles of four years, is rampant in the northern nomadic camps. Tables 22, 23, and 24 give percentages for the number of deaths attributed to disease and famine and for the number of deaths by age in 1972.

TABLE 21

Measles Indicence and Case Fatality Rates in Niger, 1957 - 1973

MEASLES

Year	Cases	Case Fatality Rates
1957	1,060	4 %
1958	5,350	1
1959	11,374	3
1960	8,903	4
1961	11,978	11
1962	4,202	7
1963	4,928	5
1964	14,412	4
1965	27,547	2
1966	6,717	2
1967	5,548	2
1968	11,259	2
1969	25,054	3
1970	1,755	6
1971	2,886	2
1972	29,050	NA
1973	35,532*	3.3

*Based on January-June data

Source: C.D.C. 1973

TABLE 22

Death Rates Per 1000 in 1972 (Cause Attributed by Villagers)

	Nomads				Sedentary			
Area	Number Clusters	Measles and/or Famine	Other	Total	Number Clusters	Measles and/or Famine	Other	Total
North	7	52	14	66	4	13	25	38
South	4	2	15	17	4	4	13	17
Total	11	39	15	54	8	9	20	29

TABLE 23

Percent of Total Deaths Attributed by Villagers to Measles and/or Famine in 1972

	Nomad		Sedentary		Total	
Area	Number Deaths	Percent	Number Deaths	Percent	Number Deaths	Percent
North	105	78	20	35	125	71
South	9	11	8	25	17	18
Total	114	73	28	32	142	65

TABLE 24

Age Distribution of 54 Deaths Attributed by Villagers to Measles and Famine

Age Case	1	1	2	3	4	5-7	8-9	10-12	13-14	15-24	25-44	Total
Measles	1	7	4	-	2	8	4	3	-	4	1	37
Famine	1	-	2	1	-	7	2	4	-		3*	17
Total	2	7	6	1	2	15	6	7	-	4	1 3*	54
	18 33%					28 52%				8 15%		

*Exact age unknown

Source: C.D.C. 1973

From these tables one can state that up to 78 percent of all deaths in the sample of northern nomad camps in 1972 were attributed to famine or measles or both, and that well over half the victims were under 12 years of age.

Mortality rates in the sample of northern nomadic camps were twice as high in 1972 as the average annual rate for Niger for 1965 to 1971 (see Table 25).

TABLE 25

The average annual death rate from 1965 to 1971 in Niger was 23/1,000.

Death Rates (Per 1,000) in 1972

	Nomads		Sedentary		Total	
Area	Number Clusters	Death Rate	Number Clusters	Death Rate	Number Clusters	Death Rate
North	7	66	4	38	11	59
South	4	17	4	17	8	17
Total	11	54	8	29	19	44

Source: C.D.C. 1973

* * * *

Tables 22-25 indicate that conditions in southern Niger for both nomadic and sedentary groups are far superior to those in northern Niger, and that of the northern inhabitants, the nomads are the more deprived of food and health care.

Health Planning

It is estimated that only 7 to 15 percent of Niger's population (the urban sector) enjoy the benefits of an established health program. In the rural areas district dispensaries are used only rarely by persons living more than 10 kilometers from them. Two factors are responsible

for the general absence of medical care: lack of infrastructure and immobility of male nurses in charge of the dispensaries. Preventive medicine remains largely in theory and not in practice since nurses spend very little of their time at the PMI centers. Consequently the emphasis at these rural dispensaries has been placed on curative medicine for a small number of patients (Fournier 1972).

Assuming the limited number of strategies which could be applied to increase the effectiveness of rural health care, the most obvious, a major increase in the number of dispensaries, is beyond the monetary resources of the country. Mobilization of the nurses out of the central dispensaries and into the villages has been attempted previously but has failed; some villages have built their own village dispensaries, but they remain unmanned. A third strategy is to place health care in the hands of village volunteers trained by the dispensary nurses. In Niger's Maradi department, the actual course of events since 1966 has included attempts at health education (animation) of the rural population under the Minister of Human Advancement. In the pilot zone it has become apparent that the effectiveness of rural health programs is directly proportional to the degree of motivation demonstrated by the people. In addition, animation of the existing medical personnel, especially the dispensary nurses, is prerequisite to the training of village volunteers. It is imperative that a nurse view his role as that of educator for all forms of medical care -- curative, preventive, health and hygiene education, and collection of medical statistics. Emphasis is placed on the nurse's assuming responsibility for the entire population served by the dispensary, rather than assuming only the responsibility of maintaining the dispensary itself.

Animation of the rural population takes place in successive steps. First the villagers are called together, the purpose of a proposed program is explained, and expectations for village participation are outlined. At a second meeting, if reaction to the program is favorable, the village

presents the volunteers who have been selected for training by the medical personnel. Once trained, these individuals, either first-aid workers or midwives, return to the village and their roles are explained again at a third village meeting. Each year a sensitization session is scheduled to determine whether the villagers wish to continue or change the operation, replace the volunteers, or abandon the program. In this way, the former rural dispensaries have become, "rural health centers" radiating medical care through first-aid teams sent by the villagers to the center for training in maternal child-care, elementary preventive and curative measures, hygiene education and collection of medical-social statistics.

Some villages have a small pharmacy financed by the local population and run by a trained first-aid volunteer ("secouriste"). This person is trained to take care of minor injuries, to treat conjunctivitis early, and to administer anti-malarial therapy prophylactically to the children during the appropriate seasons. He channels cases which are too difficult for him to handle to the health center. In 1972, there were 101 of these village pharmacies in Niger (Fromentin 1973).

Each pharmacy has a president, a secretary-treasurer, and two secouristes, all of whom are volunteers. The secouristes are responsible for medical care in health and hygiene education. The secretary-treasurer is responsible for ordering medicine and arranging for payment for those medicines which are not free. He keeps records of all orders and expenses. The president assists in all financial matters. A typical stock for one of these small pharmacies would include: soap and mercurochrome for skin lesions (free), methylene blue for buccal infections (free), and Argerol for conjunctivities (free), a sulfonamide for diarrhea (bought), and an antimalarial agent (bought). Approximately 50 percent of the villages' medical cases are handled by these pharmacies (Fournier 1972).

An important aspect in the operation of a pharmacy is a monthly visit paid by the nearest health center nurse who checks over sick villagers, answers any questions a secouriste might have, and looks over the month's records. Without the technical and moral support provided by the nurses, volunteers are likely to lose interest and abandon the pharmacy. Mobilization of the nurses has thus been an essential part of the rural health program.

In addition to the volunteer secouristes, traditional midwives are also trained in a 15-day session at the nearest health center. They are instructed in pre- and post-natal care, in hygiene, and in preparation of weaning food. After passing an examination each midwife is given a kit of supplies which is refilled by the dispensary nurse during his monthly visit. This aspect of the program has not been so successful as the training of secouristes. The advanced age of most of the midwives accounts in large part for the limited effectiveness of their training. Many are reluctant to change their ways, and it is difficult for the nurses to be sure that the midwives are administering proper care.

Two of the most successful campaigns undertaken by the health centers and the village pharmacies have been the introduction of a nutritious weaning food and the promotion of malarial prophylaxis. Although there has been some hesitation among women to forfeit traditional weaning foods, the cooked groundnut cakes developed at the dispensaries are becoming more and more popular. Flavoquinine, on the other hand, has been rapidly accepted as an effective suppressor of malaria. The drug has been widely used since its introduction in 1965, despite the cost the villagers must pay to obtain it.

Built into the rural program is a method for continuous evaluation and free exchange of ideas among the medical personnel of a particular district. Trimestrial meetings are held in each medical district ("Arrondisssement"). In attendance are the mecial director of the

Department, representatives from Animation Rurale and Alphabetization, all nursing personnel and the sub-prefect of the district. Compilation and evaluation of medical statistics obtained from the various villages provide a basis for formulating policy changes. Formerly, when such statistics were unavailable, nurses had little grasp of the medical status of the people in their charge. Now practical solutions to immediate problems can be worked out at these meetings.

As of March, 1973, there were pharmacies in 675 village communities, 361 trained, traditional midwives, and 423 secouristes (UNESCO 1973b).

The success of the rural animation program in Niger has led to a health plan and budget that is oriented toward medicine and health education for the masses. Education of the people in matters of health and nutrition is carried out in the schools, rural dispensaries, social centers and PMI's, and by the mobile units and village secouristes. As Table 26 demonstrates, the emphasis in planning the infrastructure in 1971 included the expansion of existing facilities (number of beds in the hospitals, etc.) and an increase in the number of rural facilities (dispensaries, mobile units, PMI's.

In recognizing the need for accurate health statistics the Ministry of Health stated in its four-year plan for 1971-1974 that the Equipes Mobiles would be responsible for health surveillance as well as for detection, treatment, and control of the major endemic diseases -- including T. B. and leprosy.

Foreign Aid in Health Care

Most aid given to Niger for health and nutrition programs is multilateral, whereas bilateral aid is generally directed toward economic improvements. Table 27 gives the source and estimated contributions for public health efforts during the period of 1971-1974.

TABLE 26

Medical Infrastructure in 1971 and Expected in 1974

Type of Medical Unit	1971	1974	Number of Beds 1971	Number of Beds 1974
National Hospitals	2	2	807	1,104
Departmental Hospital Centers	4	4	241	464
Hospital Center (DIFFA)	1	1	106	106
Anti-tuberculosis Center	3	4	128	128
Medical Centers				
(Hospital Beds)	26	26	335	335
(Maternity Beds)			289	318
Medical Center Dispensaries	4	4	-	-
Rural Dispensaries	109	125	-	-
Rural Dispensaries of FED Program	--	129	-	-
PMI Social Centers	8	11	-	-
Hygiene Centers & Mobil Units	3	7	-	-
Departmental Hygiene Mobile Units	7	7	-	-
OMNES (Niger Mobile Medicine & Health Education Organization)	2	-	-	-
Measles-Smallpox Vaccination Units	12	12	-	-
Treponema Infection Unit	1	-	-	-
Infirmaries	3	3	70	70
Medical Stations	13	13	-	-
Private Hospitals & Clinics	5	5	56	56
Private Dispensaries	10	10	-	-
Medical Social Centers	4	4	-	-
TOTAL			2,032	2,581

Source: Fromentin 1973

TABLE 27

Four-Year Plan 1971-1974: Forecasted Public Investments in Health and Social Infrastructure (in CFA x 10^6)

	Sources	Total
Campaign against T. B.	UNDP	56.30
Sanitation	WHO	37.00
	National Funds	6.90
Re-equipping & Equipping of Hospitals	FED	561.30
16 Rural Dispensaries	FED	51.20
OMNES and EMD Teams	FAC	194.00
Treponema Infection Units	WHO	32.46
	National Funds	4.00
Maternal and Infant Hygiene	WHO	36.49
	National Funds	1.50
Measles-Smallpox Vaccine	WHO	14.60
	USAID	246.65
Curative Medicine	FAC	54.00
Construction & Equipment of 4 Social Centers and of PMI--Niamey	FAC	100.00
Extension PMI -- Niamey	3°FED	176.00
Additional Hospital Equipment	3°FED	88.00
Reconstruction of 20 Dispensaries	3°FED	252.00
Ouallam Route Hospital	National Funds	10.00
Anti-tuberculosis Extension Center Niamey	National Funds	3.40
Niamey Hospital	National Funds	7.00
Departmental Mobile Unit Garage Niamey	National Funds	3.40

Source: Fromentin 1973

See Appendix F for more detailed information regarding WHO and UNICEF funding in health and nutrition in west Africa.

One of the external agencies involved in Health and Nutrition is the C.I.E. (Centre International de l'Enfance) with its central bureau in Paris. This agency was created in 1949 and is closely related to UNICEF. Its activities are devoted to mother and child care in three principal directions: teaching, education, and research. It organizes meetings at various times, bringing together health personnel working at all levels in the public health system. On these occasions the participants consider some of the special aspects of the system chosen at a previous meeting, -- such as the role of the health worker in a village. Each delegate is sent by his government which pays his expenses. The teachers are paid by the C.I.E. These meetings emphasize the importance of preventive medicine. Each attendant is asked to share his own experiences and difficulties throughout the workshops.

The M.I.T. team vistied a model C.I.E. health center in Tillaberi in January, 1974. A nurse screened the different patients who came, and only some of them were seen by the physician. In this center there is a midwife. Many data on the patients were collected. The C.I.E. also has mobile teams which make surveys for parasites. After fixation, samples are then sent to Europe for identification.

The C.I.E. operation in Niger is limited. It has no permanent installations. Its fate since the change in government in 1974 remains uncertain.

APPENDIX B.5: SENEGAL

Federal Organization of the Health Care System

The objectives set forth in the National Development Plan for 1969-1974 included provisions for the expansion of health care services within the integrated framework of social and economic development. In other words, adequate health care is recognized as a salient feature of Senegal's development planning. Our sources of information for Senegal have been extremely limited.

Health Budget

Expenditures for activities and personnel in the health care delivery system and social services accounted for approximately 9 percent of the national budget in 1968-1969 (see Table 28).

Medical Infrastructure

Health infrastructure in 1972 consisted of 5 principal and 4 secondary hospitals, 32 health centers, 140 health stations, 279 rural clinics, 40 maternity wards, and 70 MCH centers. For the period ending in 1974, an additional 17 health centers and 129 health stations have been planned. There were several mobile units for combatting endemic diseases, including tuberculosis and leprosy (UNESCO 1972).

Personnel

An average inhabitants/physician ratio of 24,000/1 was reported in 1972; however, the wide variation between different regions demonstrates the same kind of disequilibrium of distribution that exists in the other Sahel-Sudan countries: one doctor per 300 in Cap-Vert region and one doctor per 77,000 in Casamance. Efforts to increase the number of medical personnel in rural areas are reflected in the numbers of paramedical personnel: (1972) 110 technical health officers, 950 nurses, 162 public health nurses, 168 midwives, and over 200 traditional birth attendants. Every year 280 workers in fields of health and social

TABLE 28

Health Budge for Senegal, 1966 - 1971

Year	Health Budget (CFA x 10^6)	Percent of National Budget
1966-1967	2,834.475	7.95
1967-1968	3,250.505	9.01
1968-1969	3,351.580	9.01
1969-1970	3,491.000	
1970-1971	3,555.000	

Distribution of funds in 1968-1969 were as follows:

Personnel	2,098.260 x 10^6 CFA
Material	932.920 x 10^6 CFA
Transportation	320.400 x 10^6 CFA

Source: data from Fromentin 1971

service are being trained in the country.

Personnel Training

The major center for specialized nursing training in west Africa is the Center for Special Nursing Education (CESSI) in Senegal. Prior to its existence, west African nurses wishing to specialize had to be trained abroad.

There are several other medical training schools in the country, including the medical school at the University of Dakar (with departments of pharmacy and dentistry), the School of Obstetrics for midwives, the School for State Nurses, and the School for Social Assistants, all in Dakar. In Kaolombole there are schools for health and sanitation agencies. In the past these schools have been training centers for people from other countries of west Africa, but the number of foreign students is dwindling.

Principal Diseases

Disease patterns and mortality rates in Senegal are similar to those in other countries of the region. Major diseases include malaria (particularly in the eastern regions), measles (responsible for over one-half the deaths of children aged 1 - 4 years in some regions), tuberculosis, venereal disease, schistosomiasis, tetanus, and cerebro-spinal meningitis. Onchocerciasis is particularly wide-spread along the Gambia and Falimé rivers, affecting half the population over 15 years of age (Fromentin 1971).

Impact of the Drought

There is little information regarding the health status of individuals affected by the drought in Senegal. Determination of the hardest hit areas was made by the Directorate of Agricultural Services which based its evaluation on reduction in overall crops and livestock as well

as food supplies. Therefore, it is likely that the area regarded as hardest hit (including parts of all regions except for Casamance) may be suffering more from a shortage of industrial crops than from a shortage of food crops.

It is generally believed that the nomadic Peuls in the regions of Fleuve and Diourbel (approximate population: 350,000) have suffered most severely from the drought (W.H.O. 1973a).

Health Planning

The development planning sponsored by the Senegalese government embraces all advances in health and social affairs as important gains in overall national development. Raising the standard of living of the population is viewed as a function of health care and nutrition planning as well as economic growth. Of prime importance in recent years has been the effort to ameliorate conditions in the rural environment where health care and educational facilities had been largely neglected.

In keeping with the objectives of the National Development Plan, the Ministry of Public Helath has worked in close coordination with several other ministries to promote economic and social development in the rural areas. The emphasis has been placed on providing basic health services, especially preventive measures, to the rural population. During recent years the number of training institutions for paramedical personnel has increased substantially and many of their graduates are being placed in the rural areas.

Education of women and children has been an integral part of the development program. The Teachers Training School of Women's Technical Education instructs its students in nutrition, home economics, and child rearing so that they in turn can function as animateurs in the rural villages. An extensive network of schools and training centers which would specialize in the economic and cultural advancement of women

has been planned. Primary schools also serve as a prime target for health, and nutrition education.

A rather impressive advancement in the past five years has been the extensive use of radio as a means for educating people in isolated areas. Programs on all aspects of rural advancement -- agriculture, women's training, nutrition, and health -- are broadcast to thousands of villagers. During the first three years of the program, educational radio broadcast over 7,000 programs on aspects of health and nutrition. Animateurs on the local level are responsible for organizing listening groups and for answering questions on the content of the program. In this manner educational radio has promoted a dialogue between the villagers and the technical staff (UNESCO 1972).

Foreign Aid

Assistance from multi-lateral and bi-lateral organizations has encompassed all aspects of health care services -- technical personnel, transport facilities, infrastructure and medical supplies. Appendix F provides a more detailed account of current programs instituted or assisted by U.N. organizations.

APPENDIX B. 6: UPPER VOLTA

National Organization of Health Care System

Administration of Upper Volta's health care system is outlined schematically in Figure 2.

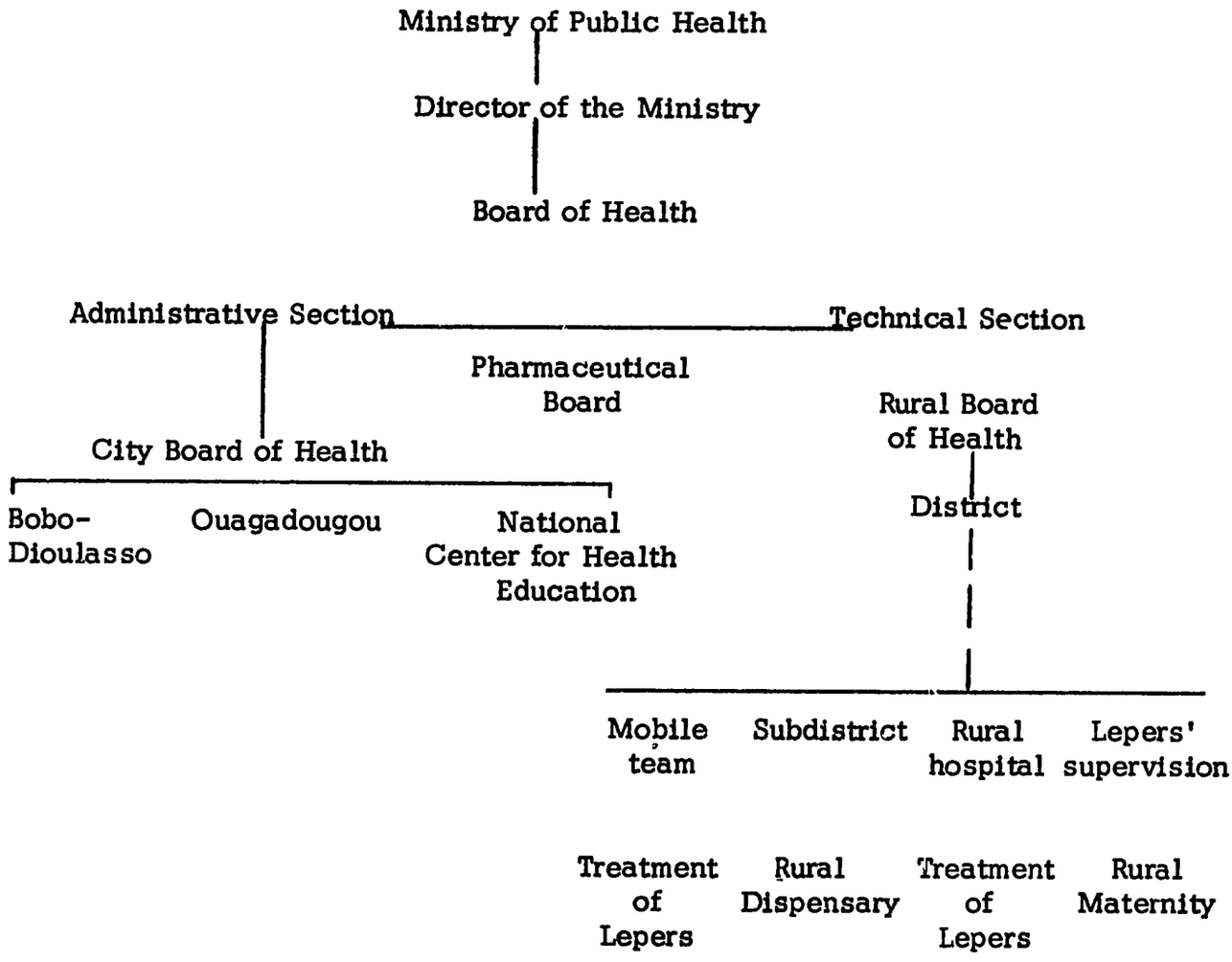
In upper Volta the public health administration has been divided into two sections (excluding the division for pharmaceutical distribution), one concerned with the urban, and the other with the rural health. The urban division encompasses two cities, Ouagadougou, and Bobo-Dioulasso (237,000 inhabitants) and is also responsible for health instruction. The rural division encompasses the entire rural health program, and is itself sub-divided into different sections comprising mobile health teams for combating endemic diseases, and stationary teams (medical centers, health centers, hospitals, rural maternities, etc.). The mobile teams seem to be the most efficient of all the existing structures. They are responsible for the population census with regard to health problems, mass vaccinations (measles, smallpox, BCG, yellow fever) and the detection of specific diseases such as sleeping sickness, onchocerciasis, leprosy, and trachoma. Detected cases are referred to the stationary units for treatment and follow-up, with exception of the campaign against leprosy which is a part of a special mobile system. The stationary and mobile medical divisions are under the direction of a physician who is head of the sector. This allows for a certain degree of coordination of activity.

Health Budget

In 1972, 7.5 percent (less than 4 million dollars) of the national budget was allocated to the Ministries of Health and Social Affairs. This was equivalent to a per capita expenditure of less than 75 cents (Fromentin 1972).

FIGURE 2

Administrative Organization of Upper Volta's Health Care System



Medical Infrastructure

The director of urban health care administers the National School of Health and is responsible for the following services in Ouagadougou and Bobo-Dioulasso.

In Ouagadougou:

1 Principl Hospital (585 beds)

9 Dispensaries

4 Maternities

2 PMI

1 Othalmological Dispensary (59 beds)

1 Anti-Tuberculosis Center

1 National Center of Health Education

1 Hygiene Service

1 Medical Inspection of Schools

Health services are evenly distributed around the perimeter of the city.

In Bobo-Dioulasso:

1 Principal Hospital (735 beds)

2 Maternities

6 Dispensaries

1 PMI

1 Hygiene Service

1 Medical Inspection of Schools

Services are poorly distributed.

Centre Muraz: a division of OCCGE, comprising the following sections -- biology, parasitology, entomology, onchocerciasis, chemistry, etc.

The Director of Rural Health Care is responsible for administering all other health facilities in Upper Volta, viz:

In the 12 Rural Health Sectors, there are:

3 Regional Hospitals
- Fada N'Gourma (128 beds + 41 cribs)
- Gaoua (124 beds + 32 cribs)
- Ouahigouya (520 places)

3 Medical-Surgical Centers
- Tenkodogo (68 beds)
- Koudougou (96 beds)
- Banfora (90 beds)

1 Anti-Leprosy Center at Kaya

8 Medical Centers
- Dédougou (25 beds)
- Tougan (43 beds)
- Nouna (84 beds)
- Kaya (30 beds)
- Kongoussi (35 beds)
- Dori (12 beds)
- Yako (35 beds)
- Pô (35 beds)
- Mango (32 beds)

45 Health Centers

59 Dispensaries

17 Isolated Maternities

86 Curative Medicine Centers (12 closed)

25 Private Units

170 Mobile Units
- 20 Inspection teams
- 26 Leprosy Control
- 124 Treatment Circuits (Fromentin 1972)

In addition to administering the facilities listed above, the director of rural health care is responsible for the campaign against transmissible

endemic diseases in the entire country, Ouagadougou and Bobo-Diolasso included. He is charged with the responsibility for the following: (1) one central store for medicines and materials; (2) one mobile ophthalmological unit; (3) one anti-leprosy unit in Ouagadougou; and (4) seven national vaccination teams.

Such a spectrum of activities under the direction of a single physician has promoted integration and coordination of the medical system. In recent years, the fixed centers have been expanding their activities to include preventive medicine, and such usually fixed centers as the PMI's are beginning to set up mobile units.

Personnel

The following list of medical personnel complied in 1971 gives the number of people serving in various capacities under the direction of "Service de Santé Urbaine."

30 Physicians
3 Dental Surgeons
3 Pharmacists
72 State Midwives
16 African Midwives
219 Matrônes
10 Health Technicians
72 State Nurses
302 Nurses
7 Hygiene Agents
20 Social Assistants
1 Laboratory Technician.

These figures indicate an inhabitant/physician ratio of 7,900/1 and an inhabitant/nurse ratio of 630/1 for the two cities of Ouagadougou and Bobo-Dioulasso.

The "Service de Sante Rurale" on the other hand, reported an inhabitant/physician ratio of 188,000/1 and an inhabitant/nurse ratio of 6,200/1 for the rest of Upper Volta (population 4,883,000 in 1971). Medical personnel consisted of: 26 physicians, 12 State midwives. 70 State nurses, 19 health technicians, and 697 nurses to which must be added 962 temporary agents performing different functions (Fromentin 1972).

Personnel Training

Although Upper Volta does not have a medical school, there were 192 students studying abroad for their medical degrees in 1972. How many of these have actually returned or intend to return is difficult to say. A problem faced by most developing countries which must send their students abroad is the tendency for students to remain abroad once graduated. Also, much of the training is related to curative medicine which often entails sophisticated apparatus and expensive drugs that are not available in their home countries. In general the training is ill-adapted to the priority health needs of a developing country.

In 1968, a national nursing school was opened in Ouagadougou. It offers a 3-year program and is designed to give the student a comprehensive view of the health problems found in Upper Volta. It stresses the need for preventive measures and for rural animation, particularly of pregnant and nursing mothers in the fields of hygiene and nutrition. Students are instructed in statistics to enhance their appreciation of the role of health statistics in planning viable health programs. "Service de Santé de Base" is the terminology used to encompass all these areas in health training. As will be seen under "health planning," the orientation of Upper Volta's health planning in the past seven years has been toward these "Service de Santé de Base" (UNESCO 1970).

Principal Diseases

Many of the most prevalent diseases in Upper Volta are the same as those in the other Sahel-Sudan countries. These include measles, malaria, tuberculosis, cerebrospinal meningitis, trachoma, venereal disease, tetanus, and intestinal parasites. The causes and severity of most of these diseases can be attributed to either poor hygiene (coupled with an absence of sanitation) and malnutrition.

In addition to these more common diseases are several which are particularly prevalent in Upper Volta. These include onchocerciasis, leprosy, umbilical tetanus, dracunculosis (Guinea worm), and schistosomiasis.

Onchocerciasis, commonly called "river blindness" is a major problem in Upper Volta. The vector of the disease, Simulium damnosum breeds in the fast-flowing branches of the Volta River. Ten percent of the land (some of the most fertile in Upper Volta) has been abandoned. Four hundred thousand people are infected (10 percent prevalency) and 40-50 thousand, or 1 percent of the population are blind as a result of the disease. Currently, an important project backed by several international agencies and encompassing seven countries is underway in the Volta Bassin. This project is using insecticides from boats and aircraft in a program for eliminating the vector (FAO, IBRD, UNDP, and WHO 1973).

Leprosy: In 1971 there were 131,000 recorded cases, and 3,074 new cases detected (prevalency of 2.62 percent, incidence of 0.06 percent). A special mobile unit is responsible for treating the disease; in 1971, 79,449 lepers were receiving treatment from this unit. This program has been especially effective in diagnosis of the disease in its early stages, thereby increasing the probability of arrest or cure.

Umbilical tetanus frequently results from the custom which dictates that at the moment of birth the infant much touch the ground before

the cord is cut.

Dracunculosis: The Guinea worm is very prevalent in Upper Volta, particularly during the rainy season. The disease in transmissible only if the water is used both for washing and drinking. Most cases heal after several months and leave no residual problems, but because of the disease, an important number of work days may be lost.

Schistosomiasis: Bladder schistosomiasis affects 40 percent of the adult population and more than 30 percent of school-aged children in Upper Volta. This has become an important public health problem.

Cholera has never been present in Upper Volta in epidemic proportions. Widescale vaccination of the population was carried out by the mobile teams in 1971.

Trypanosomiasis: There has been a reduction of the number of new cases of this disease over the past few years. Most of the new cases in 1971 (114) were in migrants.

Impact of the Drought

The hardest hit cercles in Upper Volta include: Dori, Oudalan, Ouahigouya, Seguenega, Titao, Djibo, Barsalogho, Kongoussi, Boulsa, Bogande, and Diapaga. The population of these areas is 13,00,000 out of a total of 5,800,000 (C.D.C. 1973).

Statistics from measles incidence during the past 11 years provides a measure of the degree to which migration encampments and malnutrition have affected the health status of the people during the drought (See Table 29). The sharp increase in attack rates and in case fatility rates may be a result of the drought, with crowding in resettlement centers and poor nutrition being important causal factors.

The C.D.C. team reports that 624 cases (confirmed and suspected) of cholera have been detected in Ouagadougou, which suggests that an epidemic of this disease may result from the circumstances of the

TABLE 29

Measles Incidence and Case Fatality Rates in Upper Volta

1962 - 1973

Year	Cases	Deaths	Case Fatality Rate
1962	27,797	1,021	3.7%
1963	7,953	290	3.6%
1964	5,117	211	4.1%
1965	21,225	635	3.0%
1966	12,001	203	1.7%
1967	13,647	206	1.5%
1968	4,763	1,805	37.9%
1969	14,959	848	5.6%
1970	10,204	602	5.9%
1971	19,174	881	4.6%
1972	21,251	670	3.2%
1973	61,029*	3,479	5.7%

*Estimate based on January-May data.
Source: C.D.C., 1973.
More cases of measles will be reported this year than in any year during the preceding 11-year period. Reported case fatality rates have remained constant.

drought. Cholera may always be feared when crowding and unsanitary water supplies coexist.

Health Planning

From 1967 to 1970 a project was undertaken by the government of Upper Volta to improve the general welfare of children and women in the rural areas. Emphasis was placed on nutrition and hygiene education in primary schools and health centers. The project included digging and covering of wells to provide the villages with uncontaminated water and the building of PMI centers in the villages for the prevention, detection, and cure of major endemic diseases, including leprosy, tracoma, and tuberculosis. In that time period alone, 24 health centers, 42 dispensaries, 2 maternity wards, and one hospital were equipped in the rural areas. In 1968-1969, 834 wells were dug and are being covered and equipped with hand-pumps. A most favorable consequence of the project has been the active participation at the village level of the women in the execution of the social-health sensitization projects. Increased social and economic responsibility among the women is expected to benefit regional and national development in addition to furthering the well-being of the village children. These areas in health care, namely animation in hygiene and nutrition, construction of rural PMI's and of covered wells, and the campaign against endemic transmissible diseases fall under the generalized category of "Service de Stanté de Base." The program has been continued to the present, although its success during the past three years of drought is not known (UNESCO 1970).

Tables 30 and 31 give a summary of the expected cost for health planning in the urban and rural sectors for the period 1972 to 1976.

TABLE 30

Urban Health Program, 1972

Municipal Maternities and Dispensaries will be upgraded for optimal functioning.

Existing hospitals will be re-equipped.

Service of Neuro-Psychiatry to be reconstructed.

Each medical unit will be supervised by a physician, and the quality of treatment improved.

Schedule of Program Expenditures, 1972 - 1976
(in CFA x 10^6)

Projects	1972	1973	1974	1975	1976	Total 1972/76
Construction of second wing of Bobo-Dioulasso Hospital	-	80	64	-	-	144
Construction of Pediatrics Pavilion of Ouagadougou Hospital	-	95	-	-	-	95
Enlargement and Equipping of Blood Bank--Bobo-Dioulasso	-	10	-	-	-	10
Construction and Equipping of Anti-tuberculosis Dispensary--Bobo-Dioulasso	-	25	-	-	-	25
Construction of Dispensary at Koko (Bobo-Dioulasso)	10	23	-	-	-	33
TOTAL	10	233	64	-	-	307

Also, four optional projects amounting to 564 million CFA's were:

1. Construction of a National School of Public Health.
2. Construction of Maternities, Health Centers and Dispensaries in Ouagadougou.
3. Construction and equipping of a psychiatric hospital in Bobo-Dioulasso.
4. Construction of 3 Maternities, 1 Health Center, and 2 Dispensaries in Bobo-Dioulasso.

Source: Fromentin, 1972.

TABLE 31

Rural Health Program in Upper Volta

Schedule of Program Expenditures, 197 - 1976

(in CFA x 10^6)

Projects	1972	1973	1974	1975	1976	Total 1972/76
Development of "Santé de Base	141	84	133	94	90	542
Begin operations at Medical-Surgical Center at Fada N' Gourma	5	3	6	2	-	16
Campaign against Endemic Diseases	118	84	87	130	81	510
Operating of anti-leprosy center in Ouagadougou	2	0.8	0.7	0.7	-	4
Operating of 20 leprosy treatment circuits	4	-	-	-	-	4
Maintenance & repair of Rural Health vehicles	51	25	10	10	10	106
Modernization and enlargement of Rural Medical Centers	-	270	-	-	-	270
Equipping and operation of anti-leprosy center--Kaya	6	4	-	-	-	10
Re-equipment of mobile units (Lutte contre les Grandes Endemies)	9	10	-	-	-	19
Smallpox eradication and measles control program	28	26	21	21	21	117
TOTAL	364	506	258	258	212	1,598

Source: Fromentin, 1972.

Foreign Aid

Contributions from foreign organizations were expected to total 8.8 million dollars for the four-year period, 1972-1976. The following organizations are expected to have contributed the designated amounts to the advancement of rural health projects in Upper Volta:

F.A.C.	852 million CFA	
F.E.D.	270 million CFA	
UNICEF	283 million CFA	
W.H.O.	15 million CFA	
U.S.A.I.D.	102 million CFA	
Follereau Foundation	13 million CFA	
A.D.S	16 million CFA	(Fromentin 1972)

See Appendix F for further information regarding aid from UNICEF and W.H.O.

APPENDIX C: COUNTRY PROFILES

OF

FOOD AND NUTRITION

APPENDIX C.1: CHAD

Traditional Food Patterns

Chad is divided into two distinct climatic zones: The northern desert, which comprises 48 percent of the total area, and the southern savannah. The diets of the northern nomadic tribes differ from those of the southern sedentary groups according to seasonal variations and means of livelihood. Among the northern Caucasian Muslims, for example, diets consist largely of milk and milk products, mutton, and cereal; whereas diets of the southern Negroid Animists are based primarily on tubers, fish, and leaves. Despite an overall cattle/inhabitant ratio of 1.3 in 1965, most cattle were exported on the hoof to Nigeria. In general a large number of cattle is viewed as a symbol of wealth, so that cattle herders will usually eat mutton rather than beef, given a choice.

In the region of Lake Chad and in the river basins of the Chari and Logone, the yearly fish yield has been greater than 100,000 tons (fresh fish) in the past. Not only does fish provide the major source of protein for these people, it is also an important export product (approximately one-half of the total catch is exported to Nigeria in dried or smoked form).

The major grain crops grown in Chad are millet and sorghum, which form the base of most diets. In addition, corn and wheat are grown in the southern prefectures and near Lake Chad. Peanut and rice cultivation in the south has been commercialized to a limited extent. In the north, especially in the prefecture of Kanem, dates are the major crop. A variety of vegetables are grown for autoconsumption, including manioc, squash, cucumbers, eggplant, tomatoes, and beans. Lemon and mango trees are cultivated in some areas; in general, however, very few citrus fruits are grown. Food crops, relative to cotton and cattle, account for a very small proportion of

Chad's exports. In 1965, Chad was self-sufficient in foodstuffs of vegetable origin, with the exceptions of tea and sugar (May 1965).

Before the present drought, the "average" diet in Chad was generally considered to be adequate. Although a nation-wide survey of nutritional status has never been conducted, spot surveys in various regions of the country during the sixties provided some support to this statement. The most complete analysis of nutritional status in Chad was prepared by W. H. O. consultant, Dr. H. Paret (1965). In addition to results from his own surveys in N'Djamena, Moundou, and Sarh, Paret summarized most of the spot surveys which had been conducted in Chad prior to that time. It is clear from these that general statements on nutritional deficiencies cannot be made for the entire country; nevertheless, there seemed to be agreement among the surveyors that, overall, the nutritional status of the people was reasonably good.

There is considerable variation in the statistics available on the average and range of daily per capita intake during normal times in terms of calories and grams of protein. Paret quotes Angladette as reporting that in 1961 Chad's figures for average daily per capita intake of calories and grams protein were the highest in all of francophone Africa: 3,986 calories and 125 grams protein. These figures vary sharply from those reported in the FAO Food Balance Sheets 1964-1966, which are reprinted in part in Table 1.

Most of the surveyors chose children and pregnant women as subjects, presumably because the existence of nutritional deficiencies are most likely to be discovered in these two susceptible groups. For example, Paret advances the theory that the high mortality rates for infants and children in Chad, as in all developing countries, is largely due either directly to a high incidence of malnutrition, or

TABLE 1

National Per Capita Daily Averages for Food Intake in the Sahelian Countries

	Chad	Mali	Mauritania	Niger	Senegal	Upper Volta
Total energy kcal.	2,064.0	2,131.0	1,993.0	2,175.0	2,299.0	2,060.0
Animal energy kcal.	176.0	191.0	566.0	185.0	230.0	73.0
Total proteins	64.6	53.5	73.4	65.1	64.0	70.3
-animal	13.8	15.0	37.5	12.5	21.2	5.3
-milk	2.9	3.8	20.2	5.2	4.0	1.4

Source: FAO Food Balance Sheets, 1964-1966.

indirectly to diseases contracted as a result of lowered resistance consequent to malnutrition. However, in a survey of children in the pediatrics ward of the hospital in N'Djemena, Paret found that only 1.4 percent of the children were suffering from overt malnutrition or undernutrition. This figure compared favorably with the 8.14 percent figure obtained in a similar survey conducted in Bamako. Furthermore, there were no reported cases of kwashiorkor in the hospital or elsewhere in Chad. Although these figures are not supportive of his contention that malnutrition takes a high toll of children, Paret was able to show that children in the 1 - 4 age group from N'Djamena and Moundou suffered a decline in growth rate (weight increase), relative to children in Paris, while up to the time of weaning, Chadian children demonstrated a relatively higher growth rate (Paret 1965).

Deficiencies in Vitamin A, C and B_2 constituted the majority of cases of malnutrition found in Chad. Many villages do not have ready access to fruit and other sources of vitamin C, and some diets do not include a balanced proportion of leafy vegetables. Anemia, when identified, can be attributed to several causes: malaria, insufficient iron in the diet, parasites, etc.

Goiter is a problem in the southern prefectures of Chad, especially in Moyen Chari and the Logones. There appears to be a difference of opinion with regard to its high incidence. Paret suggests that there is insufficient iodine in the diets, whereas Buck et al., consider the problem to be a result of peanut consumption. They state that peanuts are among those plants which prevent the absorption of iodine (goitrogens), and that it is in the peanut-growing regions that the incidence of goiter is high--up to 13.4 percent (W.H.O. 1973a). Compared to some other areas of Africa, this is not a high incidence.

As in all countries of the Sahel-Sudan region, there are numerous food taboos which in many cases are directly responsible for

nutritional disorders. For example, among some ethnic groups it is believed that a mother's milk is poisoned if she becomes pregnant while nursing; consequently, the nursing child is weaned, regardless of his age, and is likely to be fed a diet with insufficient protein.

Current Food Supply

In response to the pressures of drought on food availability, two surveys of Chad were made in 1973 by FAO missions (Ganzin 1973a; FAO 1973a), one in July and one in October. Their objectives were (1) to assess the food situation, in terms of production and consumption of grain during 1972; (2) to make predictions of the availability of grain for the period October 1, 1973 to September 30, 1974; (3) to assess the logistical problems that would be associated with a food aid program; and (4) to make recommendations with regard to food aid and its distribution for the period October 1, 1973 to September 30, 1974. It was recognized by both missions that the overall grain production was not a fair indicator of the actual availability for villages in different parts of Chad. While it appeared to the first mission that the southern prefectures had a surplus in grain supplies, a number of factors (poor transport and storage, unstable market prices) largely precluded the possibility of the northern prefectures' benefitting from the south's surpluses, if they existed. Logistically, some of these same factors, particularly the lack of adequate transport facilities, determined the limitations of the suggested food aid program. Although the missions came up with radically different estimates of actual food needs, the recommended allotments of food aid were arrived at through careful analysis of distribution feasibility. The October mission judged the effects of the drought in Chad as being far more severe and widespread than indicated by the earlier mission. It recognized an immediate need

(within the six-month interval between September, 1973, and April, 1974) for 53,000 tons of food. Furthermore, it estimated that 84,000 children and 8,000 women in the drought-stricken areas were urgently in need of aid. The total grain requirements for 1973-1974 were assessed at 100,600 tons, of which only 28,000 tons had been pledged by donor countries at that time (see Tables 2 and 3).

Nutritional Status--Impact of the Drought

An unqualified statement with regard to nutritional status of the Chadian population cannot be made by the authors at this time. No nutritional surveys conducted in the past twelve months have come to their attention. Nevertheless, one might reasonably assume that the severe shortage in food supplies (in terms of both crops and livestock) during the past two years has resulted in multiple nutritional deficiencies for a considerable proportion of Chad's population. Food aid assessments were based on the bare minimum requirements for survival, and it is not known at this time to what extent food aid distribution has been realized.

Nutrition Planning

Efforts in this area have been concentrated in the past on providing elementary instruction in nutrition and food preparation to mothers and to children. The National Center of Nutrition and Food Technology for Chad (CNTA) and various U.N. Organizations (W.H.O., FAO, and UNICEF) have been the foremost initiators of nutrition planning. Their projects have included technical instruction in nutrition for health personnel, nutrition animation of patients and clients in the PMI's and social centers, and establishment of school canteens.

TABLE 2

Forecasts of Harvests and Food Deficit in Chad
(end September, 1973)

Prefectures	Population	1973 Production	Requirements In tons* x 10^3	Deficit In tons x 10^3	Deficit Percent
Sahelian zone					
Batha	330,000	18.0	36.3	- 18.3	50.0
Bet	81,000	-	8.9	- 8.9	100.0
Biltine Ouaddai	491,000	25.2	54.0	- 28.8	53.0
Kanem	192,000	1.6	21.0	- 19.4	92.0
Lac	130,000	5.6	14.0	- 3.4**	20.0
Chari-Baguirmi	470,000	34.0	52.0	- 18.0	34.0
Guera	178,000	16.0	19.6	- 3.6	18.0
Salamat	93,000	10.0	10.2	- 0.2	1.0
Sub-total	1,965,000	110.4	216.0	-100.6	46.5
Southern zone					
Mayo Kebbi	510,000				
Tandjile	251,000				
Logone Occid.	247,000	270.0	270.0	***	0.0
Moyen Chari	418,000				
Sub-total	1,683,000	270.0	270.0	0.0	0.0
TOTAL	3,648,000	380.4	486.0	-100.6	20.7

* On the basis of 110 kg/inhabitant/year for the Sahelian zone and 160 kg/inhabitant/year for the southern zone.
** Deficit partly met by wheat production (5,000-6,000 tons/year).
*** No surplus in the south this year.

Source: FAO 1973a.

TABLE 3

Consignments of Grain Expected or Available in Chad on October 12, 1973

Aid	Awaited	Route	ETA Port	ETA Chad	Remarks
Wheat, Rwanda	136.5	Nigeria	arriving	end 9/73	
Wheat, Finland	830.0	Nigeria	9/25/73	10/25/73	
Rice, China	2,000.0	Nigeria	10/ 7/73	11/ 7/73	
Wheat, FAC 1st quarter	2,500.0	Nigeria	10/ 4/73	11/ 4/73	
Sorghum, U.S.A.	3,000.0	Nigeria	10/17/73	11/17/73	
Maize, China	2,000.0	Nigeria	10/31/73	11/31/73	Source: Embassy
Maize, FAC 1st quarter	2,000.0	Nigeria	10/31/73	11/31/73	
Semolina, Canada	2,000.0	Nigeria	11/15/73	12/15/73	
Wheat, FAC 2nd quarter	2,500.0	Nigeria	11/30/73	12/30/73	
Maize, FAC 2nd quarter	1,000.0	Nigeria	12/73	1/74	
Sorghum, FAC 1st quarter	1,000.0	Nigeria	12/73	1/74	
Sorghum, FAC 2nd quarter	1,000.0	Nigeria	1/74	2/74	
Wheat, EDF 2nd quarter	6,000.0	Nigeria	2/74 3/74 4/74	3/74 4/74 5/74	3 consignments of 2,000
Rice, U.S.S.R.	2,000.0				
Sorghum, Sudan	1,000.0				
TOTAL	28,966.6*				

*Rounded to 28,000 in text.

Source: FAO 1973a.

When he wrote his report in 1965, Dr. Paret stated that an official inter-ministerial committee on nutrition existed, but that it was basically non-functional. The dearth of nutritional data, in conjunction with the low priority rating attributed to nutrition planning has rendered the committee much more token than real. He felt that coordination by a single-minded agency such as CNTA would be required before nutrition planning would be incorporated as an important priority in national development policy (Paret 1965).

APPENDIX C.2: MALI

Traditional Food Patterns

Food patterns in Mali have followed closely the generalized patterns for the Sahel-Sudan region. Comparisons and contrasts between dietary patterns can be drawn according to various social, economic and ecological criteria, for example, (1) dietary patterns of urban dwellers as compared to those of rural inhabitants; (2) patterns for nomadic groups and those for sedentary groups; (3) to a lesser degree, dietary patterns of the wealthy versus those of the poor. The first of these comparisons-- urban vs. rural--reflects the difference between a money economy, where what a person eats depends on his ability to purchase food rather than on availability of food (the urban centers have good storage facilities and food year-round), and a subsistence economy, where seasonal variation determines the availability of food. Accessibility to food, then, is the major differentiating feature of the dietary habits for these two groups of people. On the other hand, dietary staples do not vary greatly, although there tends to be somewhat more variety in the urban resident's diet than in that of the farmer.

Differences in lifestyle and occupation dictate the variation between the diet of nomads and that of sedentary farmers. Milk and milk products serve as the food base for nomads, who generally consume an adequate amount of animal protein, but whose caloric intake is considered insufficient. In contrast, sedentary farmers base their diets on grains and vegetables, and although most raise some livestock, they generally consume an insufficient amount of animal protein.

With regard to diets of the wealthy versus those of the poor, Dr. Jacques May suggests that differences are generally a matter of quantity and not quality. That is, increased consumption of

carbohydrates provides more calories, but does not necessarily contribute to a more nutritious diet (May 1968).

Staple foods for urban dwellers, sedentary farmers, and fishermen are millet and sorghum. Rice cultivation in the central delta of the Niger River has steadily increased in importance since the 1960's and rice is now popular as a staple food in the cities. Secondary staple foods include corn, fonio, and peanuts. Most dishes consist of a millet or sorghum base with a vegetable, oil and meat sauce. Two of the most popular vegetables which have particularly high protein content are niébé (Vigna sinensis - 23.3 percent protein) and the Sudan bean (Phaseolus acutifolius - 21.2 percent protein). Other vegetables include the Bambara pea, dolique, eggplant, tomatoes, yams and sweet potatoes. May reports that in addition to domesticated vegetables, many nutritious wild varieties contribute substantially to the diets; unfortunately, these wild plants are usually neglected in nutrition surveys.

For a country which has traditionally ranked first among the francophone countries in cattle, and whose yearly fish catch ranks third among African countries north of the equator, it is paradoxical that its inhabitants--be they farmers, herders, or fishermen--consume relatively little animal protein. According to FAO figures for 1964-1966, less than 35 percent of the total protein intake is from animal sources number of factors are responsible for this contradiction: (1) prestige is associated with herd size; (2) meat is frequently saved for feasts, even during the difficult soudure period; (3) there are many food taboos regarding meat, eggs, and milk which are recognized by most cultural groups; (4) it is estimated that one-fourth to one-half of the yearly fish catch is lost to insects, and most of the remaining fish are used for trade rather than consumption (Biesemans 1973).

Various estimates of average caloric and protein intake have been made and are given in Table 4.

TABLE 4

Average Per Capita Daily Caloric and Protein Intake for Mali

	Total Calories	Total Protein (grs.)	Animal Protein (gr.)
Republique du Mali (W.H.O. 1976)	2,394	75.5	11.4
Angladette (W.H O. 1976)	2 [illegible]08	83.0	5.0
FAO Balance Sheet	2,[illegible]31	53.5	18.8

Again, national averages are only suggestive, and do not reflect the extreme variations in diets due to seasonal fluctuations. Sample surveys conducted during the 1960s provided some insight into nutritional status of the people as a function of seasonal change.

In Mali, as elsewhere in the Sahel, periods of abundance resulting from grain harvests (November-December) are followed by a gradual reduction of food stocks until July and August when food is extremely scarce and overt signs of malnutrition begin to appear. May cites a survey conducted by Pales, et al. in 1954 which indicated that in a village 46 kilometers outside of Bamako, over 70 percent of the villagers were surviving on an average caloric intake of 802 C per capita per day during July. Relief usually comes in September with the harvest of corn, fonio, and niébé (May 1968).

Most sample surveys have been carried out in the area under the control of the Office du Niger, where nutritional status is generally considered to be the best in the country. Nevertheless, when compared to W.H.O. standards for nutritional requirements, most

diets in the area were deficient in vitamins A, B_2, C, and in calcium and iron, even during harvest months.

Goiter is common throughout Mali, with an average incidence rate of 10.6 percent. The rate exceeds 60 percent in some parts, particularly in the cercle of Bandiagara in the Mopti Region.

The incidence of malnutrition is particularly high among the 1 - 5 age group. Weaning patterns have long been recognized as the foremost contributing factor to childhood malnutrition. In general, babies grow normally during the first six months, but growth rates decline dramatically after that age, when the mother's milk is insufficient in quantity. If the child is fed a supplement, it is the common bouille (tô) that adults eat. This dish has very little value as a source of protein. As a consequence of the low protein diet, marasmic children are frequently found in hospital pediatric wards. The percentage of cases of overt malnutrition among hospitalized children was estimated at 14.2 percent in 1969. Twenty-three percent of all deaths in the Centres de Pediatrie were attributed to malnutrition (Fromentin 1969).

Rates of malnutrition among children of the 1 - 5 age group during normal times range from 1.2 percent in Segou Region to 5.4 percent in each of Mopti and Sikasso Regions (May 1968).

Current Food Supply

The most recent surveys of the food supply in Mali were conducted last July and October by two separate FAO missions. Government figures for agricultural production and food demand could not be substantiated by the mission members, and their reports provide only rough estimates of actual food needs for the period between October 1, 1973 and September 30, 1974. We cannot say at this time whether their figures for food aid requirements have

proven reliable during the past ten months or not. The food aid considered necessary by the second mission included 198,000 tons of grain for the affected rural areas (plus 60,000 tons to be sold in markets to the less affected urban residents), 8,760 tons of dried milk, 6,840 tons of fats, and 7,200 tons of CSM (FAO 1973b).

In Mali responsibility for the transport and distribution of food rests with a national drought control committee made up primarily of members of the Ministry of Defense and Security and of OPAM (Mali Farm Produce Office). Generally speaking, the storage facilities, with a total capacity of 96,000 tons, are considered sufficient to fill the needs of the inhabitants, given adequate stocks. Although most of the store-houses are located in the urban centers, 1000-ton storehouses are distributed among the chef-lieux of the cercles.

Conditions among the northern nomadic groupswere considered a major problem, and many of the difficulties facing the drought control committee had to do with transporting food to the Gao Region where most of the nomads live, and where total disaster has been declared. Governmental supervision of settlement patterns for migrating nomads has facilitated food aid distribution to a great extent. Relatively speaking, the sedentary farmers and urban dwellers have fared far better during the drought years than the nomads. To a large degree, the disequilibrium of effects is attributed to long-standing social conflicts between the sedentarized and nomadic populations. Both FAO missions expressed the view that major socio-economic adjustments are absolutely prerequisite to improving the lot of the nomads (Ganzin 1973b; FAO 1973b).

Nutritional Status - Impact of the Drought

Those areas designated by the Malian government as disaster areas were the subject of a nutritional surveillance conducted in August and September of 1973 by the Center for Disease Control in Atlanta. They selected a total of 517 children from 20 sedentary clusters and three nomad clusters considered representative of conditions in the villages of the affected areas. Using 80 percent of the median Stuart-Meredith weight-for-height measurement as the threshold for acute malnutrition, they recorded measurements for each child and checked for signs of edema, an overt indicator of kwashiorkor. Their findings are summarized in Table 5.

The dramatic decrease in incidence of undernutrition in the Gao sample between July and September reflects the massive migratory movement of nomads away from the area. It is clear from Table 5 that the most severely affected groups are the nomads in the northern part of the country. Furthermore, rates of 40 percent and 43 percent edema were recorded for nomadic children in Tombouctou and Gao, respectively, as compared to less than 1 percent among the sedentary populations examined (C.D.C. 1973).

Nutrition Planning

Nutrition planning is recognized by Malian health officials as an important variable in national development. Implementation of a national nutrition program began in 1966 with the designation of a Division of Nutrition within the Ministry of Health and Social Affairs. At that time a director and two dieticians were appointed to a government office in Bamako. Unfortunately, lack of equipment and vehicles confined their efforts to Bamako. In view of the limitations, they focused their attention on nutrition training programs for all medical, paramedical, and social personnel.

TABLE 5

Percent of Children with Measurements below Acute-Malnutrition Threshold, Selected Areas, Mali July-September, 1973

Date	Area	Nomad			Sedentary			Total		
		Number Clusters	Number Children	Percent <Threshold	Number Clusters	Number Children	Percent <Threshold	Number Clusters	Number Children	Percent <Threshold
8/73	Tombouctou	1	35	80				1	35	80
7/73	Gao	1	50	70	5	124	49	6	174	55
9/73	Gao	1	51	35	5	112	30	6	163	32
8/73	Nioro				6	126	3	6	126	3
8/73	Nara				9	182	4	9	182	4
Total*		2	85	74	20	432	17	22	517	26

* Excludes Gao revisit in 9/73.

Source: C.D.C. 1973.

A broader approach to the nutrition problem has included an increased emphasis in areas such as primary education, agricultural training schools, and promotion of research in developing acceptable dietary supplements. Opinions vary as to the most effective way to ameliorate the nutritional status of a population. According to one theorist, nutrition planning on a large-scale basis is necessarily linked to agricultural production, environmental sanitation, food processing, marketing, and education activities (Pines 1973). It would seem that Malian officials are of a similar opinion, and through an integrated approach they hope to find a solution to this important problem.

W.H.O., UNICEF, and the World Food Program (WFP) have been major contributors in the field of nutrition in Mali. W.H.O. technical consultants have been associated with the Nutrition Division in some capacity since its inception. The development of "santé de base" programs has led to an emphasis on nutrition animation, particularly in the PMI's, mobile units, and social centers.

APPENDIX C. 3: MAURITANIA

Traditional Food Patterns

Seventy-five percent of Mauritania's population are transhumant herders, which makes it the only country in the Sahel–Sudan region where nomads outnumber sedentary farmers. In fact, sedentary farmers are found only along the Senegal River in the southwest portion of this vast country. There the climate is typically Sahelian and the fertile alluvial soil is conducive to agriculture. Crops there are very similar to those found in the other five countries: millet and sorghum, niébé, peanuts, barley, wheat, and sweet potatoes. To the north of the Senegal River Valley, herding in the desert, mining in the central plateau, and fishing along the coast constitute the different livelihoods.

Diets vary seasonally. For example, during the rainy winter months, more milk is consumed than cereals, while the opposite is true during the dry summer months. The soudure in May and June is relieved somewhat with the second harvest of millet in the Senegal River Valley, and by the harvest of wild fonio.

For many years before the present drought, cereal crop production in Mauritania was barely enough to cover one-half of the demand. About one-fifth of the requirements in leguminous plants was met by imports (W.H.O. 1973c).

In an area where herd size is associated with wealth and prestige, it is not surprising that three-fourths of the milk produced has traditionally been fed to the young animals, and that the majority of the people consume less than three ounces of meat per person per day.

Figures in Table 6 were based on an interview survey conducted by S.E.D.E.S. in 1968. Clearly the urban population is in a better position with respect to availability of certain foods than are the food-producing populations themselves.

Extremes in per capita consumption, as evidenced in Table 6, suggest the kinds of reservations which must be kept in mind when

considering national averages for these countries. Accordingly, Table 7 should be interpreted with caution.

The incidence of malnutrition in Mauritania is not well known. For most infants, weaning takes place between 18 and 24 months, and their diets are usually supplemented with milk after six months. Consequently, the protein-calorie malnutrition so widespread among children in the Sahel-Sudan region is not so prevalent in Mauritania. According to results from a survey in the Hodh regions by Mazer in 1959, signs of malnutrition appear more frequently among the 5-15 age group than among the very young children (cited in W. H. O. 1973c).

Current Food Supply

The severe drought of the past five years has been a nationwide disaster in Mauritania, with no area escaping its ravages. With a reduction of the cattle herd size from 2,400,000 head in 1968 to an estimated 600,000 head in 1973, the nomads have lost not only their livelihood but their major source of food as well. Grain production for 1973-1974 was estimated to be less than 30 percent of the normal yield, which had always been insufficient to feed the population. Formerly, grain had been imported from Senegal and Mali, but since these countries are also suffering from the drought, Mauritania has become dependent almost solely upon foreign aid (FAO 1973c).

The multi-donor mission to Mauritania, under the auspices of FAO, reported in October, 1973, that 100,000 tons of grain, 6,000 tons of milk, and 4,000 tons of fats would be required from external sources to feed the population between October 1, 1973 and September, 1974. The actual food demand was estimated at 198,000 tons, 67,000 of which was expected to be rice purchased by Sonimex (Société Mixte d' Importation et d'Exportation), an industrial firm in Nouakchott which monopolizes importing of consumer goods. In view of the immense

TABLE 6

Annual Per Capita Consumption
of Certain Foods in Mauritania

Annual per capita consumption (in kilos)	Rice	Sugar	Tea	Millet	Meat
Nomads	6.17	16.6	1.42	75.7	23.5
Sedentary farmers	6.00	12.4	0.72	140.0	17.5
Urban	55.20	36.7	2.80	94.8	42.3
National average	10.30	17.8	1.44	87.0	24.2

Source: Data cited in W.H.O. 1973c.

TABLE 7

National Averages for Daily Per Capita Consumption
of Some Food Types in Mauritania

	g/person/day	Kcal.	prot.g
Cereals	299	1,038	28.9
Legum	29	101	6.6
Dates	29	39	0.2
Meat	94	154	12.1
Milk and derivatives	470	362	20.2
Fish	31	26	4.8
Sugar	56	217	-

Source: Data from FAO Food Balance Sheets, 1964-1966.

limitations posed by the inadequate transport system, it was not known how the remaining deficit of 31,000 tons could be met.

In December, 1972, the Minister of Health and Social Services was appointed the coordinator of all food relief operations. He has been faced with largely insurmountable difficulties, namely the virtual nonexistence of storage facilities, impassable or nonexistant roads to outlying areas, and a limited number of transport vehicles (further compounded by limited supplies of fuel). About 60 percent of the food aid was expected to be sold on the market to provide the revenues necessary for distributing the remaining 40 percent to the hardest hit areas.

Nutritional Status--Impact of the Drought

The Center for Disease Control conducted an extensive survey of nutritional status in Mauritania in August, 1973 (C. D. C. 1973). It covered nomadic or sedentary clusters or both in all but two regions (Regions IV and VIII). A summary of their results can be found in Table 8. In addition to weight-height measurements, they noted signs of overt malnutrition and found large numbers of the population, especially in Region VI near Boutilimit and R'Kiz, suffering from chronic malnutrition and in some cases, severe undernutrition. Several cases of scurvy and beri-beri had been treated by local doctors. Measles was the major cause of death with a case fatality rate of 30 percent among some of the nomad groups. It was reported that refugees in Boutilimit and R'Kiz were surviving on a monthly per capita ratio of four kilograms of food grains and one kilogram of dried milk. The population in Region VII had not suffered so much as might have been expected, thanks to a fairly good date crop.

Nutrition Planning

A concerted and coordinated program of nutrition planning has not

TABLE 8

Percent of Children with Measurements below Acute-Malnutrition Threshold* Selected Areas, Mauritania August, 1974

Region	Area	Nomad			Sedentary**			Total		
		Number Clusters	Number Children	Percent < Threshold	Number Clusters	Number Children	Percent <Threshold	Number Clusters	Number Children	Percent <Threshold
I	Nema	4	102	22	-	-	-	4	102	22
II	Aioun	1	36	25	-	-	-	1	36	25
III	Kiffa	4	108	13	-	-	-	4	108	13
V	Boghe	4	101	12	1	33	3	5	134	10
V	Aleg	2	70	14	-	-	-	2	70	14
Total Region V		6	171	13	1	33	3	7	204	11
VI	Nouakchott	3	151	17	2	74	5	5	225	13
VI	Boutilimit	4	105	18	1	29	0	5	134	15
VI	Rkiz	2	56	18	1	35	14	3	91	16
VI	Rosso	1	21	52	2	55	11	3	76	22
VI	Mederdra	1	35	14	2	50	10	3	85	12
Total Region VI***		8	217	21	6	169	9	14	386	16
VII	Chinguetti	-	-	-	3	81	9	3	81	9
VII	Atar	-	-	-	2	53	4	2	53	4
Total Region VII		-	-	-	5	134	6	5	134	6
Grand Total		26	785	17	14	410	7	40	1,195	14

* 80 percent of the median Stuart-Meredith weight-for-height ratio.
** Includes children of government workers.
*** Excludes Nouakchott.

Source: C. D. C. 1973.

been implemented by the government of Mauritania. Nevertheless, those ministries concerned directly or indirectly with nutrition problems have made some efforts in this direction. For example, the Ministry of Health and Social Affairs has promoted nutrition animation in some of the PMI centers, while the major thrust of the 1970-1973 economic and social development plan was to increase agricultural production. In addition, the World Food Program has worked in coordination with the Ministry of Education to sponsor a school canteen program in post-primary schools. Needless to say, the emergency situation caused by the drought has largely preempted these endeavors and replaced them with a concerted effort to prevent mass starvation.

APPENDIX C.4: NIGER

Traditional Food Patterns

The Sahel-Sudan, or agricultural zone within Niger, covers approximately 30 percent of the total land area, with the remaining 70 percent being desert or sub-desert. The major crops grown include millet and sorghum, rice, wheat, corn, beans, niébé, manioc, peanuts, voandzou, onions, tomatoes, sugar cane, and potatoes. Bananas, pineapples, and guava, in addition to the usual mangoes and papaya, are cultivated. According to May, both niébé and voandzou are excellent sources of vegetable protein and are relatively easy to grow in arid regions. Unfortunately, over half the harvests of these two legumes are exported out of Niger to the southern coastal countries (May 1968).

Tuaregs and Peuhls are nomadic groups which together account for 20 percent of the total population. Approximately 54 percent of the population are Hausa agriculturalists, and the Djerma, including both sedentary farmers and nomads, comprise 25 percent of the total. Livestock are an important feature in the lifestyles of all groups, since even sedentary farmers often own some cattle. Animal protein is supplied by these herds, as well as by sheep, camels, and to a lesser extent chicken, fish, and wild game. Results from a study by Kretchmer indicate that physiological differences with regard to lactose metabolism exist between the nomads and such groups as the Hausa. Specifically, the latter groups do not demonstrate lactase activity after age five and can consume only those milk products in which the lactose has been broken down or eliminated. On the other hand, fresh milk is an important source of protein during the entire life of a nomad (Kretchmer 1971).

Little information exists regarding the nutritional status of the population during normal times. Before the drought, the majority of Nigeriens were believed to have an adequate diet with a national average

per capita intake of 2,175 C a day, which ranked second only to Senegal among the six Sahelian countries (FAO Food Balance Sheets 1964-1966). To many observers protein-calorie malnutrition appeared to be widespread among children in the 1-5 age group, and localized in pockets among other age groups. A Peace Corps survey of pre-school children (exact ages not given) was conducted in six centers in the southwest portion of Niger during 1970-1971. The surveyors used standard methods for determining the existence of malnutrition, and came up with malnutrition rates ranging from 13 percent to 38 percent, with a weighted average of 24 percent of the 551 subjects (W. H. O. 1973d).

The first results of a survey on "Malnutrition among Infants in Niger" done between April and June, 1973, by the Direction of Social Affairs and the PMI indicated that 16-21 percent of the children are undernourished before they are one year old, and the prevalence rises to 30 percent for children 1-3 years old. The number is even higher among children seen in curative pediatric clinics (Ministère de la Santé Publique, Niger 1973). There is a consensus among persons involved in the nutrition field in Niger that childhood protein-calorie malnutrition here, as elsewhere in the Sahel, is due above all to ignorance of correct ways to supplement a child's diet at the time of weaning.

Seasonal fluctuations greatly influence the incidence of malnutrition. It is most prevalent during the months of May, June, and July; this is preharvest time, and it is during this period that food reserves are at a minimum. April, May, and June are the hottest months of the year and dehydration becomes a problem in addition to the malnutrition. Pockets of scurvy, beri-beri, pellagra, and ricketts exist year round, but their incidences increase dramatically during the soudure. Anemia is frequently the compounded effect of too little meat

and heavy infestation of blood and intestinal parasites.

Current Food Supply

The FAO mission of October, 1973, with the help of Niger's Agriculture Service, estimated the 1973 grain harvest and the deficit with respect to food demand. Grain requirements amounted to 857,856 tons, 636,328 tons of which were expected to be supplied by Niger's farmers. The remaining 221,626 tons was the amount to be supplied by donor nations. In addition, it was determined that food aid should include 8,850 tons of milk powder for use in medical units plus 7,300 tons of CSM, 5,800 tons of fats, and if possible 363 tons of fishmeal, to offset the effects of herd loss by the nomads.

As a consequence of the drought during the past few years, the rate of immigration from Chad and Mali into Niger has greatly increased. The presence of an additional 150,000 people (estimated) precipitated the Niger government's request to the mission that a special regional food stockpile be established for "floating" populations. Such a system, covering the entire Sahel region would help to offset many of the political, social, and economic problems which have so often proven insurmountable during the current crisis (FAO 1973d).

Nutritional Status: Impact of the Drought

Using 80 percent of the Stuart-Meredith scale as the threshold beneath which a child is considered to be suffering from acute malnutrition, the Center for Disease Control conducted a survey on 438 Nigerien children from purportedly representative clusters of nomadic and sedentary groups (north and south) from areas designated by the government as the most severely affected by the food shortage. Their findings showed an average of 9 percent of those children examined fell beneath the 80 percent margin. The percentages were further

broken down according to social type (nomadic and sedentary) and location. These figures are given in Table 9.

The data strongly suggest that the nomads have been affected more severely by the drought than the sedentary groups. Notably the highest incidence of acute malnutrition was recorded for a single cluster of Malian refugees; measurements for one-fourth of the children fell below the threshold. Most children suffering protein-calorie malnutrition were marasmic; less than 2 percent of the children examined showed edema (C. D. C. 1973).

Nutrition Planning

The most direct effort to ameliorate the nutritional status of the Nigerien people, particularly pregnant women and young children, has been made in the PMI's. A large number of these centers instruct young mothers in the proper way to prepare food, and in the selection of the right kinds of food, especially weaning foods for their babies. These programs and others which are directly involved with the nutrition field have been widely supported by the international agencies, notably FAO, UNICEF, and W. H. O. At the national level there is a division of sanitary education and nutrition within the Ministry of Public Health.

Recognition of the nutrition problem prompted the publication of two documents by the Niger government in 1973. Prepared by the Ministry of Public Health, "Survey of Malnutrition in Children in Niger" was regarded as a first step in a better understanding of the health status of children in the country (Ministère de la Santé Publique, Niger 1973). The second document, "Nutritional Perspectives for the Countries of the Sahel for 1985" was prepared by the Ministry of Development and Cooperation. It attempts to show how projections of certain important variables in the development process -- population growth,

TABLE 9

Percent of Children with Measurements below Acute-Malnutrition Threshold, Selected Areas, Niger
August-September, 1973

Area	Nomad			Sedentary*			Total		
	Number Clusters	Number Children	Percent < Threshold	Number Clusters	Number Children	Percent <Threshold	Number Clusters	Number Children	Percent <Threshold
North	7	145	14	5	106	3	12	251	9
South	4	85	8	5	102	5	9	187	6
Total	11	230	12	10	208	4	21	438	8
Malian Refugees	1	20	25						

*Excludes all villages of population 5,000 or more.

Source: C. D. C. 1973.

economic growth, and food availability -- serve to demonstrate what steps must be taken in the very near future to assure enough food for the populations of 1985 (Ministère du Dévelopment et de la Cooperation, Niger 1973).

APPENDIX C. 5: SENGEAL

Traditional Food Patterns

A considerable amount of information on dietary habits and nutritional status exists for Senegal. Numerous surveys of food patterns according to ethnic group, ecological region, and season have been conducted before and since independence.

There are three distinct ecological regions in Senegal: the northern Sahel region, the central Sudan region, and the southern woodland region. Production in the first region is limited primarily to herding and some grain crops. Major food crops in the central zone, which includes the so-called "peanut basin," are millet and sorghum, rice, maize, and niébé and other legumes. In the southern zone, rice, manioc, and legumes are cultivated for consumption.

Urban residents have their own special diet, made up largely of imported grains, such as rice and wheat. Some very sophisticated vegetable gardening goes on just outside the cities, especially around Dakar; surplus production from these is exported. Food availability in the cities is constant year-round, in sharp contrast to the rural areas where seasonal fluctuations contribute to an annual pattern of food excesses and deficits. It should be pointed out, however, that the excessive rural-to-urban migration during the past 15 years has led to an overall decrease in available food per capita in the cities. In Dakar, for example, it has been estimated that the average daily per capita caloric intake of 3,000 C. in 1953 had diminished to 2,200 C. by 1965. Likewise, the average number of grams of protein consumed per capita had decreased from 83/day to 66/day (W.H.O. 1973e).

In 1968, Hellegouarch, et al., conducted a survey of diet patterns in Fatick Department, 150 kilometers out of Dakar. They determined caloric, protein, and lipid intake according to the following three seasons:

I. January-February: post harvest

II. May-June: living off food stocks

III. September-October: soudure

Their findings showed an intake pattern ranging from a 3 percent - 10 percent excess in calories/person during season I, to a 7 percent - 18 percent deficit during season III. Protein/person varied from a 11 percent - 18 percent excess during season I to a 6 percent - 20 percent deficit during season III. These same patterns have been demonstrated time and again for different rural areas in Senegal; they differ only in degree of excess and deficit (cited in W. H. O. 1973e).

In general, people in the rural areas eat two meals a day, one at noon, and one in the evening. There may also be a small breakfast of leftovers. During the soudure, most families have only one formal meal, but part of every day is spent searching for wild plants and small game. During this time, rats and dogs are not an uncommon addition to the daily fare (May 1968).

Ethnic differences dictate to a great extent the livelihood of an individual, food taboos which he is expected to observe, methods of cultivation, and a whole range of other culturally-based activities. Frequently these factors play as large a role, if not larger, as the climatic and soil conditions in determining the adequacy of an individual's diet. Anthropological evidence for this relationship abounds, and the reader is referred to May, The Ecology of Malnutrition in West Africa and Madagascar (1968).

Protein-calorie malnutrition is not uncommon in Senegalese children. The particular type of PCM is a function of the region and predominant mode of livelihood. For example, marasmus is the type of PCM observed most frequently in children from the northern areas of the country, while kwashiorkor is more prevalent in the southern regions. The cases seen most frequently, however, are marasmic kwashiorkor, which is most typical of the central population. The large majority of children with PCM are from the urban centers,

among the class of recent migrants.

Other types of malnutrition which are encountered include anemia, particularly among pregnant women and young children, riboflavin deficiency among children, and goiter in several regions, especially in Casamance and Senegal Oriental. Incidence of goiter is higher in females than in males. Anemia is associated with several factors, such as iron deficiency, malaria, blood parasites, and ascorbic acid deficiency. Cases of avitaminosis A, C, and B_1 are rare.

Urbanization has resulted in an increased incidence of malnutrition for large numbers of the rural-urban migrants. The sudden change from subsistence farming to a money economy often places the migrant in the difficult position of being unable to purchase food for himself and his family. Most of these people are skilled as farmers, but qualify only for the low-paying unskilled positions available in the cities. Hospital records in urban centers indicate that young children suffer most from the rural-urban move. An additional problem is faced by infants in the city: it has become popular for women to bottle-feed their babies rather than nurse them. This serves to increase the likelihood of enteric infections.

Current Food Supply

Senegal's position in face of the current drought is somewhat different from the position of the other Sahel -Sudan countries. Whereas 94 percent of the population from the other countries is rural and auto-subsistent, only 54 percent of Senegal is rural (Ganzin 1973c). The rest of Senegal's population resides in semi-urban or urban centers. For several years before the current drought, Senegal depended upon imports to supply enough food for its population. This need now amounts to approximately one-third of the total requirements, or 300,000 tons of grain per annum. Much more emphasis has been placed on the development of cash crops for export than upon food crops for auto-subsistence.

The drought has had a particularly detrimental effect on the peanut crop, which is the principal cash crop; consequently, those farmers depending on the peanut crop have lost much of their purchasing power. Therefore these populations, as well as those nomadic groups who have lost large numbers of cattle, are most in need of food aid.

The FAO mission determined a minimum need of 25,000 tons of grain for the year 1973-1974. Given the likelihood of another subnormal harvest in November (after the mission's visit), the mission set a maximum need at 60,000 tons, to be supplied to the most affected populations. There was no mention by the government of need for supplementary foods such as milk powder and CSM; presumably, these needs will continue to be met as they have in the past by UNICEF and other voluntary agencies (FAO 1973e).

Nutritional Status: Impact of the Drought

Very little information exists which specifies the effects of the drought on the nutritional status of the people. The small sample surveys which have been conducted indicate that the impact in Senegal has been much less severe than in isolated areas of the other five countries. In some regions, children seem generally thin, but their nutritional status is about the same as in normal years (Ganzin 1973c).

Nutrition Planning

In the field of nutrition planning, Senegal is among the most advanced countries in Africa. Not only is nutrition planning incorporated into the various ministries of the government, but it is the special interest of numerous institutes and agencies. While it is beyond the scope of this profile report to give a complete survey of the countless achievements in this field, some of the more outstanding ones will be outlined here.

Within the Ministry of Public Health there is BANAS (Bureau d'Alimentation et de Nutrition appliquée au Sénegál) which supervises the training of nurses and other paramedical personnel in matters of nutrition. Its activities fall within the general framework of the "santé de base" program.

ORANA (Organisme de Recherche sur l'Alimentation et la Nutrition en Afrique) is concerned with all aspects of the field: clinical surveys, laboratory research, and training. Although it is a division of the Ministry of Public Health, it is financed by outside agencies.

ITA (Institut de Technologie Alimentaire) is primarily concerned with the development of enriched foods for placement on the market and for use in medical units. One of their earliest successes was the development of "farine," a flour composed of millet and peanut. In response to the discovery of aflatoxins, they have developed other formulas which substitute such legumes as niébé for peanuts.

The medical school in Dakar places much emphasis on nutrition instruction, particularly in conjunction with pediatrics. In Khombole, where medical students receive clinical training, it has been estimated that during the past five years, 55 percent of the children have been receiving an adequate diet, as compared to 31 percent prior to that time.

School canteens and school gardens are common in the primary schools. Nutrition education is being given to all school children.

UNICEF, W.H.O., and the World Food Program have contributed large sums of money, equipment, technical supervision, and supplies in response to the government's concern in matters of nutrition. Activities and programs which they have sponsored range from the development of a milk industry in St. Louis to training students in horticultures, to development of the rural infrastructure.

APPENDIX C. 6: UPPER VOLTA

Traditional Food Patterns

A report on the nutritional services in Upper Volta was prepared in 1972 by W. H. O. nutritionist Dr. J. Budlovsky. His account included several references to surveys which had been conducted prior to his study. He pointed out that no clinical surveys on the nutritional status of vulnerable groups had been done, and that most information available was very general. Many of Dr. Budlovsky's observations and remarks have been incorporated into the present report (Budlovsky 1972).

Traditional food patterns in Upper Volta do not vary appreciably from those found in the other Sahel-Sudan countries. Millet and sorghum form the base of every diet, while rice and corn provide some variety for urban populations. Statistics indicate that cereals provide 75-80 percent of the caloric content of an individual's diet. Favorite dishes are the ubiquitous "tô," "bouillie," patties and cakes. The monotony of the starch base is broken by the various sauces made of leafy vegetables, peanuts, oil, and sometimes meat or dried fish. The legumes used in the sauce, namely gumbo, niébé, baobab leaves, peanuts, voandzou, and others are the most important source of protein in the diet. During the soudure when sorghum is scarce, diets in the south and southwest include fonio and tubers, such as manioc and sweet potatoes.

The best sources of lipids for sedentary and urban populations are vegetable oils: peanut oil, karité butter, sesame oil. Only nomads and Peuhls rely on animal fats. Generally speaking, there is very low consumption of fruits. Seasonal abundance of mangoes, papaya, and karité fruit is followed by a long period when no fruit is available at all.

Despite large numbers of cows and goats, very little meat or milk is consumed by the rural populations. Meat is included in the diet at most once or twice a week in addition to times of feasting; once or twice a month would be a closer estimate for most rural families. On the

other hand, city families consume over ten times as much meat as their rural neighbors. Their average yearly consumption has been estimated at 36 kilograms/person while the figure for rural inhabitants is closer to 3.5 kilograms/person. Fish and foul comprise a very small, almost negligible, part of the diet. In rural areas meat from small game, including rodents and insects, plays an important role in times of duress. Only Peuhls and nomads consume milk in any quantity. Taboos regarding eggs restrict the consumption of this important source of protein to an average of six eggs/person/year. While an estimated 11-13 percent of the calories consumed by an Upper Voltan from protein sources, less than one percent of the total are animal proteins (Budlovsky 1972).

It is difficult to determine the incidence of malnutrition in Upper Volta since there does not seem to be any single standard of measurement and diagnosis used in medical units throughout the country. Furthermore, most people do not classify malnutrition as a disease and consequently do not consider the condition worthy of a visit to a medical unit until complications--usually an infectious disease--set in.

According to observers in the field, up to 30-40 percent of the rural children between the ages of six months and five years show signs of protein-calorie malnutrition (Budlovsky 1972). From 1969 to 1971, Dr. Nissim Tal of Ouedraogo Yalgado Hospital in Ouagadougou recorded the incidence of PCM in the pediatrics ward. Approximately 8.5 percent of the 5,450 children admitted were suffering from some form of PCM. The highest incidence was found in the 1-3 age group. Approximately 40 percent of the malnourished children died. Breast-feeding in the Upper Volta is generally continued until the child is at least two years old and sometimes longer. No supplement is given until the child begins to walk, and the supplement given at that time is almost exclusively millet and sorghum. Once again it appears that nutrition education for parents is

the single most vital prerequisite to a lowering of PCM incidence among young children.

Other forms of malnutrition, specifically vitamin and mineral deficiencies, occur throughout the country, with the highest incidence rates being in the Sahel zone during the soudure. Scurvy, goiter, pellagra, and anemia are the forms of malnutrition observed most frequently in the medical units. Anemia is particularly prevalent among pregnant women and young children. Dr. Tal reported a 12.5 percent incidence rate of anemia among patients in the pediatrics ward in the Ouagadougou hospital.

Incidence of goiter in west Africa has been surveyed thoroughly during the past 25 years. In Upper Volta, where incidence ranks first among the six Sahel-Sudan countries, goiter is a widespread condition, particularly among women. The most vulnerable group is adolescent girls (15 years old), and the largest goiters are found among the most elderly women (Pales 1950).

Current Food Supply

The FAO multi-donor mission to Upper Volta in September, 1973, was unable to make an absolute judgement of food production and food demands of the stricken population. A dearth of agricultural data and the unreliability of production statistics (which account only for the ten percent of the millet and sorghum which reaches the regular markets) forced them to determine a minimum and maximum for food aid requirements for the first three to six months of the period January 1, 1974 to October 1, 1974. The absolute minimum was based on the size of the nomadic population most affected by the drought and amounted to 31,200 tons of grains for the first three-month period. Unable to gauge the success of the harvest for 1973, they set a maximum at 117,000 tons of grain to cover the needs of the entire population, should the harvest prove insufficient. The mission was reluctant to estimate

needs for a longer period of time, since these would be wholly determined by the success of the harvest in November. They decided that subsequent missions to Upper Volta should be made every three months during the year to reassess food needs.

Members of the mission recognized the nutritional needs of the people, particularly the nomads, as being more than a matter of grain supplies. Consequently, they arrived at figures for provisions of milk powder and fats needed to sustain an adequate nutritional balance for the nomads, pregnant women, young children, and hospital patients. The demand was estimated at 3,500 tons of milk powder, and 6,000 tons of butter oil.

For more detailed information regarding the mission's method for determining need as a function of production, transport, storage facilities, and market fluctuations, the reader is referred to their summary report (FAO 1973f).

Nutritional Status: Impact of the Drought

Once again, our only source on this subject is the Center for Disease Control nutritional surveillance conducted in August and September, 1973. Their findings, summarized in Table 10 indicate that the most severely affected populations were residing in the north and northeast portion of the country, specifically the cercles of Djibo, Ouadalan, and Dori. Their results were not broken down into nomad/sedentary categories; they used a southern village (Po) as a reference population. It cannot be conclusively stated that the populations showing the highest incidence of acute malnutrition are suffering from unprecedented shortages of food, since there is annually a shortage in the northern part of the country during the three-month period before harvest (C. D. C. 1973).

Nutrition Planning

A coordinated nutrition program at the national level does not

TABLE 10

Percent of Children with Measurements below Acute-Malnutrition Threshold, Selected Areas, Upper Volta, August-September, 1973

Area	Number Clusters	Number Children	Percent < Threshold
Dori	6	241	11
Djibo	7	229	13
Ouadalan	3	214	16
Ouahigouya	12	211	1
Titao	4	101	6
Total	32	996	10
Po	1	340	3

Less than one percent edema was found.

Source: C. D. C. 1973.

exist in Upper Volta. Nevertheless, the ministries most frequently involved with various approaches to the nutrition problem are active. These include the Ministry of Health, the Ministry of Social Affairs, the Ministry of Agriculture, and the Ministry of Education. By far the greatest emphasis has been placed on promoting good nutrition practice at the "ground roots" level. For example, animateurs in the PMI's and social centers, as well as rural school teachers, instruct mothers and children in matters of proper diets and food preparation. Many of the schools throughout the country maintain school gardens for practical application courses in agriculture.

Records on incidence of malnutrition are kept in many of the medical units, but as pointed out earlier, standards for identification vary from one unit to another. Most medical facilities do not have adequate supplies for treating PCM. Several pilot projects which would incorporate nutrition education have been planned, but most of these have not been executed to date. In 1971, a center for recuperation and education in nutrition was established. A sample of 16 children and their mothers were given thorough clinical examinations three times a week for a period of time. When malnutrition was diagnosed, supplements of high-protein and vitamin-rich food were administered. Daily instruction in nutrition was given to the mothers.

Recognition of the urgency of the food supply problem is apparent in the type of proposals made by the Ministry of Agriculture in recent years. Efforts to ameliorate the conditions of subsistence farmers cover a large range of proposals: well-digging, provisions for storage, market stabilization, and food enrichment programs. A lack of funding has largely prevented the realization of these proposals (W. H. O. 1973f).

APPENDIX D: AGE PROFILES AND POPULATION PROJECTIONS IN THE SAHEL-SUDAN

Existing population statistics have been used in a computer program developed by Dr. William McFarland and Mr. Henry Cole of General Electric TEMPO in Washington, D.C. The projections employ a variety of assumptions about changes in fertility and mortality for each of the six Sahelian countries and for the region as a whole. Although efforts were made to select reasonably realistic assumptions of what might happen in the region during the next 45 years, these are only projections, not forecasts. The tabular material used to construct Figures 1 - 18 of this section was only a fraction of the total. Illustrated are two sets of assumptions for each country (Chad, Mauritania, Niger, Senegal, Upper Volta), seven sets of assumptions for Mali, and one set of assumptions for the region as a whole. Assumptions 1 through 7 were run for each of the six countries and for the region as a whole. Assumption 8 was run only for Upper Volta. The entire set of data may be obtained in tabular form either from TEMPO or from the M.I.T. Sahel-Sudan Project; the original computer tapes may be obtained from Mr. Cole at TEMPO.

Different age groups make quite different demands on the various sectors of an economy or society and provide quite different inputs to the sectors. For instance, the 0-5 age group has quite different health and nutrition needs from adolescents, adults, and the elderly. The ratio of the labor force to dependents can be important for capital formation and output per capita, and the proportion of women younger than fertile age can give an indication of future population growth and the momentum of population change. With the changing demographic conditions provided in the projections, the entire age-structure changes over time and makes itself felt on most programs and plans. Naturally, the assumptions which have been used in this program by no means exhaust the possibilities. Unfortunately there has not been sufficient time for full analysis of this extensive tabular material or for full consideration of the implications.

FIGURES

The assumptions.

The assumptions indicated in the title of each figure are listed below.

(1) Constant Fertility
Constant Mortality

Standard baseline projection. The initial population for each country was taken from projections done by the U.S. Bureau of the Census, whose 1970 population totals and age-sex structures are from U.N. Medium Variant Projections. For all countries, age-specific birth rates were based on demographic sample surveys published in France, Institut National de la Statistique et des Etudes Economiques (1967), and adjusted to attain consistency with U.N. estimated crude birth rates for 1965-1970 (United Nations 1970). Estimated life expectancies for Mali, Mauritania, Niger, Senegal, and Upper Volta were taken from the Demographic Yearbook (United Nations 1970). Life expectancy for Chad was estimated by the Bureau of the Census at ISPC using stable population models and regional model life tables. All survival rates were taken from Coale and Demeny "West" and "North" tables (1966).

Survival rates are generally expected to improve over time so that this assumption is on the pessimistic side. Population growth under this assumption will be somewhat slower than with survival rate improvement.

(2) Constant Fertility
Declining Mortality

The original life expectancy at birth was increased by 25 years over a 50 year period using Coale and Demeny "West" tables. The one exception is the case of Upper Volta where an initially higher infant-mortality rate warranted the use of "South" tables. (See Assumption 8.)

This assumption reflects the possibility of general improvements in health services, urbanization and nutrition. The decline in mortality is gradual, with the greatest impact on infant-child mortality. These results are close to U.N. projections and should give the high-side population growth rates.

(3) Constant Fertility

Constant Mortality but with Lowered Infant-Child Mortality

The original infant-child mortality rates were reduced immediately to that which would exist for life expectancy at birth of 60 years in the Coale and Demeny "West" tables.

This is not a realistic assumption, but serves to indicate the importance of maternal-child health and nutrition programs and their impact, should they become a reality immediately.

(4) Constant Fertility

Declining Infant-Child Mortality

The original infant-child mortality rates were reduced over a 50 year period to that which would exist for a life expectancy at birth of 60 years in the Coale and Demeny "West" tables.

This is a somewhat more "realistic" result of programs in Assumption 3, extended over time.

(5) Declining Fertility with African Age Pattern

Constant Mortality

Each initial age-specific fertility rate was reduced by 30 percent over a 50 year period.

Fertility decline need not necessarily be the result of birth control programs, but may derive instead from the development process or the social, cultural, and economic change that takes place during modernization (the "demographic transition").

(6) Declining Fertility with Transformed Age Pattern Constant Mortality	The initial Gross Reproduction Rate for each country was reduced by 30 percent over a 50 year period using the age-specific pattern characteristic of low fertility countries given in the U.N. Department of Economic and Social Affairs Publication, Population Bulletin of the U.N. (1965). This assumes that the fertility age pattern shifts to that of "western" low fertility countries. The GRR declines over a 50 year period to 70% of its original value. To some extent this assumes that development occurs in a more western form.
(7) Declining Fertility with African Age Pattern Declining Mortality	This has the fertility pattern of Assumption 5 and the mortality pattern of Assumption 2. This could be a possible tableau if full health, maternal and child health, and family planning progressed well. Again, the declines may be part of the development process.
(8) Declining Fertility Declining Mortality	As pointed out earlier, infant-child mortality rates for Upper Volta warranted use of survival rates from Coale and Demeny "South" tables, with life expectancy of 35. We assume a 30 percent decline in fertility rates over a 30 year period and a concurrent decline in mortality, such that life expectancy reaches 60. Implications are similar to those for Assumption 7.

Figure 1 illustrates the age and sex related projections for the region as a whole, based on the assumption that birth and death rates will not change until the year 2020, and that in-and out-migration will not be significant factors. In fact, if previous trends continue, there should be some improvement in life expectancy at birth. Outmigration of men of reproductive age should counterbalance this. Fertility rates cannot be predicted; they are not likely to change without substantial economic advance or improvement in life expectancy

What is apparent from Figure 1 is the broad and rapidly expanding base, which means a high dependency ratio. The figure also illustrates the momentum of population growth, because rapid growth will continue as the expanding numbers of children move into the reproductive years. The projections and the momentum will change if factors influencing population growth change. While an infinite number of assumptions can be made for purposes of projecting changes, only a few rather general ones have been worked out and illustrated.

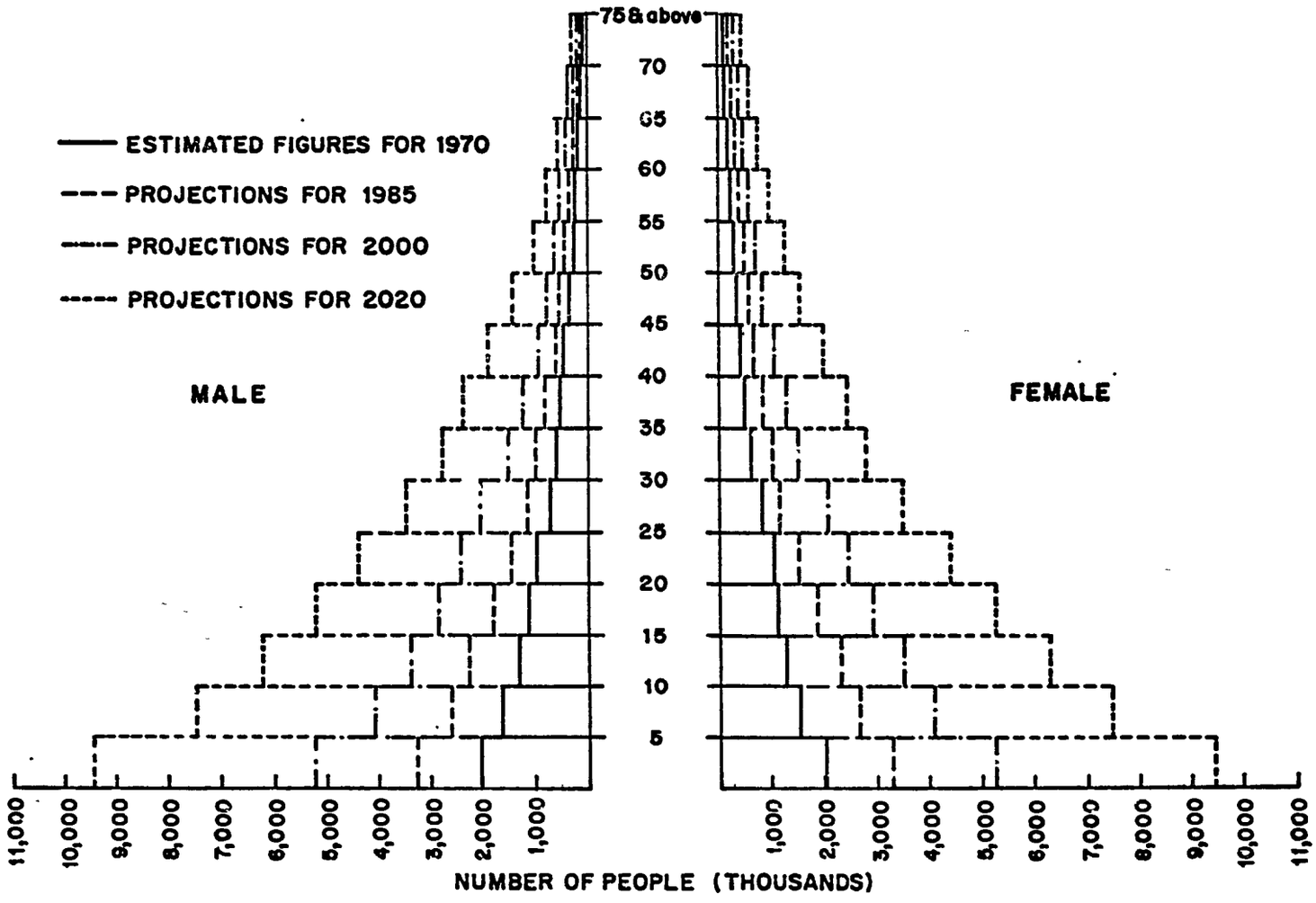


FIGURE 1: Age Structure for the Sahel-Sudan Region, Assuming Constant Fertility and Mortality 1970, 1985, 2000, 2020. Based on Assumption 1.

The projections for Mali on the assumptions of unchanging birth and death rates appear in Figure 2. The same considerations apply here as in the preceding paragraphs for the region as a whole. Unless change occurs in fertility or mortality, or unless there is major out-migration, developmental planning must take these projections into account, or further deterioration in living standard seems inevitable.

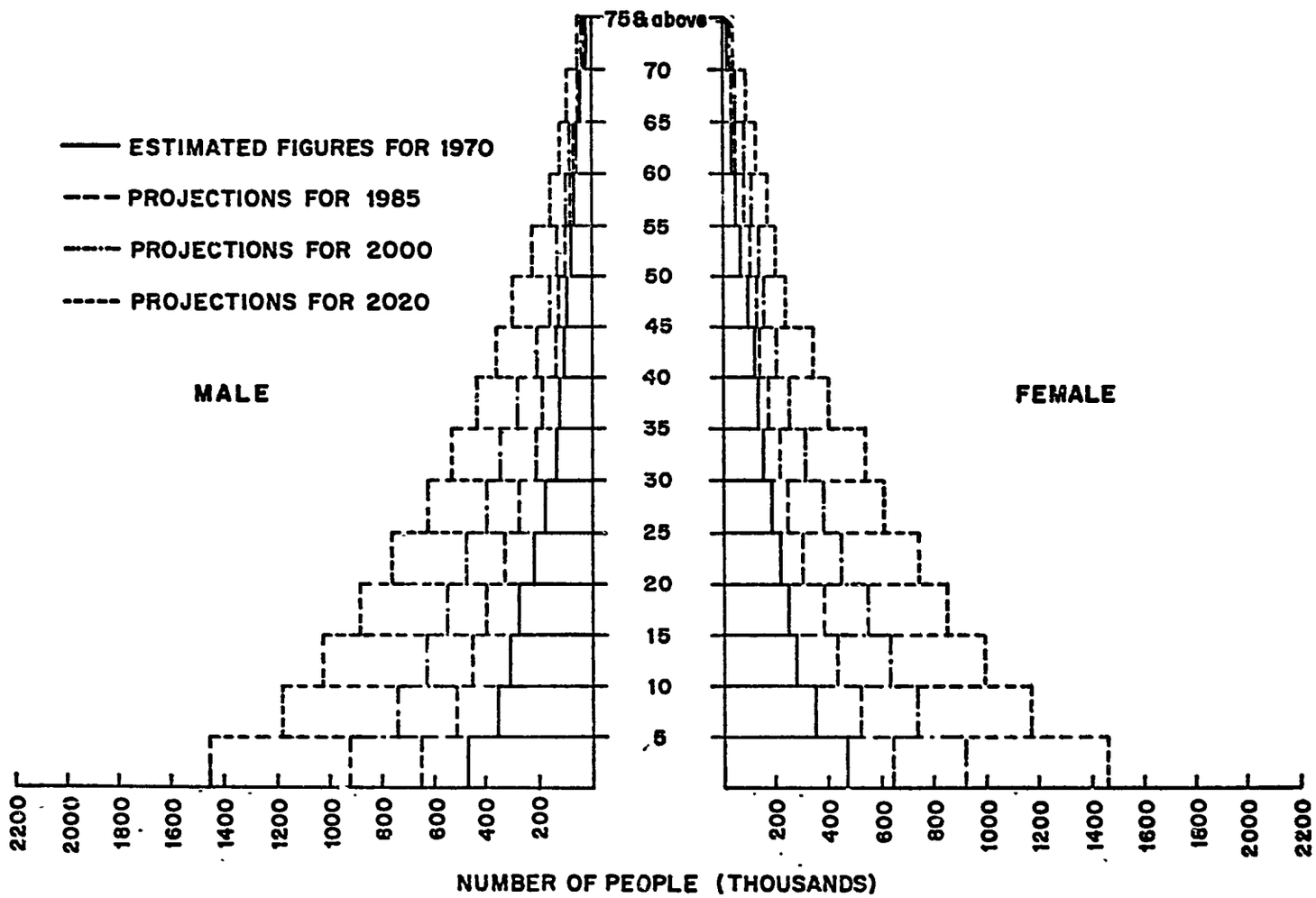


FIGURE 2: Age-Structure for Mali, Assuming Constant Fertility and Mortality, 1970, 1985, 2000, 2020 Based on Assumption 1.

The effect of a 25-year increase in life expectancy from present low levels is illustrated in Figure 3. The figure assumes no change in fertility. The enormous increase in the population is at once apparent, as well as the high dependency ratio and the population growth momentum (slope of the curves). The accelerating growth rate, especially among the young, is evident. This degree of growth change is almost certainly unsustainable under any realistic predictions for the economy of Mali.

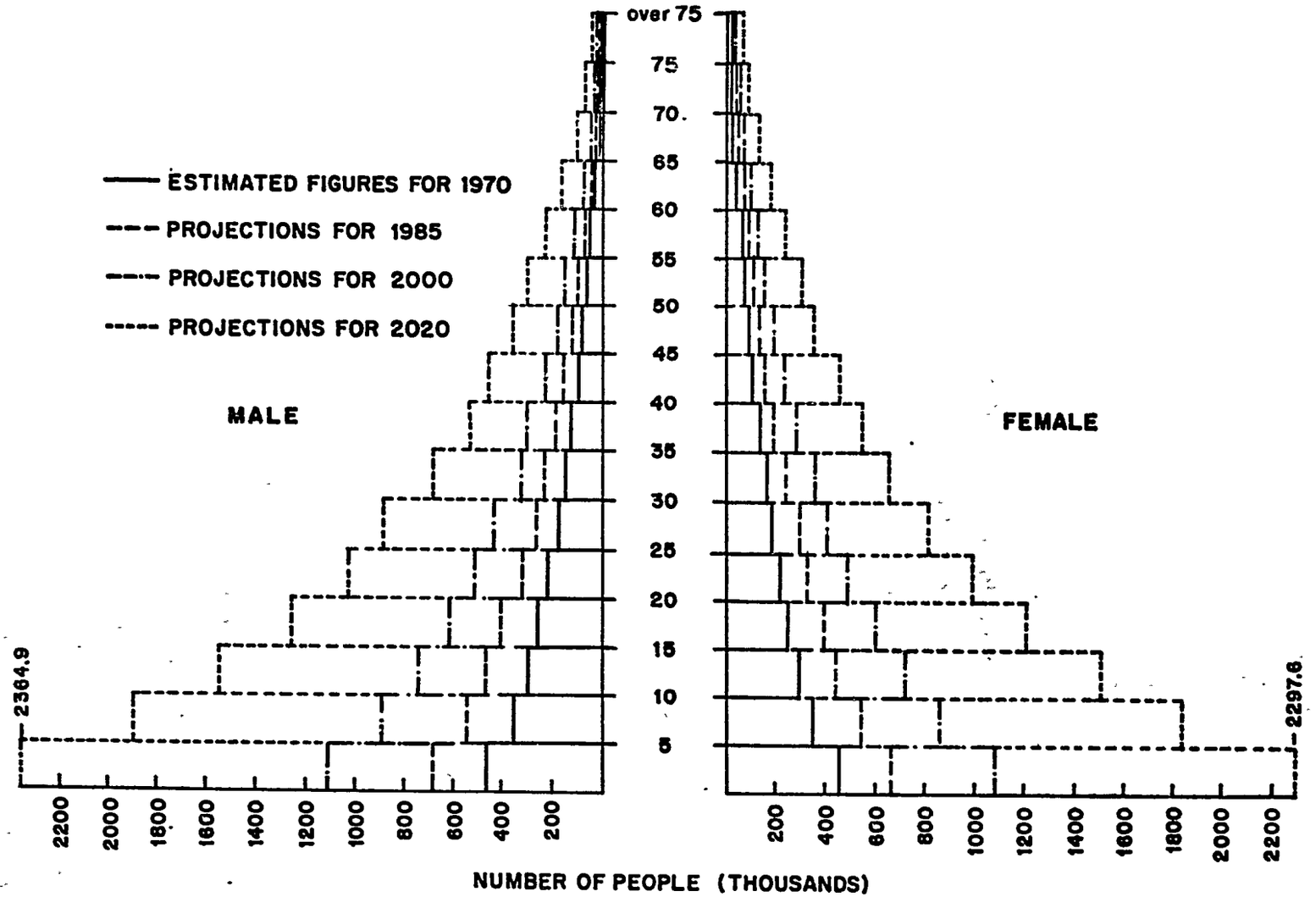


FIGURE 3: Age-Structure for Mali, Assuming Constant Fertility, Declining Mortality, 1970, 1985, 2000, 2020

Based on Assumption 2.

If life expectancy could be raised at once to 60 years (Figure 4), the growth projections are even higher than with the gradual increase illustrated in the previous figure. More realistically, the projections of Figure 5 derived from assuming a gradual fall in infant mortality without noteworthy change in adult mortality, such that life expectancy reaches 60 years in 2020. The projected population, dependency ratio, and momentum are seen to be considerably in excess of that which will occur if there are no changes in present trends (Figure 2).

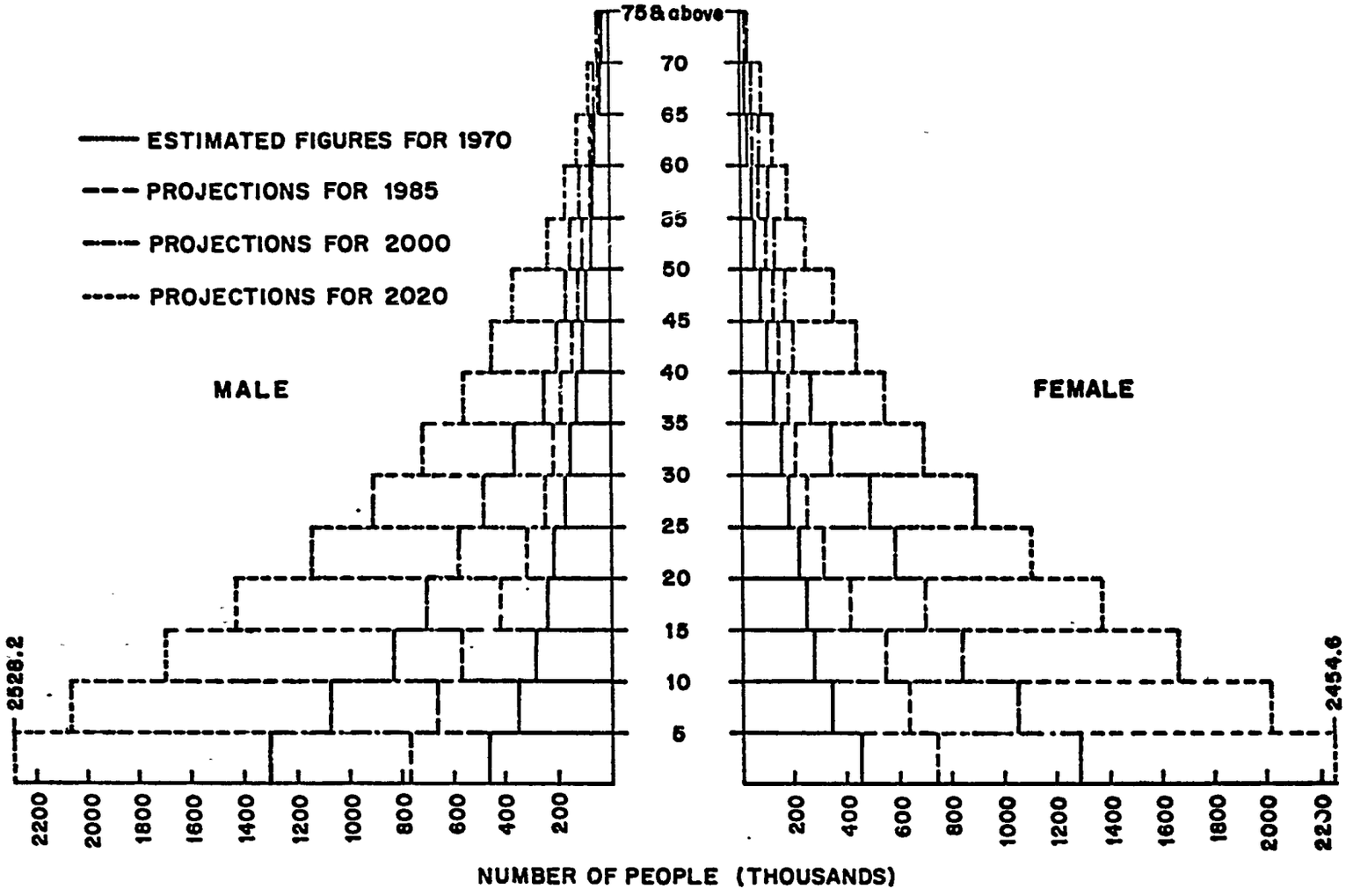


FIGURE 4: Age-Structure for Mali, Assuming Constant Fertility and Mortality, but Lower Infant-Child Mortality, 1970, 1985, 2000, 2020. Based on Assumption 3.

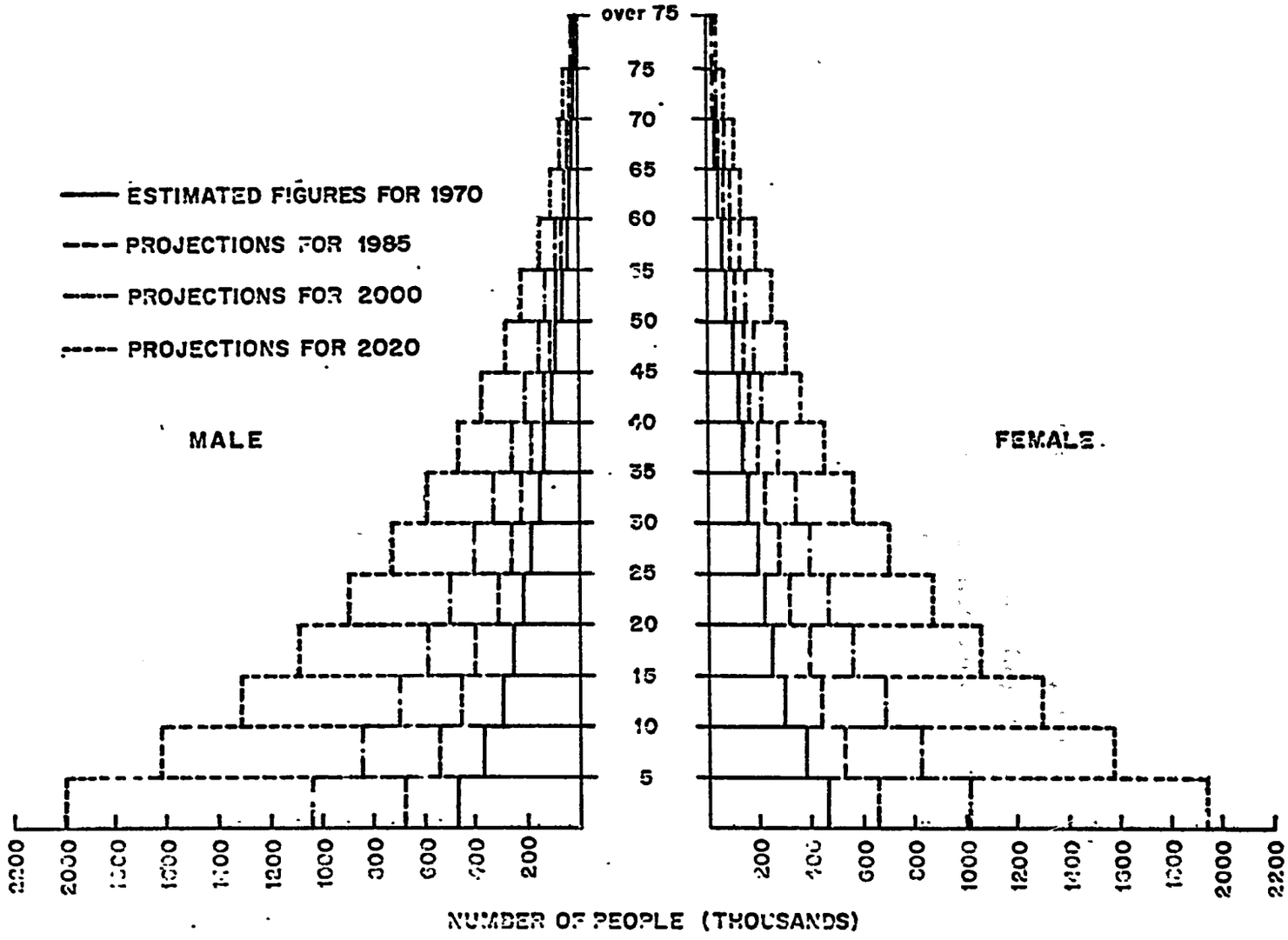


FIGURE 5: Age-Structure in Mali, Assuming Constant Fertility, Declining Infant-Child Mortality, 1970, 1985, 2000, 2020. Based on Assumption 4.

When fertility is reduced by 30 percent in each age group in the age specific fertility pattern for Africa, but without change in mortality, this growth rate becomes considerably reduced and the dependency ratio improves (Figure 6). This assumption lacks reality, which is that a fall in fertility would probably decrease the death rate and improve life expectancy, thus enhancing population growth. Nevertheless, the change effected by this modest reduction in fertility is striking, and is illustrated by comparison of Figure 6 with Figure 5.

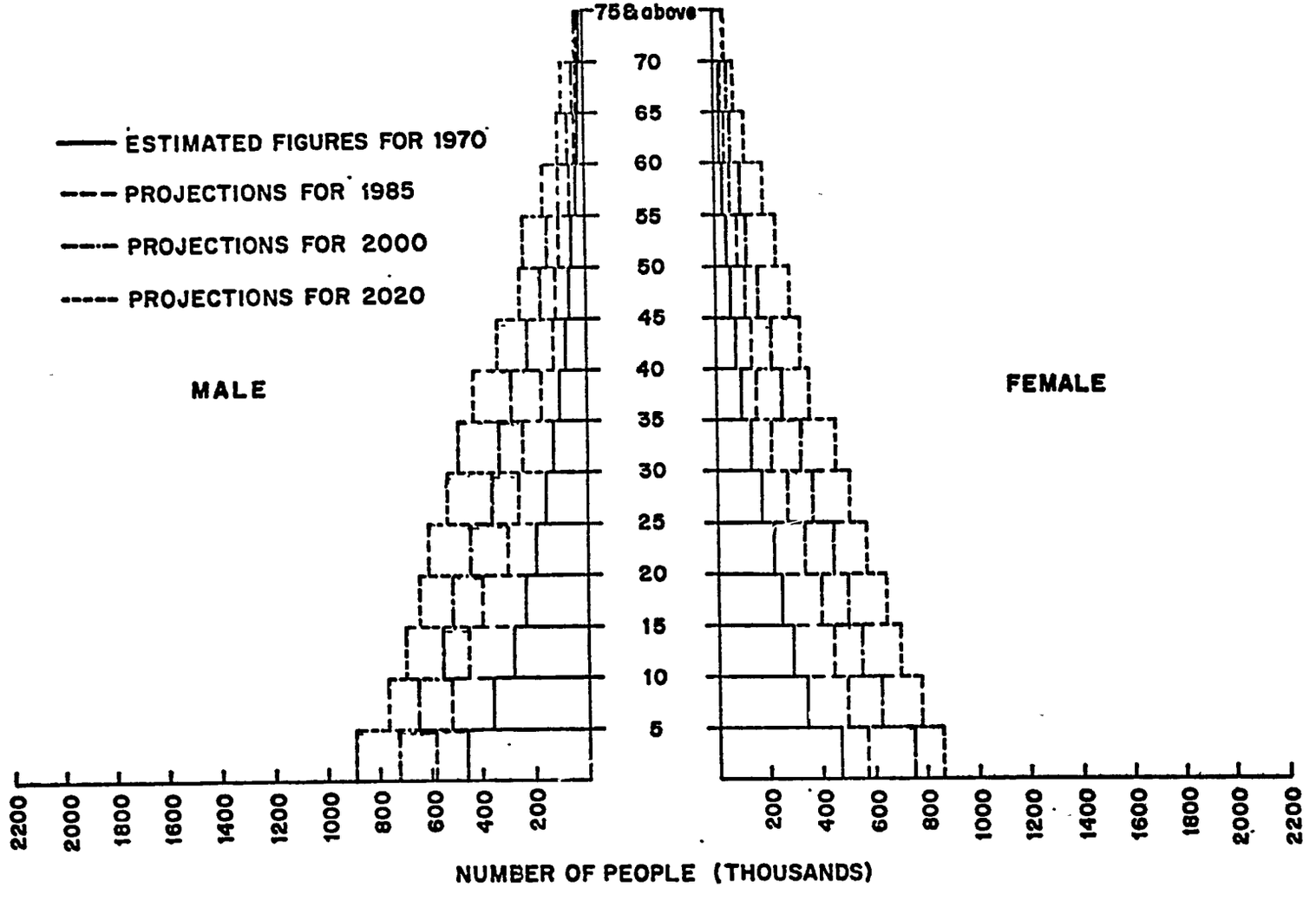


FIGURE 6: Age-Structure for Mali, Assuming Declining Fertility, Contant Mortality, 1970, 1985, 2000, 2020. Based on Assumption 5.

Figure 7 is similar to Figure 6. Here the only change from the assumptions of Figure 6 is that age specific fertility pattern changes over the same 50 years with the same 30% reduction, but that the birthing pattern follows that of the developed countries.

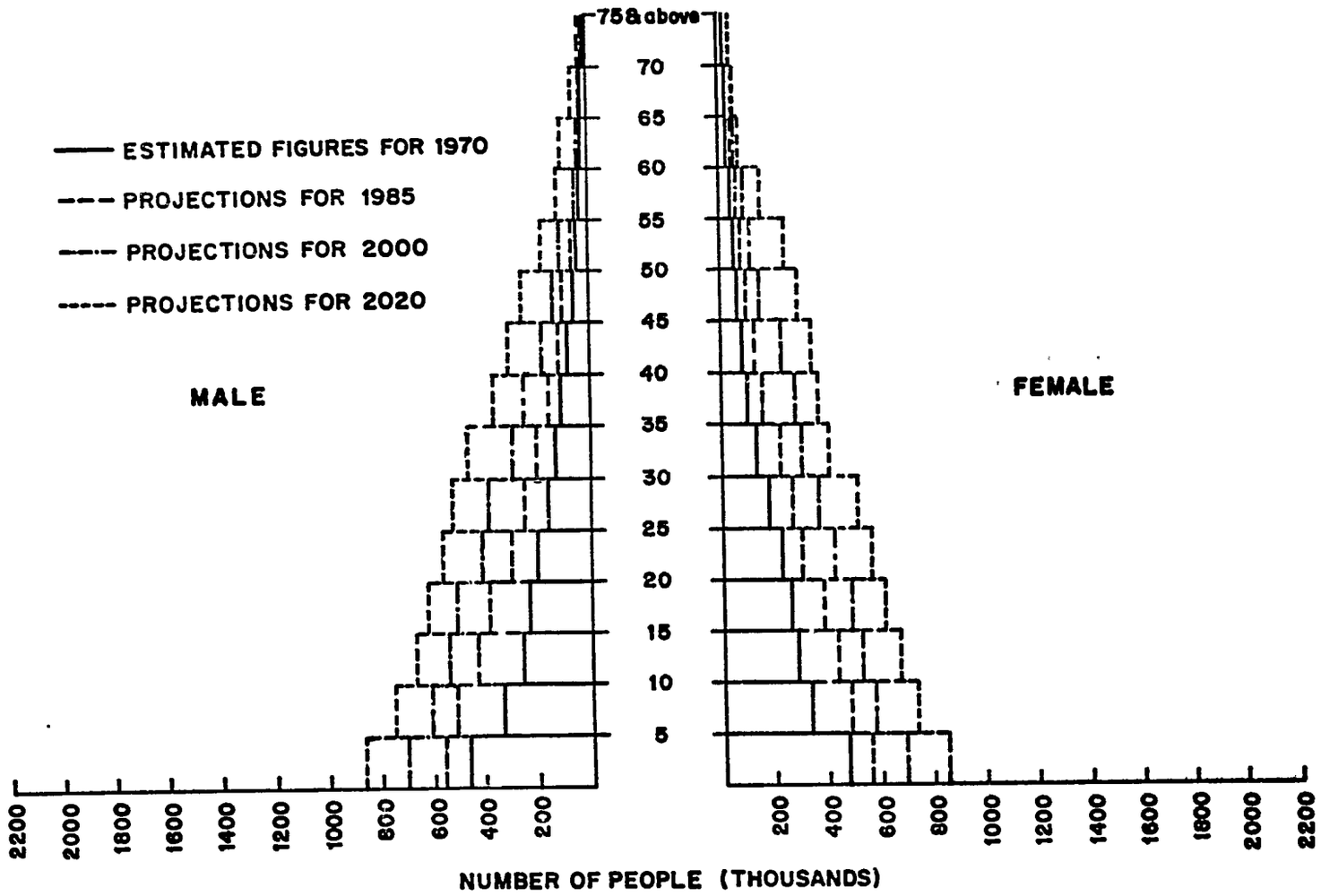


FIGURE 7: Age-Structure for Mali, Assuming Declining Fertility, Constant Mortality, 1970, 1985, 2000, 2020. Based on Assumption 6.

If mortality is reduced so that life expectancy is increased by 25 years, with the greatest improvement in the infant-child age group, and if fertility is gradually reduced by 30 percent in the age-specific pattern of Africa, then the pattern should be as in Figure 8. This pattern is strikingly similar to what is projected in Figure 2. This life pattern has, however, significant and important advantages for the individual and for the society. The assumptions imply a much improved life expectancy for those who are born, and they suggest the economic advantage of avoiding the wastage of premature deaths. The projections also indicate that even the heroic achievements of a 25 year increase in life expectancy and a 30 percent reduction in fertility achieve by themselves nothing insofar as population and population growth are concerned. The assumptions are not unreasonable goals. If they are reached, economic progress must accommodate a sharply increasing population, or else living standards will drop below the present low levels.

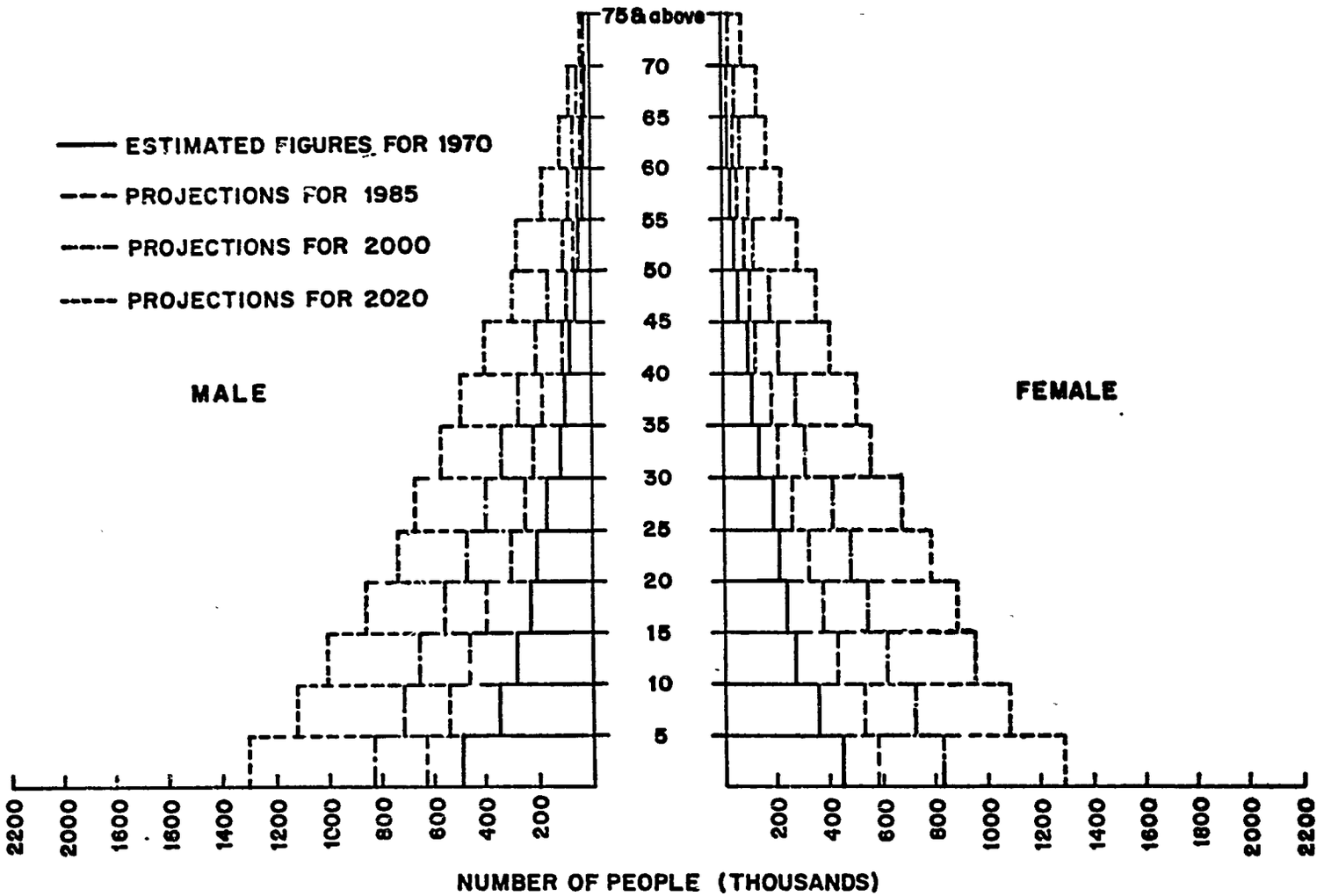


FIGURE 8: Age-Structure for Mali, Assuming Declining Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 7.

The powerful effect of reduced fertility (if even by 30 percent) on population growth is illustrated by comparison of Figures 9 and 10 for Senegal. Figure 9 assumes no change in fertility or mortality, while Figure 10 assumes the reduction in fertility. In fact, a reduction in fertility of 30 percent is improbable in any social matrix without a concomitant fall in mortality, and the latter would tend to negate the restraining effect of diminished fertility on population growth.

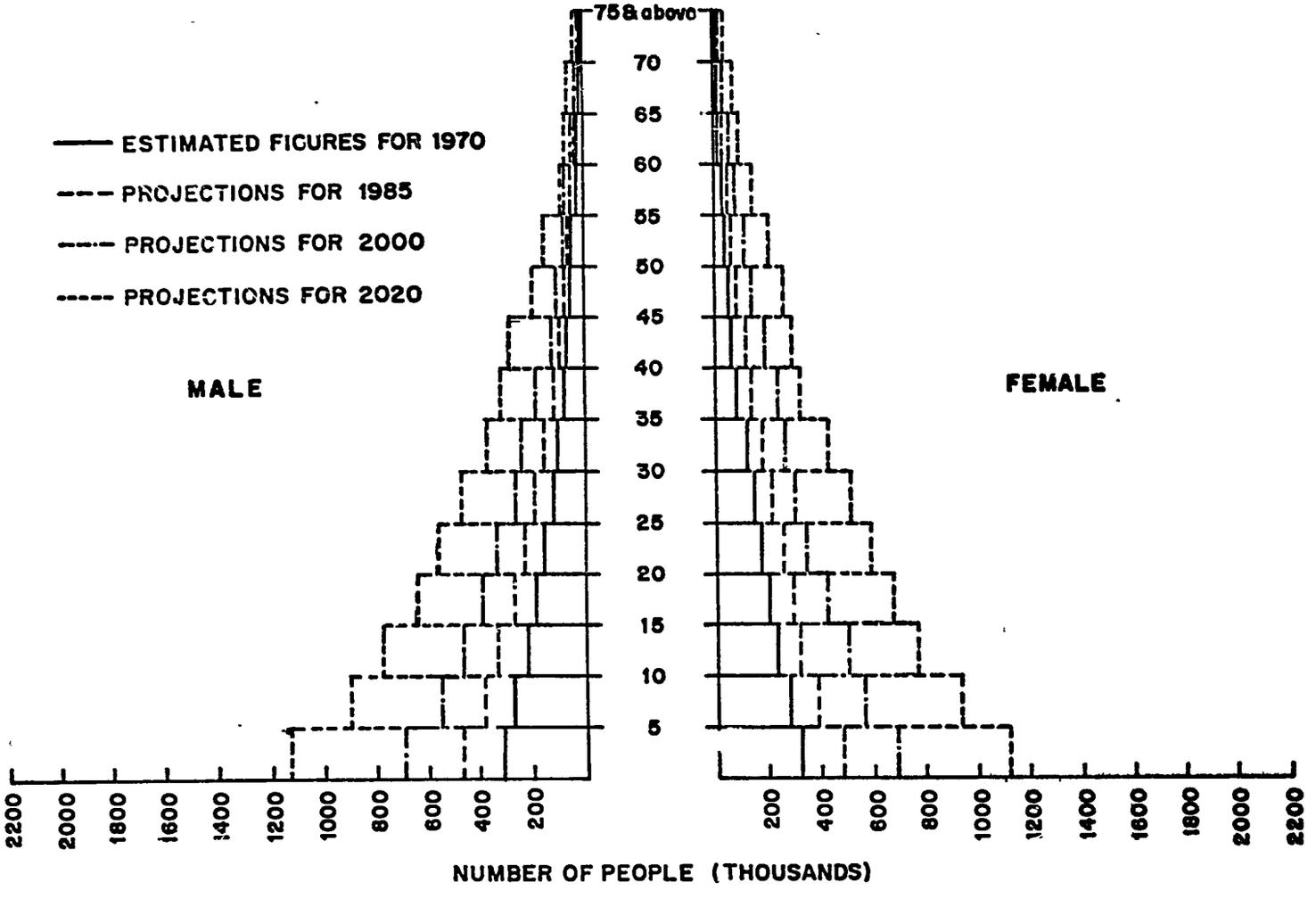


FIGURE 9: Age-Structure for Senegal, Assuming Constant Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 1.

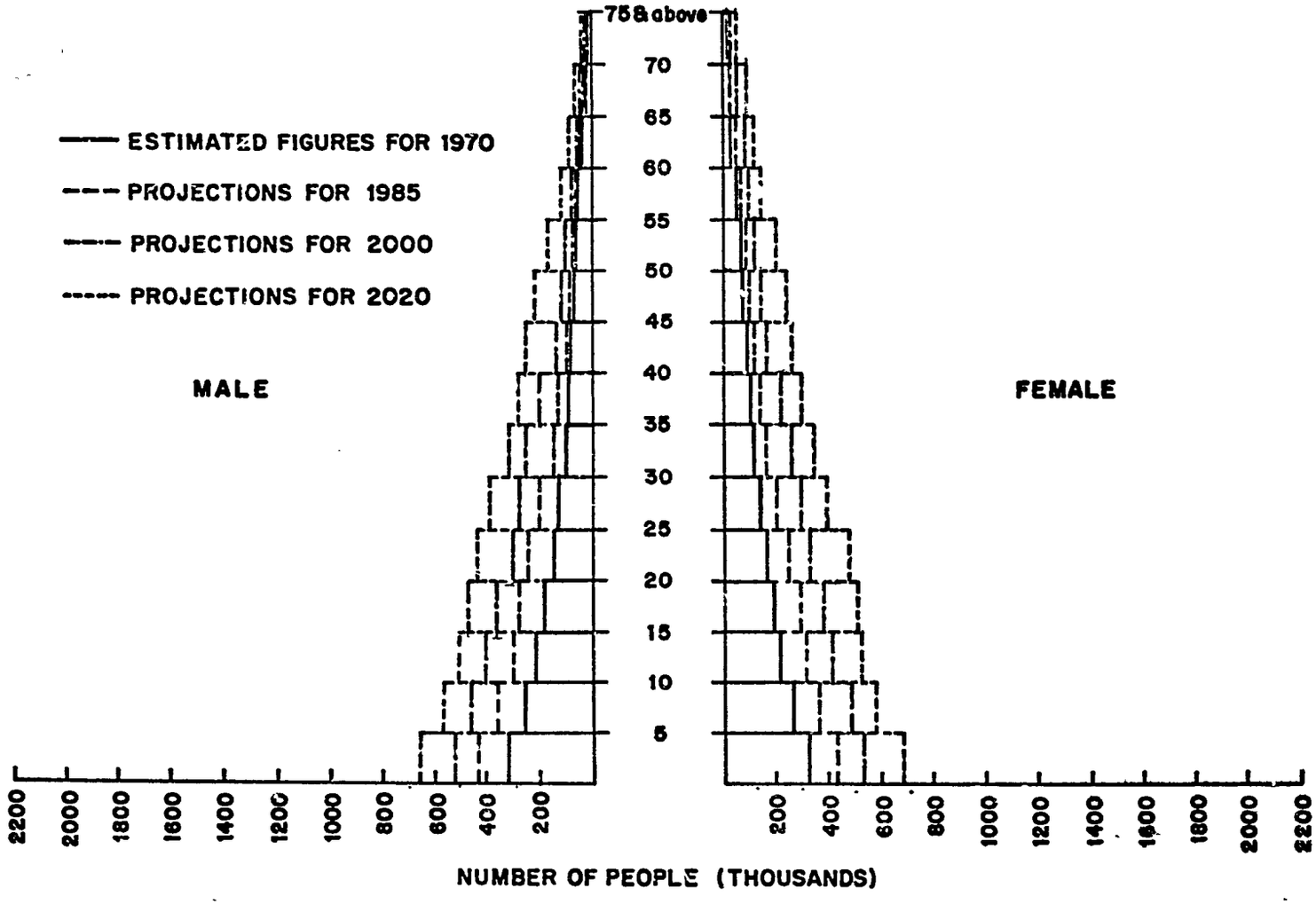


FIGURE 10: Age-Structure for Senegal, Assuming Declining Fertility, Constant Mortality, 1970, 1985, 2000, 2020. Based on Assumption 6.

Similar considerations apply to Figures 11 and 12 for Niger. Again the restraining effect of a substantial change in fertility is apparent (Figure 12). Even with this difficult achievement, the population of Niger would more than triple in the next 50 years.

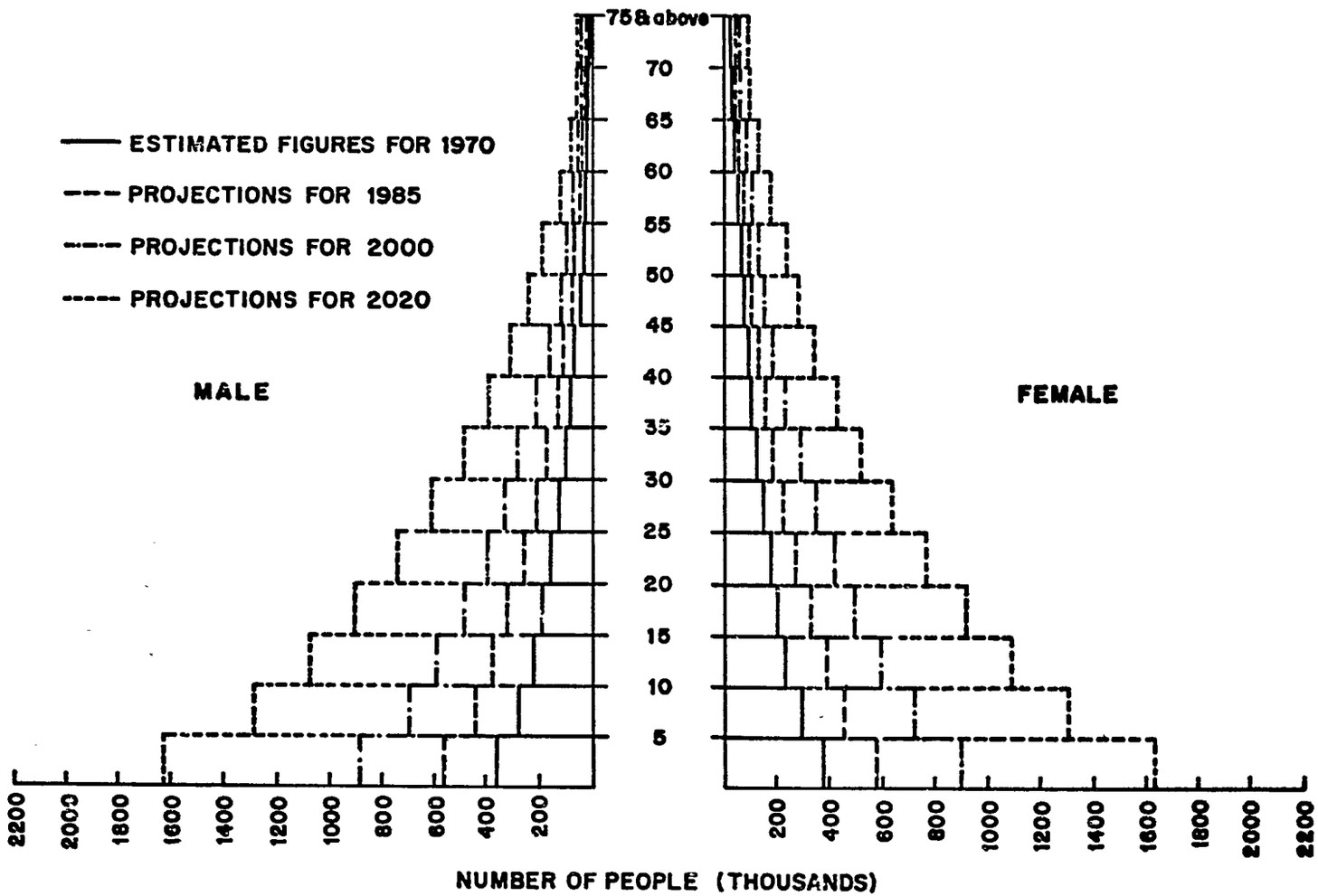


FIGURE 11: Age-Structure for Niger, Assuming Constant Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 1.

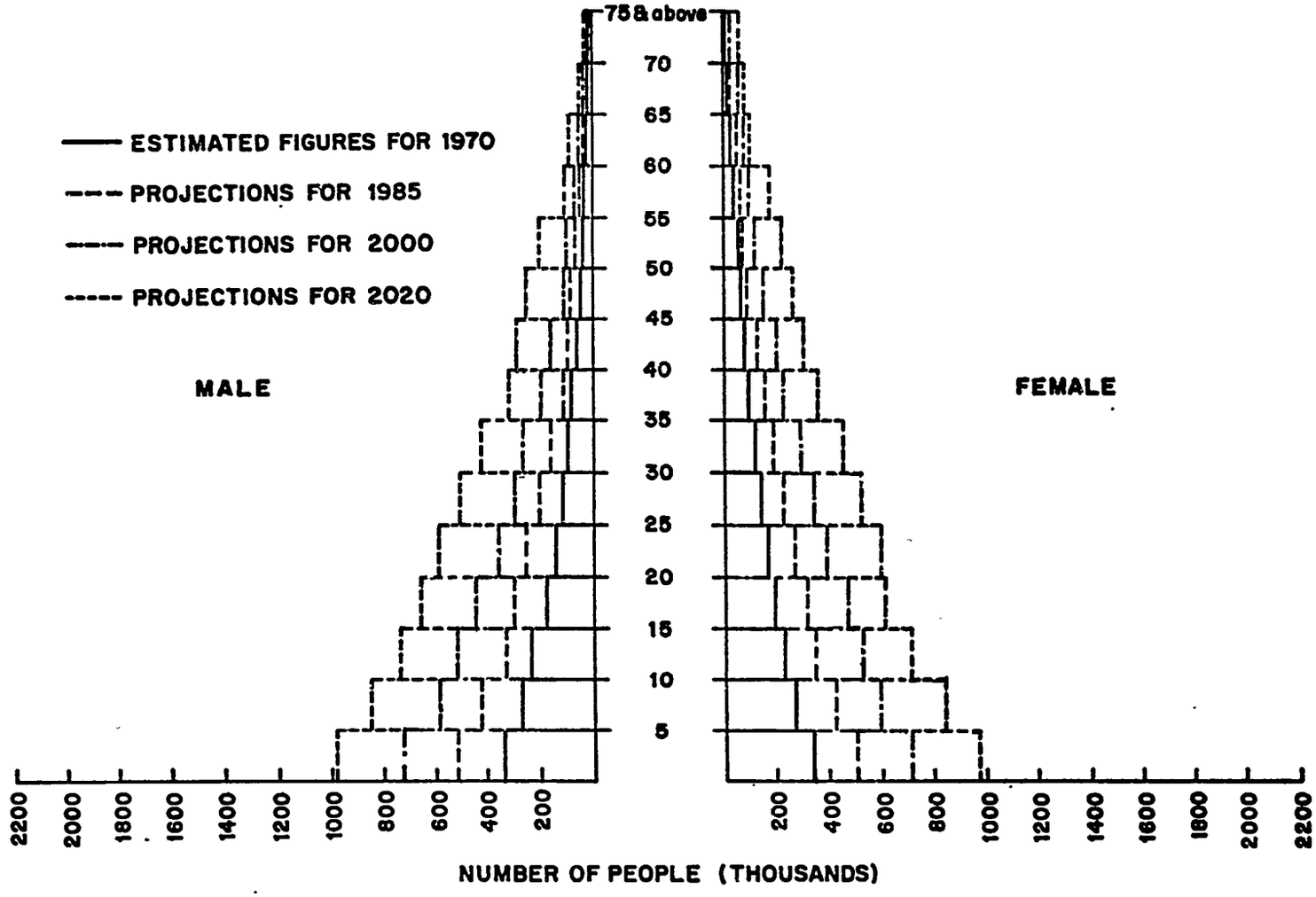


FIGURE 12: Age-Structure for Niger, Assuming Declining Fertility, Constant Mortality, 1970, 1985, 2000, 2020. Based on Assumption 5.

The runaway effect of declining mortality on population is illustrated in Figures 13 and 14 for Chad. The assumption is only made that life expectancy increases gradually over a 50 year period to a level somewhat below that of the contemporary West. The assumption is not a reality assumption, of course, because such an increase in population as in Figure 14 would almost surely defeat efforts at improving life expectancy at birth.

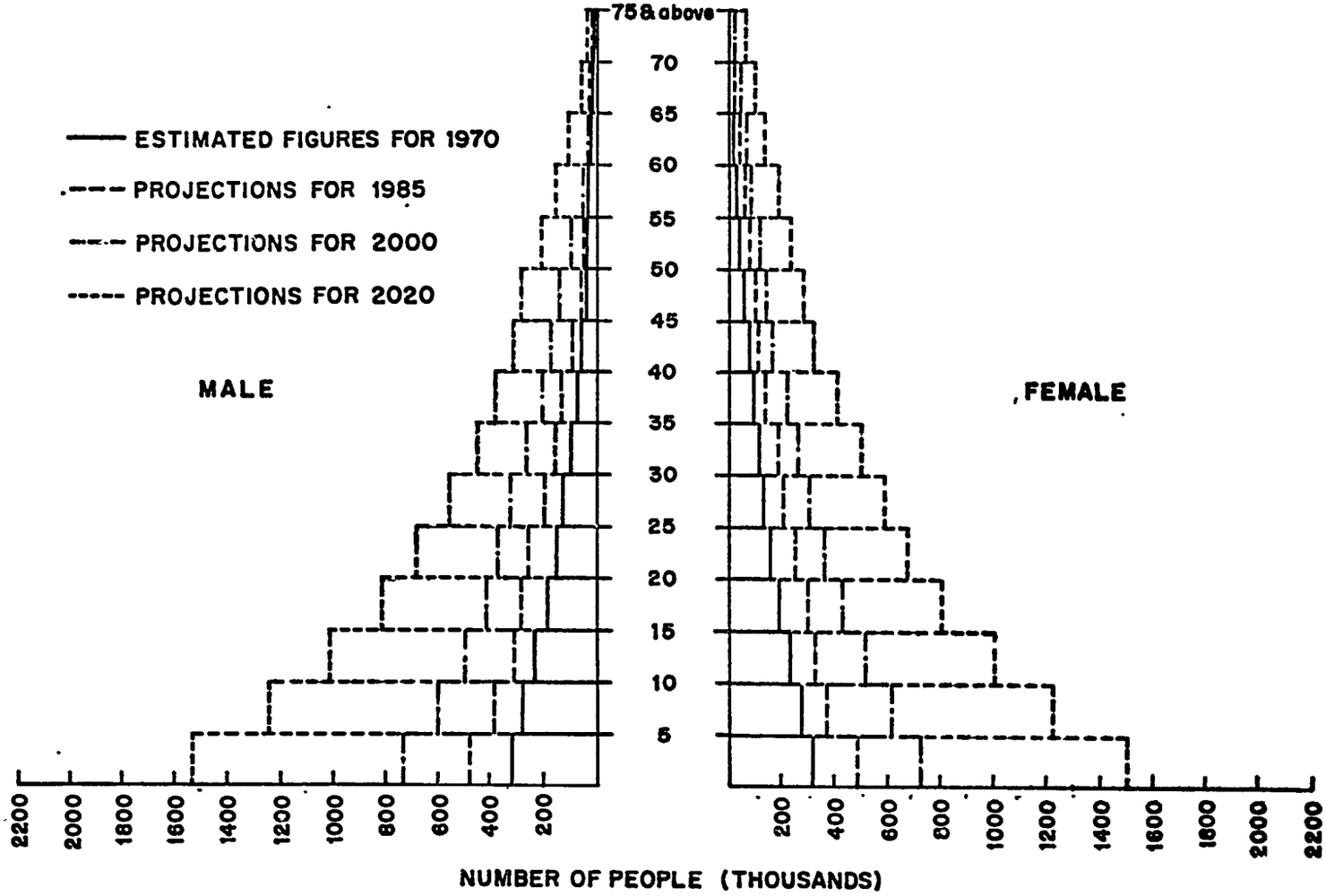


FIGURE 13: Age-Structure for Chad, Assuming Constant Fertility, Declining Mortality, 1970, 1985, 2000, 2020. Based on Assumption 2.

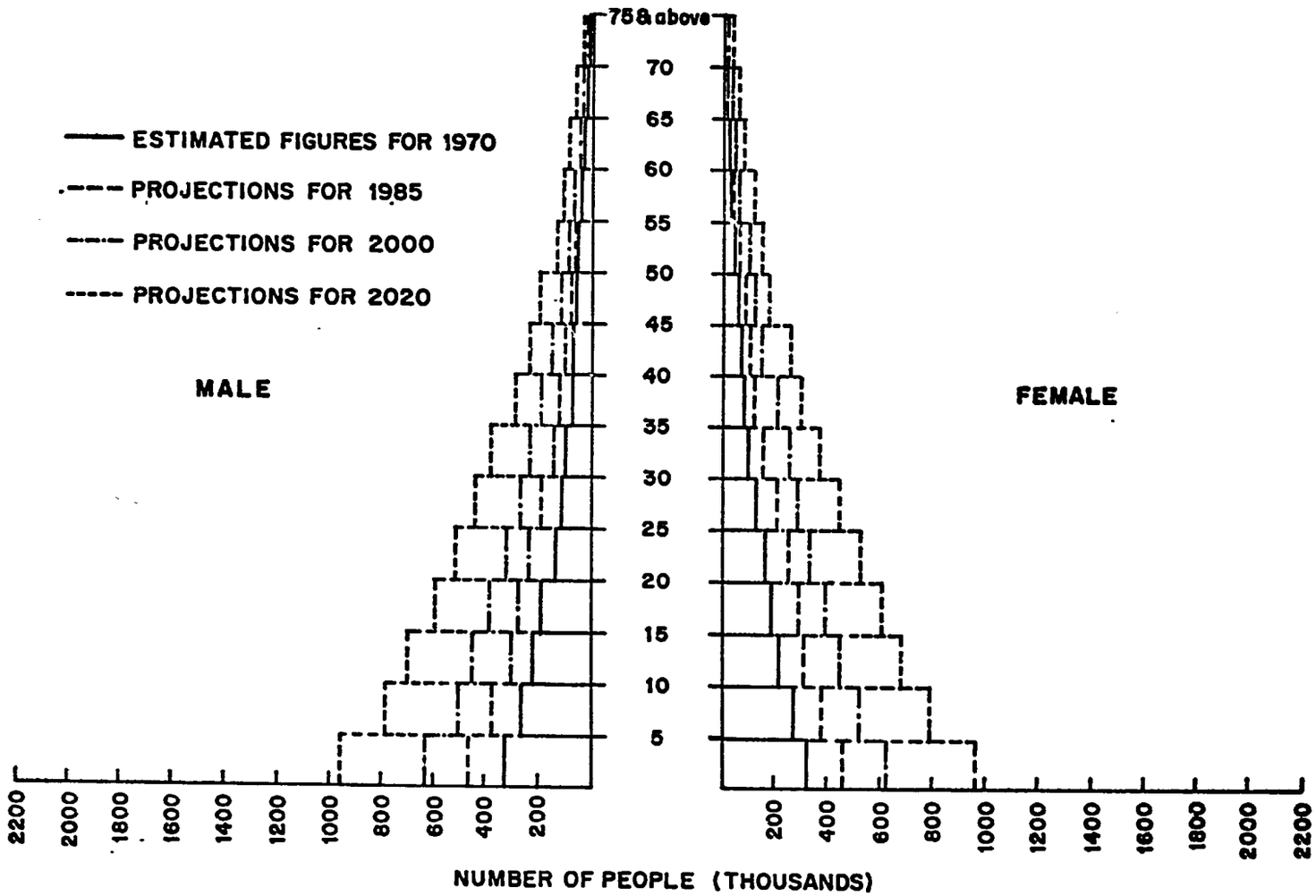


FIGURE 14: Age-Structure for Chad, Assuming Constant Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 1.

Just the same considerations apply to the projections for Mauritania. The no-change assumptions of Figure 15 may be compared with Figure 16, wherein the assumptions are made that fertility does not change, but that infant-child mortality falls gradually over a 50-year period in order that life expectancy increases to 60 years. A huge increase in population pressure results, with a very high dependency ratio and a strong population momentum.

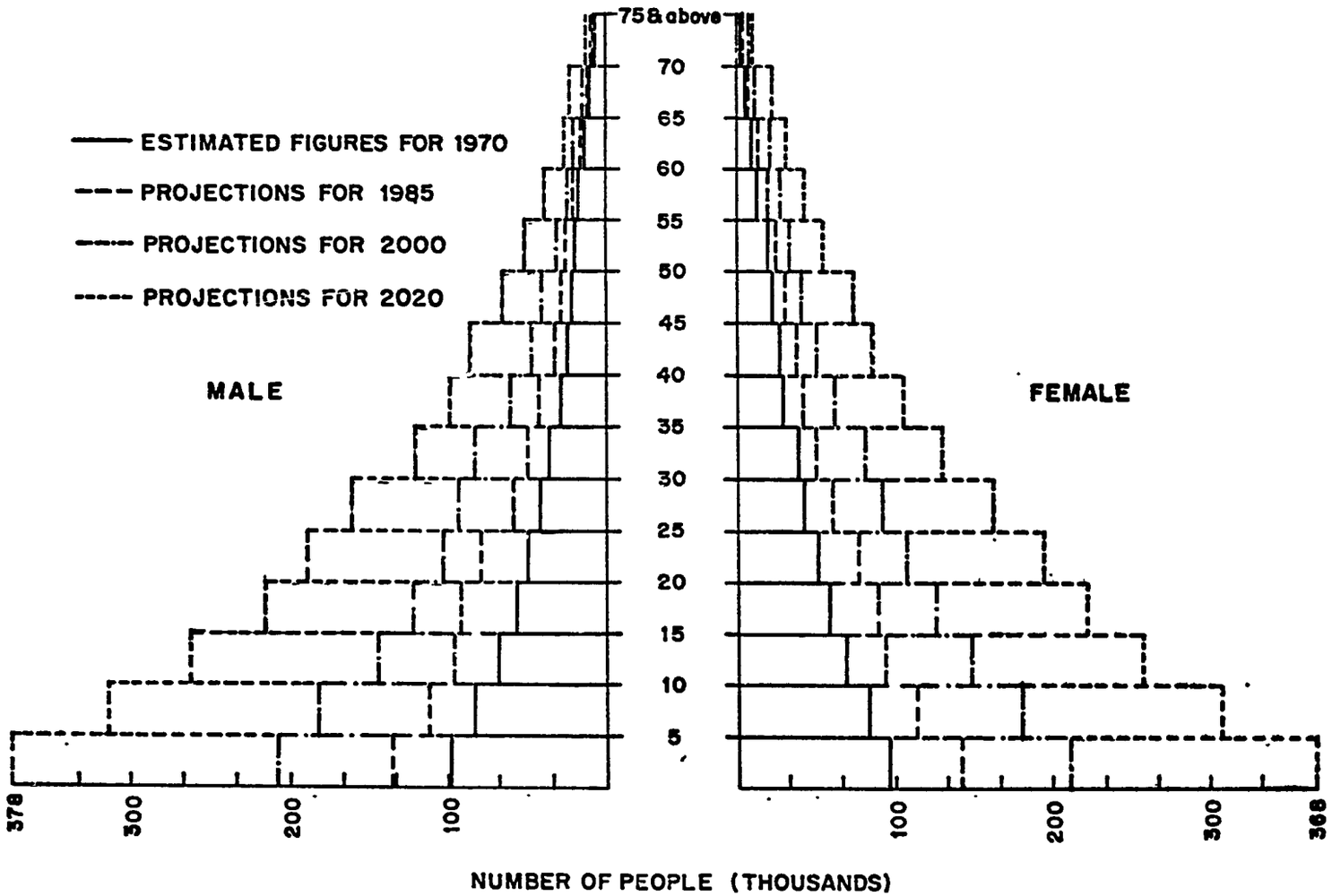


FIGURE 15: Age-Structure for Mauritania, Assuming Constant Fertility, Declining Infant-Child Mortality, 1970, 1985, 2000, 2020. Based on Assumption 4.

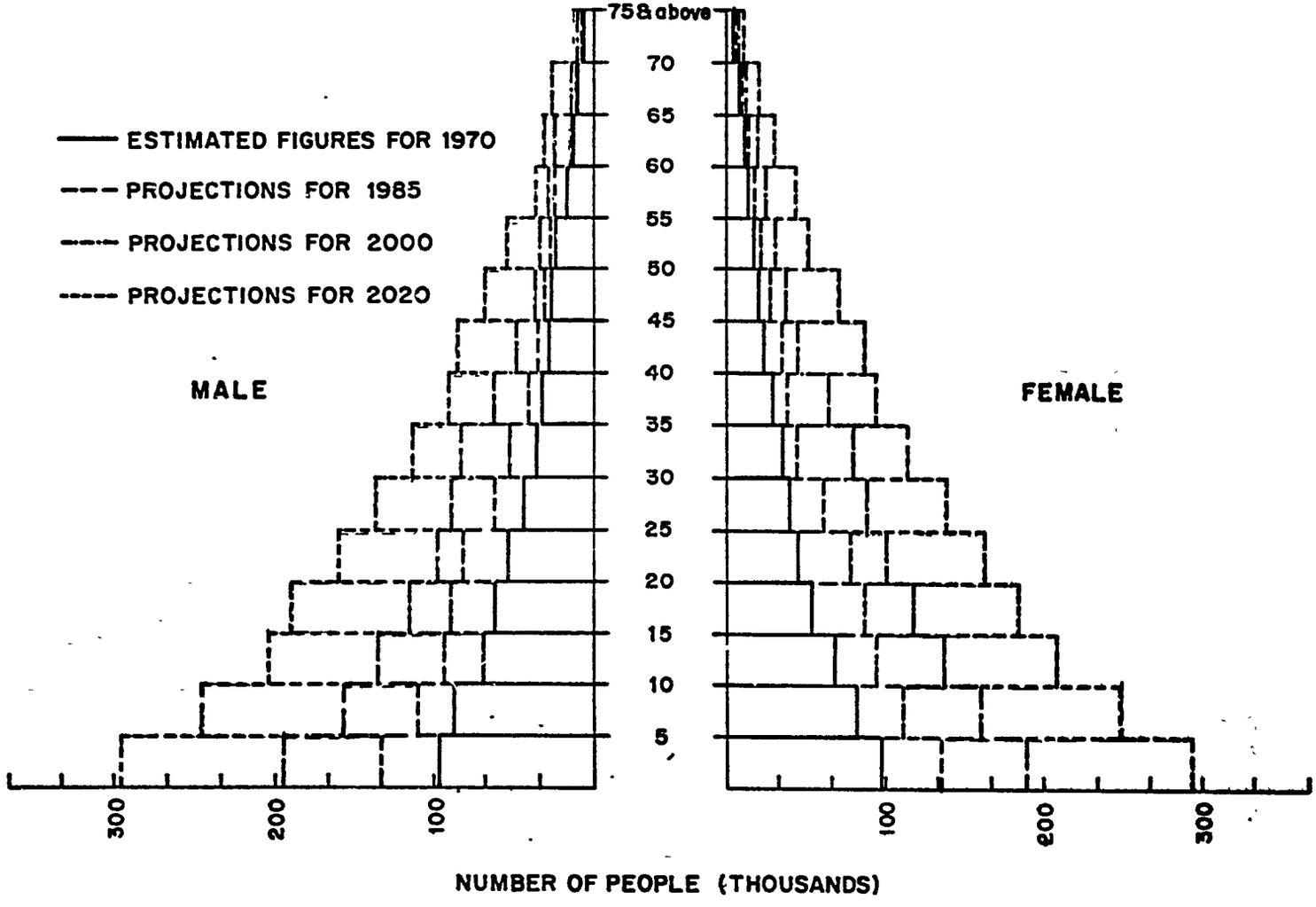


FIGURE 16: Age-Structure for Mauritania, Assuming Constant Fertility and Mortality, 1970 1985, 2000, 2020. Based on Assumption 1.

Finally, as with Mali (Figures 2 and 6), the lack of net effect on population of substantial reductions in fertility and mortality are illustrated for Upper Volta (Figures 17 and 18).

These projections are not predictions, but they are inevitable within the framework of the assumptions which lie behind their construction. They also illustrate the obvious point, which is that change in any one of the factors which contribute to population, whether it is fertility, mortality, age distribution, in- or out-migration, or the economy, will generate changes in the others. Some of these responses may be reinforcing, others negating. In addition, the projections indicate the central importance of surveillance and of planning in health, nutrition and population if future disasters arising from a widening gap between people and their means are to be avoided.

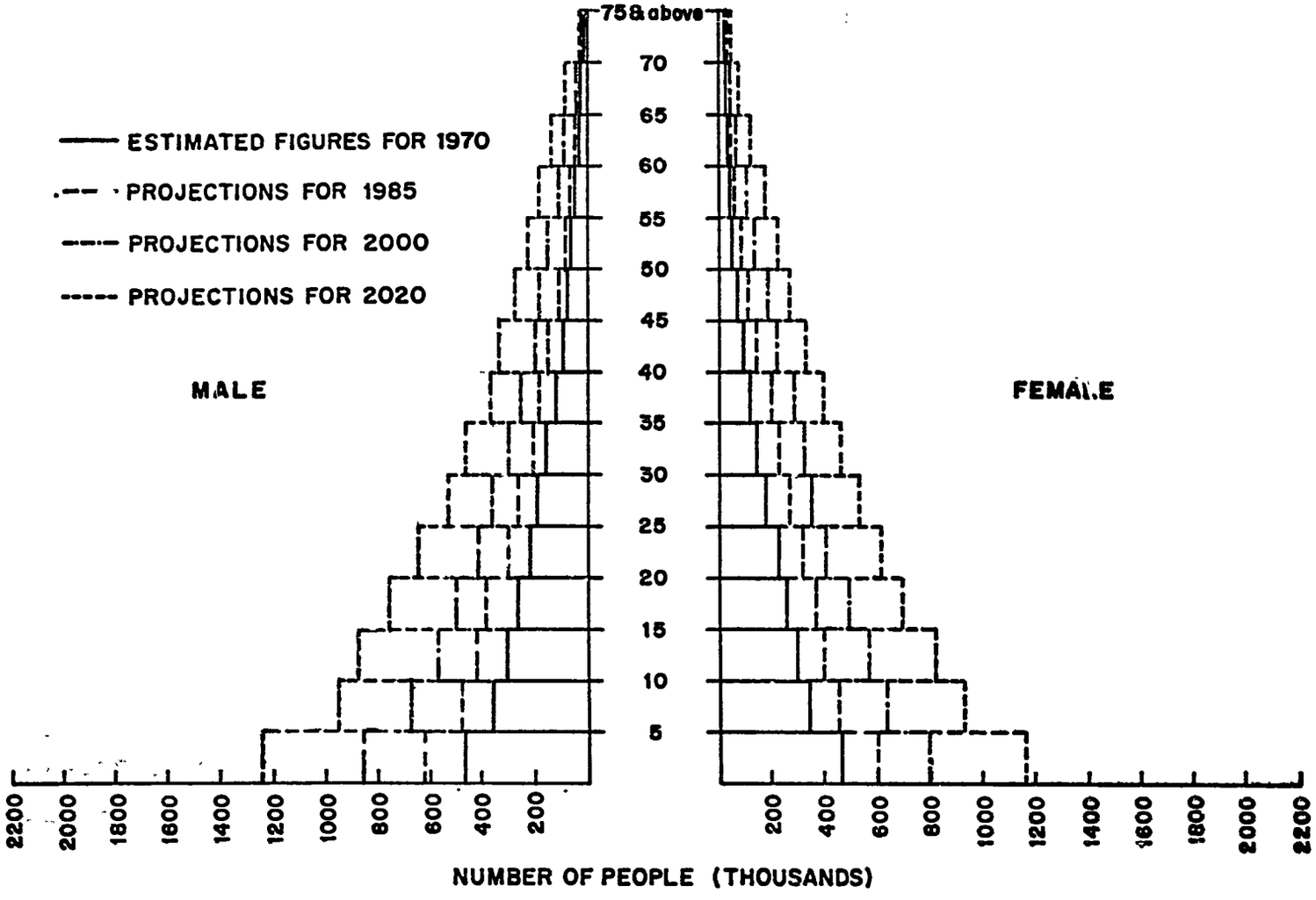


FIGURE 17: Age-Structure for Upper Volta, Assuming Constant Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 1.

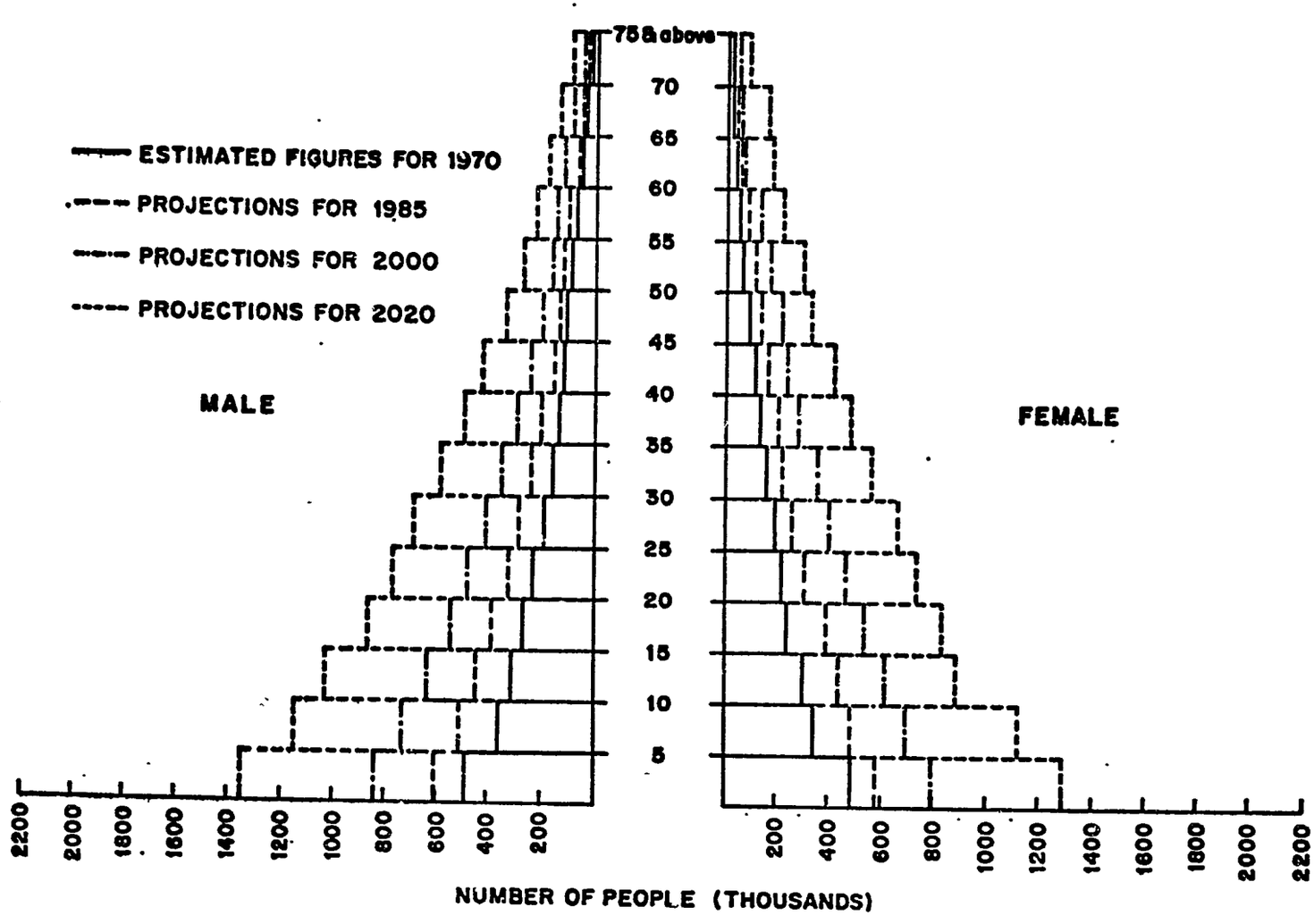


FIGURE 18: Age-Structure for Upper Volta, Assuming Declining Fertility and Mortality, 1970, 1985, 2000, 2020. Based on Assumption 8.

APPENDIX E:

Information Base for Natality Concerns and Programs

(Dr. A. Molnos)

Checklist of questions relevant to the population in the Sahel-Sudan zones. [Prepared by Dr. Angela Molnos].

1. Development Programs in the respective areas during the last 10 to 20 years, including current endeavors. Have there been attempts to introduce technological or other innovations? (e.g. a new crop, fertilizers, irrigation, malaria eradication, transport network development, adult education campaign, changes in animal husbandry). Find out the history of each of the programs. (Who initiated it, who financed it, who worked on it? What were the declared objectives? How was it planned, implemented, evaluated? What local people and how many of them were involved at each stage? What was the relationship between the outsiders and the local people? How much of the objectives has been achieved? What were the anticipated and unanticipated side-effects of the program?) Analyze the likely reasons for the success/or failure of these programs before initiating yours.

2. Family planning/population programs - Go through the same questions in respect to family planning/population programs where they exist (e.g. Mali). Add the following questions:

   What type of family planning service and delivery system? (Clinic based, commercial etc.) What contraceptive methods? Who is providing the service? (doctors, nurses, medically non-trained personnel) Are there family planning motivators, educators, field workers? Are hospital personnel, agricultural extension workers, community development, and other "key" people being taught, informed about contraceptive techniques and the rationale for family planning/population planning?

If there is a "bottleneck" is it because of insufficient contraceptives supplies, lack of trained personnel, lack of training materials, great distances and/or what other reasons?

How many people are reached by the services? Estimate roughly cost-effectiveness: How much input in terms of manpower/hour and/or money is needed to gain an "acceptor" and a "continuer"?

What kind of people are reached by the program and what kind are not? Parity of women in the categories of non-acceptor, acceptor, continuer? Are there resistances against the program? If so, who is against it and why? Has anything been done in order to make the program a self-supporting and ongoing activity so that it becomes part of the people's lives without further outside aid? (e.g. using traditional midwives for the delivery of the "message" and modern contraceptive technology; training the trainers; using acceptors for further motivational work; using existing communication patterns; adapting the integrated approach by which the planning of births is part of the family resources development)

3. Are "family planning"/"population planning" realistic objectives at this stage?

What are the actual advantages/disadvantages derived for a family at the grass root level from limiting and/or spacing the numbers of conceptions/births? Try to find out all the pros and cons based on the current situation in which these families live. Second step: What circumstances must be first changed in order for family planning to become a desirable goal from the people's point of view? (e.g. reduction of infant mortality; further development of the cash economy; overcrowding; shortage of productive land; etc.) The same questions should be answered for the nation as a whole and for each of the major groups within the country (see definition of "group" under 5)

4. What are the attitudes of the political leadership towards the population issue? Do they believe that the country must have more people? Do they see that as soon as some changes are introduced (e.g. reduction of infant mortality), family and population planning might become necessary? Are they properly informed about the socio-economic implications of population trends? Do they really understand these implications? Are they prepared to initiate and support an antinatalistic policy? If not, is it a) because such a policy would be an actual disadvantage to the country; or b) because the leaders, the policy makers themselves, do not understand the problem; c) or because they understand the disadvantages of population growth, but are afraid that an antinatalistic policy would be unpopular and be harmful to their political career? Is anything being done for an elite population information/education? If so, who is doing, what and how in this direction?

5. Demographic and other data - The following data and estimates should be found for the country as a whole. However, it might be very important to find them also separately for each of the distinct groups within the country. Such groups might differ from each other along one or more or all of the following or other features: ethnic composition, culture, historical background, social and political structure, religion, type of economy, language, occupational orientation, educational level, geographical area occupied.

	Country as a Whole	Group A	Group B	...
Area				
Total Population				
Growth rate				
Birth rate				
Infant mortality rate				
Women of fertile age (15-44)				
Average completed family size				
Population under 15				

	Country as a Whole	Group A	Group B	...
Population under 10				
Urban population				
GNP per capita				
GNP per capita growth rate				
Population per doctor				
Population per nurse				
Population per hospital bed				
Literacy % of total population				
Literacy % of total males				
Literacy % of total females				

6. Patterns of migration and their implications - What are the characteristics, causes and effects of the major seasonal and non-seasonal migrations? Who is moving from where to where, when and why? Effects of migrations on (regional) age-distribution, sex-distribution, birth, death rates, other population trends. Effects of migrations on the total situation with special reference to the nutritional situation. Effects on:
   - the areas of emigration and immigration
   - the productivity in general
   - on the political situation
   - on food production (food consumption and marketing)
   - on food logistic/coordinating (supply, warehousing, transporting)
   - on patterns of food distribution
   - on food preparation, consumption

7. Customs affecting birth rates among the various groups within the country.

   What is the marriage age for boys and girls? Are premarital sexual relations allowed and widespread? Are premarital pregnancies, births allowed, widespread? At what age does a woman normally give birth for the first time? Is induced abortion practiced? If so, under what

circumstances, for what reasons, by whom? What are the traditional methods to prevent contraception (e.g. coitus interruptus) and under what circumstances are they used? How long is the customary breast-feeding period and the period between two consecutive pregnancies? Is polygamy (polygymy) practiced? If so, what is the number of children per each wife? How is (or will) modern social change influence these customs? How can such old customs be preserved which restrain people from realizing their full reproductive potential?

8. Legislation - In which way, if any, does present legislation affect birth rates? Are there laws favoring parents with many children through tax relief, free school education, free medical and social services, etc.?

9. Nutrition - Basic questions: How could one maximize the nutritional effectiveness of presently available food? How can food production, storage, supply improve with available means? Food distribution over the region (can food exchange be promoted?) Are there available nutritionally good foods being underused? If so, why?

Nutrition/population problems (eating habits, dietary deficiencies etc.) of each group separately and their solutions (growing more cereals/legumes; increased security for raising domestic animals; new settlement; fishing; small livestock, etc.)

Seasonal variations (due to droughts etc.) of food intake and its implications for children, mothers and others.

Seasonal labor migration and its effects on the food intake of those remaining in the area and those leaving the area.

Food storage systems and food wastage.

Food exchange, distribution, marketing. Is there surplus food in one area while there is shortage in another?

Food intake in urban and rural areas (seasonally; by children, mothers, men)

Images of types of food. Who is supposed to eat what, when, why?

Types of food preparation. Who is preparing what for whom?

Connected beliefs.

Modern influences on eating habits.

Population trends and their implications for

a) Food production
b) Patterns of distribution
c) Food separation
d) Food consumption

APPENDIX F: UNITED NATIONS AND UNICEFF ABSTRACT

At the United Nations Inter-Agency Meeting on the Sudano-Sahelian Mid- and Long-Term Program held in Geneva in June, 1973, member organizations submitted summary statements of their current commitments to the six Sahel-Sudan countries and of their response to the emergency of the drought. We have abstracted all or part of the W.H.O. and U.N.I.C.E.F. summary statements from the final report of this meeting to give a very general idea of the types of health and nutrition programs being supported by these organizations. In no way do they represent the totality of foreign contributions in these areas.

APPENDIX F. 1: WORLD HEALTH ORGANIZATION

W.H.O.–Assisted Projects in the Drought-Stricken Countries in the Sudano-Sahelian Zone in West Africa

1. CHAD

1.1 Smallpox Eradication

Source of funds: W.H.O. regular budget

Date of commencement: 1968 – continuing.

Objective: To maintain the state of freedom from smallpox which has been attained since 1970 with no cases discovered since that date. The program is now carrying out surveillance and immunization activities for a number of communicable diseases in addition to smallpox including cholera, yellow fever, measles, tuberculosis and poliomylites.

Estimated obligations (US$) for local costs:

W.H.O. regular budget:	1973	17	500
	1974	17	500

1.2 Development of Basic Health Services

Source of funds: W.H.O regular budget, UNDP and UNICEF funds

Date of commencement: 1964 – continuing

Objectives: a) To strengthen and develop basic health services in urban and rural health services with emphasis on maternal and child health. b) To plan and carry out a long-term sanitation program, and c) to train health personnel.

Internation staff: Dr. A. Franklin, Medical Officer;
Mr. M.D. Daou, Sanitary Engineer;
Miss P.M. Matter, Nurse

Estimated obligations (US$):	1973	45	996
	1974	51	455

Other funds: Estimates not known yet.

1.3 Nursing Education

Source of funds: W.H.O. regular budget and UNICEF funds.

Date of commencement: 1962 – continuing until 1974.

Objectives: To develop the National School of Nursing and to revise the training program for nursing auxiliaries.

International staff: Miss H. V. Delvaux, Nurse;
2nd nurse under recruitment

Estimated obligations (US$): 1973 36 798
1974 41 760

Other funds: Estimates not known yet.

1.4 Fellowships

Source of funds: W. H. O. regular budget

Objective: To provide fellowships for the training of national personnel in various fields of health activities

Estimated obligations:

W. H. O. regular budget: 1973 48 700
1974 65 800

2. MALI

2.1 Smallpox Eradication

Source of funds: W. H. O. regular budget.

Date of commencement: 1965 – continuing.

Objective: Same as Chad

Estimated obligations (US$) for local costs:

W. H. O. regular budget: 1973 17 000
1974 17 000

2.2 Drainage System for Bamako and Water Supply for Selected Provincial Towns

Source of funds: UNDP

Date of commencement: 1971 – continuing.

Objectives: To formulate a staged program for sewerage and storm drainage for Bamako; to carry out water supply studies for

selected provincial towns; and to train health personnel.

International staff: Mr. J. Baehler, Sanitary Engineer.

Estimated obligations (US$):

UNDP funds:	1973	218 650
	1974	129 850

2.3 Development of Basic Health Services

Source of funds: W.H.O. regular budget and voluntary contribution.

Date of commencement: 1969 – continuing

Objectives:

(a) To implement the national health plan particularly as regards development of a network of basic health service facilities which can support mass campaigns against communicable diseases.

(b) To assume responsibilities for maternal and child health care.

(c) To improve methods for the diagnosis and treatment of malaria.

(d) To establish a central and environmental unit.

(e) To improve sanitation.

(f) To train health personnel.

International staff: Dr. J. C. Baussay, Medical Officer;
second medical officer under recruitment
Mr. L. Roy, Sanitary Engineer;
Miss R. V. Mussey, Nurse
Mr. I. Ujoodha, Technical Officer.

Estimated obligations (US$):

W.H.O. regular budget:	1973	122 400
	1974	129 219
Other funds:	1973	4 000
	1974	Not yet known.

2.4 Nursing Education

Source of funds: W.H.O. regular budget

Date of commencement: 1964 – continuing

Objectives: To develop the programs for training of nurses, midwives, and medico-social workers at state diploma and auxiliary levels; and to strengthen nursing and midwifery services.

International staff: Miss T.M. Ponty, Nurse;
Miss M. d'Hofman de Villiers, Nurse

Estimated obligations (US$):

W.H.O. regular budget:	1973	39 376
	1974	43 183
Other funds:	Estimates not yet known.	

2.5 School of Medicine, Pharmacy and Dentistry in Bamako

Source of funds: W.H.O. regular budget.

Date of commencement: 1969 – continuing.

Objectives: To assist the Government in developing the school.

Estimated obligations (US$):

W.H.O. regular budget:	1973	7 800
	1974	7 800

2.6 Fellowships

Source of funds: W.H.O. regular budget and UNDP funds.

Objective: To provide fellowships for the training of national personnel in various fields of health activities.

Estimated obligations (US$):

W.H.O. regular budget:	1973	34 000
	1974	67 100
UNDP funds:	1973	27 000
	1974	Not yet known.

3. MAURITANIA

3.1 Smallpox Eradication

Source of funds: W.H.O. regular budget.

Date of commencement: 1968 — continuing.

Objective: To complete and evaluate eradication program and develop epidemiological surveillance.

International staff: Dr. I.T. Saveanu, Medical Officer
Mr. V. Chinien, Technical Officer

Estimated obligations (US$) for local costs:

W.H.O. regular budget:	1973	57	786
	1974	61	856

3.2 Development of Basic Health Services

Source of funds: W.H.O regular budget and UNICEF funds.

Date of commencement: 1968 — continuing

Objectives:

(a) To develop basic health services.

(b) To integrate maternal and child health into the work of general health services in the country.

(c) To improve the diagnosis and treatment of malaria.

(d) To train health personnel.

International staff: Dr. J. F. Ortiz Blasco, Medical Officer
Miss K.P. Zander, Nurse

Estimated obligations (US$):

W.H.O. regular budget:	1973	51	683
	1974	52	166

Other funds: Estimates not yet known.

3.3 Nursing Education

Source of funds: W.H.O. regular budget

Date of commencement: 1963 — continuing.

Objectives: Development of basic health services and to develop the programs of the school for nurses and midwives.

International staff: Mrs. M.B. Jezierska, Nurse
second nurse under recruitment

Estimated obligations (US$):

W.H.O. regular budget:	1973	41 851
	1974	46 521

3.4 Fellowships

Source of funds: W.H.O. regular budget.

Objectives: To provide fellowships for the training of national personnel in various fields of health activities.

Estimated obligations (US$):

W.H.O. regular budget:	1973	12 000
	1974	37 000

4. NIGER

W.H.O. Resident Representative in Niamey: Dr. J. C. Emmanuel

4.1 Smallpox Eradication

Source of funds: W.H.O. regular budget

Date of commencement: 1967 — continuing

Objective: As for Chad and Mali

Estimated obligations (US$):

W.H.O. regular budget:	1973	17 000
	1974	17 000

4.2 Development of Basic Health Services

Source of funds: W.H.O. regular budget, UNDP, UNICEF and the funds in trust.

Date of commencement: 1969 — continuing.

Objectives:

(a) To expand basic health services including special services for nomads in accordance with the national health plan. Special attention is being given to maternal and child health, school health and tuberculosis control.

(b) To plan a long term sanitation program including water supplies.

(c) To train health personnel.

International staff: Dr. K. Saric, Medical Officer;
Mr. F. Jermie, Sanitary Engineer;
Mrs. E. L. Konate, Nurse;
Miss L. C. Beier, Nurse.

Estimated obligations (US$):

W.H.O. regular budget:	1973	85 273
	1974	86 471
UNDP funds:	1973	15 000
	1974	Not yet known
Funds in trust:	1973	52 800
	1974	15 000

4.3 Nursing Education

Source of funds: UNDP

Date of commencement: 1966 — continuing.

Objectives: To strengthen the National School of Public Health in Niamey and to train multi-health auxiliaries.

International staff: Miss Verhaeghe de Naeyer;
Miss A. J. Collombe;
Miss B. Vaillandt;
Miss M. R. Heimendinger

Estimated obligations (US$):

UNDP funds:	1973	192	550
	1974	196	000

4.4 Fellowships

Source of funds: W.H.O. regular budget

Objective: To provide fellowships for the training of national personnel in various fields of health activities.

Estimated obligations (US$):

W.H.O. regular budget:	1973	64	600
	1974	69	300

5. SENEGAL

W.H.O. Representative in Dakar: Dr. L.A. Atayi

5.1 Smallpox Eradication

Source of funds: W.H.O. regular budget.

Date of commencement: 1967 — continuing.

Objective: Same as Chad.

Estimated obligations (US$) for local costs:

W.H.O. regular budget:	1973	8000
	1974	8000

5.2 Development of Basic Health Services

Source of funds: W.H.O. regular budget and UNICEF funds.

Date of commencement: 1968 — continuing.

Objective: To develop basic health services to the level required to support mass campaigns against communicable diseases. Special attention will be given to maternal and child health, the national tuberculosis control program, control and treatment of malaria and training of personnel.

International staff: Dr. V. Broccolo Tommasi, Medical Officer;
Dr. M. Maton Ligeti, Medical Officer;
Dr. C. Alagan, Medical Officer;
Dr. J. Vuylsteke, Medical Officer;
Miss Nguyen-Thi-Ky, Nurse;
second nurse: under recruitment
Mr. R. C. Stedman, Technical Officer

Estimated obligations (US$):

W.H.O. regular budget:	1973	173	199
	1974	178	921
UNICEF funds:	Estimates not yet known.		

5.3 Master Plan for Water Supply and Sewerage for Dakar and Surrounding Area.

Source of funds: UNDP

Date of commencement: 1966 — continuing

Objectives:

(a) To develop a phased improvement program within a long-term plan for water supply, sewerage and storm drainage for the city of Dakar and its surrounding area.

(b) To carry out management, legal and finance studies for the development of a self-supporting water and sewerage authority.

International staff: Mr. V. Myssil, Technical Officer;
Miss S. Iskenderian, Administrative Assistant;
Sanitary Engineer: under recruitment

Estimated obligations (US$):

UNDP funds: Estimates not yet known.

5.4 Institute of Odontology, Stomatology in the University of Dakar

Source of funds: W.H.O. regular budget.

Date of commencement: 1970 — continuing.

Objective: To assist the Government in establishing their Institute and to train personnel in dental health.

International staff: Dr. K.I. Mawupe-Vovor, Dental Officer
Dr. C.L. Di pasquale, Dental Officer

Estimated obligations (US$):

W.H.O. regular budget:	1973	48	675
	1974	51	466

5.5 Fellowships

Source of funds: W.H.O. regular budget

Objective: To provide fellowships for the training of national personnel in various fields of health activities.

Estimated obligations (US$):

W.H.O. regular budget:	1973	20	000
	1974	26	200

6. UPPER VOLTA

W.H.O. Representative in Ouagadougou: Dr. F. Martin-Samos

6.1 Smallpox Eradication

Source of funds: W.H.O. regular budget.

Date of commencement: 1967 — continuing.

Objective: Same as for Chad.

Estimate obligations (US$):

W.H.O. regular budget:	1973	17	000
	1974	17	000

6.2 Tuberculosis Control

Source of funds: W.H.O. regular budget and UNICEF funds.

Date of commencement: 1968 — continuing.

Objectives:

(a) To carry out a country-wide BCG vaccination campaign.

(b) To develop a comprehensive national tuberculosis control program based on decentralization of initial bacteriological diagnosis and ambulatory treatment services.

(c) to use a simplified recording and reporting system to facilitate continuous operational evaluation.

International staff: Dr. L. E. van Giat, Medical Officer;
Miss C. M. Hubert

Estimated obligations (US$):

W. H. O. regular budget:	1973	47	285
	1974	49	397
UNICEF funds:	Estimates not yet known.		

6.3 Development of Basic Health Services

Source of funds: W. H. O. regular budget, UNDP and UNICEF funds

Date of commencement: 1968 — continuing.

Objective: To plan, organize and develop the health services. Special emphasis to be given to maternal and child health, environmental sanitation and training of the staff needed for extending integrated health services to rural health services.

International staff: Dr. J. A. Mahoney, Medical Officer;
Dr. O. G. Dindinian, Medical Officer;
Mr. S. K. Stankov, Sanitary Engineer;
Nurse: under recruitment

Estimated obligations (US$):

W. H. O. regular budget:	1973	90	434
	1974	108	399
Other funds:	1973	37	200
	1974	36	300

6.4 Nursing Education

Source of funds: W.H.O. regular budget and UNDP funds.

Date of commencement: 1968 — continuing.

Objective: To develop basic programs for training nurses and midwives to state registration level.

International staff: Miss S. Santa Maria, Nurse;
Miss A. M. Boulanger

Estimated obligations (US$):

W.H.O. regular budget:	1973	22	000
	1974	22	000
Other funds:	1973	103	500
	1974	90	000

6.5 Fellowships

Source of funds: W.H.O. regular budget.

Objective: To provide fellowships for the training of national personnel in various fields of health activities.

Estimated obligations (US$):

W.H.O. regular budget:	1973	26	000
	1974	30	500

APPENDIX F. 2: UNITED NATIONS INTERNATIONAL CHILDREN'S EMERGENCY FUND

Brief Description of On-Going UNICEF-Assisted Programs in the Six Sahel-Sudan Countries Affected by Drought

This brief summary is intended to give only a very general idea of the scope of UNICEF aid, and the status of financial input, expressed in the form of unimplemented (not yet called forward from the field) commitments available at the beginning of 1973, and new commitments approved by the UNICEF Executive Board in May 1973 where applicable.

For more detailed information and data, one may refer to excerpts for the six countries from the UNICEF Digest of Projects (October 1972 edition), and to excerpts from the 1972 Annual Report of the respective UNICEF area offices, of which a number of copies are available in the UNICEF delegation.

It is to be noted that regular water supply programs of any importance aided by UNICEF, i. e, not necessitated as an emergency measure due to the recently aggravated drought conditions, exist only in Niger ($422,000) and Upper Volta ($188,000).

1. CHAD

1.1 Commitments

The latest commitment approved by the UNICEF Executive Board was in 1971, for $419,000 to cover the period 1971-1973. In Jaunary, 1973, $619,000 of this commitment remained to carry the assistance program through 1973. There was no recommendation made to the 1973 Board for a new commitment; one is expected for the 1974 Board.

1.2 Programs

In Health, UNICEF equipment, drugs and transport for the improvement of basic health services have been provided, and in 1973 assistance continues to the basic and in-service training of obstetrical aids. UNICEF also undertakes the salary of a consultant on transport.

In Education, UNICEF continues assistance in the form of training grants to the basic and in-service training of primary school

teachers as well as to seminars at the Pedagogical Institute for Rural Training.

2. MALI

2.1 Commitments

In 1972 a $340,000 commitment was approved for a Services for Children project for 1972-1973, of which $100,500 remained unimplemented as of the beginning of 1973. Separately, $20,500 worth of call-forwards were pending from earlier commitments available for the Milk Conservation project.

In May 1973 the UNICEF Executive Board approved new commitments totalling $1,200,000 for the period 1973-1975.

2.2 Programs

In Health, UNICEF aid concentrates on equipment and transport for the expansion of basic and mother and child health services including maternities, supply of drugs to rural dispensaries, a BCG vaccination campaign, and the control of endemic diseases. In the Education field, UNICEF will help establish community development center and help train "animateurs" for social betterment through community action. In connection with the Government's rural development operation in a rice growing zone, UNICEF will assist in personnel, advisory and equipment costs for the development of extensive social programs made possible by the increase in rural income.

The Car Park Maintenance Services will be improved and regionalzied to cater better to distant areas in this large country. UNICEF will assist in the training of supervisory personnel and mechanics.

3. MAURITANIA

3.1 Commitments

Further to a small commitment of $64,000 approved in 1972 for the continuation in 1973 of on-going projects in Health and Education, the 1973 Executive Board approved a commitment of $341,000 for further continuation to cover the years 1974-1975.

3.2 Programs

UNICEFF assistance to health and education will continue, augmented by a new activity, namely the advancement of women. In health, emphasis will be placed on mobile medical services for the treatment of communicable diseases and on improvement of existing static health units. Training of nurses and midwives will continue and maternal and child care will be integrated into all levels of health center work.

The educational reform on which a government decision was recently taken will be implemented progressively, as the organizational structure necessary for coordination is established. This will include teacher training and retraining in line with the revised approach and strengthening of pedagogic supervision by the establishment of an inspection unit. The program for women's education foresees the establishment of eight centers for training women and girls in practical homecraft, child care and health and nutrition activities. Animatrices (promotion workers) and supervisors will also be trained.

4. NIGER

4.1 Commitments

As of January 1, 1973, there remained $160,000 unimplemented in existing commitments. In May 1973, the UNICEF Executive Board approved new commitments under a single program entitled Services

for Children, for $1,590,000 to cover the four-year period 1974-1977.

4.2 Programs

1973 saw the continuation of sectoral programs. In Health, UNICEF is engaged in the training of personnel, equipping rural dispensaries, pharmacies, maternity and PMI centers, BCG vaccination and disease control. The "Animation" (promotion) program involves aid to women's community centers, poultry raising, and supplementary equipment to a milk plant. In Education, assistance is directed to the production of material for correspondence courses and the Teacher Training School, and transport and equipment for primary school inspection service.

In the new assistance program, in addition to the continuation of sectoral programs, the Government intends to implement, with the participation of various UN agencies and UNICEF, a coordinated regional development strategy including a systematic attempt at integrating economic activities and social program with community participation. The objectives are to ensure that the rural population receives a minimum of the essentials of life (water and food), and of services (health and schools), to preserve and improve the environment (sanitation and housing), improvement of the workload of women (handy tools, etc.), vocational training of young people, etc.

Special attention is drawn to the long-range regular rural water supply component which represents $421,600 or 27 percent of the UNICEF input for four years. Separately, the Board has "noted" a proposed $300,000 project for a possible donor to provide water adduction equipment for setting up collective fountains which would make safe water available to communities which do not have regular water supply.

5. SENEGAL

5.1 Commitments:

The latest commitment for Services for Children was $471,000 aproved in 1972 for the period 1972-1974. Of this, $311,000 remained in January 1973 for use during 1973 and 1974. Separately there is an outstanding commitment of $217,500 in the milk conservation program for use in 1973 and 1974. There was no new recommendation submitted to the 1973 Board.

5.2 Programs

In the Health component, the assistance comprises equipping maternities and health posts, transport for supervision of services and advanced training, training grants for refresher courses for midwives, a BCG/TB mass campaign, leprosy control, health education and environmental sanitation (there is no large-scale water supply component).

For the women's technical education project, UNICEF provides supplies and equipment for the school for teaching staff, who later provide practical courses to women in nutrition, domestic science and child rearing. Educational radio, which among other things publicizes health and women's education activities in rural areas, has been a success, and UNICEF now supports the establishment of broadcast programs on a regional basis.

There is a special assistance program directed toward refugees, in the form of drugs and equipment for health centers, and furniture and equipment for a Friendship School in Teranga.

6. UPPER VOLTA

6.1 Commitments

Out of the latest commitment in 1970 for $961,000 for mid-1970 to

mid-1973, the unimplemented portion as to January 1973 of $594,000 is sufficient to carry the program through 1974. No recommendation for regular funding was presented to the 1973 Board, but only $400,000 for "nothing" (see Health Services below).

6.2 Programs

UNICEF is engaged in a coordinated program of services benefiting children of which the sectoral components are:

6.2.1 Health services: Government plans do not at present include a major expansion in the infrastructure, but concentrate on a better utilization of available services and the continuation of the successful mass campaigns to combat contagious diseases such as leprosy, tuberculosis and trachoma. The training of auxiliary health personnel has improved in quality, but it is hampered by inadequate facilities. Construction of a new school is envisaged, subject to the availability of an outside donor ($400,000 recommended to the UNICEF 1973 Board for "nothing").

6.2.2 Education: Part of UNICEF's assistance has been directed to a special rural education program to provide basic instruction and agricultural and civic training for children who have not attended primary school. The number of centers has grown to nearly 800. Before any further expansion, an evaluation is being made by the newly-created planning section in the Ministry of Education, and UNESCO, with a view to instituting reforms for more effective teaching methods and a better acceptance of the training scheme by the communities.

— Primary education: UNICEF aid has been provided in the form of equipment and transport for basic teacher training, to some experimental schools for educational reform, and for in-service refresher courses for teachers. The latter is organized by the Center for Documentation and Refresher Training which also produces periodi-

cals and documents to guide teachers in new teaching techniques.

6.2.3 Social services: Twenty-one urban and suburban centers provide women general, health and nutrition education, as well as tackle community social problems. In rural areas, village women leaders (animatrices) are trained to stimulate interest in community activities and to create women's clubs. Experimental work has begun in selected areas to promote "urbanized model villages" (water and electricity supply, other services) through community self-help and investment.

The rural water supply program is underway with the collaboration of various services, but progress in the preparation and training has been slow, hampered by lack of budget (a situation that prevailed in late 1972; the drought situation may have accelerated the activities). The three-year plan calls for 180 wells.

7. SUMMARY OF U.N.I.C.E.F. SPECIAL ASSISTANCE TO SAHEL-SUDAN COUNTRIES IN RESPONSE TO THE DROUGHT

The following tabulation summarizes the estimated cost of special assistance with particular relation to the problems created by the drought crisis, which UNICEF hopes to be able to provide for the six countries concerned through 1973-1974-1975 (subject to obtaining special contributions as shown), in addition to its normal programs of aid.

(Estimates in U. S. Dollars or Equivalent)

Type of Aid	Short Term*	Medium and Long-Term**	Total
Health & Medical	150,000	1,000,000	1,150,000
Children's Foods (including transport and local costs)	50,000	1,000,000	1,050,000
Water Supplies	150,000	2,000,000	2,150,000
TOTALS	$ 350,000	$ 4,000,000	$ 4,350,000

*Already under implementation.

**Subject to receipt of special contributions.

APPENDIX G: SUPPLEMENTAL BIBLIOGRAPHY

The bibliography which has been prepared for this Appendix includes many of the documents, books, and articles which were of special interest to project members, but which were not directly cited in the text of the Health-Nutrition-Population report. This is in no way an exhaustive list of the sources which have been consulted in the project; however, it does highlight some of the more important ones.

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