

PN-ABY-573
ISN 99355

MS 20 1991

**Agency for International Development
Small Research Program
for
Historically Black Colleges and Universities**

**Immunization Coverage of Children and
Determinants of Infant and Early Childhood Mortality
In Rural Sierra Leone: A Household Survey**

Submitted by

Principal Investigator:

**Ruhul Amin, Ph.D.
Senior Research Scientist
Institute for Urban Research
Morgan State University
Baltimore, MD 21239-9972**

Ruhul Amin 8/23/91
Ruhul Amin, Ph.D. Date

Robert B. Hill 8/23/91
Robert B. Hill, Ph.D. Date
Director
Institute for Urban Research and
Official Representative of
Proposing Organization

*Neither this proposal nor any modifications of it have been submitted to any other sponsors(s) for evaluation, review, or funding.

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A. Summary

The first objective of this study is to examine the impact of a massive Extended Program on Immunization on infant mortality and morbidity in rural Sierra Leone. The second objective is to delineate the determinants of infant and early childhood mortality in rural Sierra Leone. The proposed study seeks to do this by collecting representative household level survey data from the rural areas of Western Area, Moyamba District, and Port Loko District of Sierra Leone. The study will provide up-to-date data and analysis on the critical factors that influence infant mortality and morbidity. The project is a collaborative effort between Morgan State University and several institutions in Sierra Leone. It will be a rural counterpart study of a 1990 U.S. AID-sponsored urban study conducted by the present Principal Investigator (Amin^a, 1991). It will seek to furnish detailed data, analysis, and policy recommendations aimed at facilitating and strengthening health programs and services in rural Sierra Leone.

B. Relevance of Proposed Work to AID

1. Overview of Research Problems and Objectives

This proposed study is a rural counter-part study of a 1990 U.S. AID-sponsored urban study, entitled, "Infant Mortality, Fertility, and Contraceptive Use in Freetown, Sierra Leone: A Household Survey" (Amin^a, 1991; Amin^b, 1991; Amin and Chowdhury, 1991). Since the 1978 Alma Ata Conference, sponsored by the World Health Organization (WHO), primary health care has been the basic foundation of most of the policies enunciated by WHO and UNICEF. UNICEF has assumed a highly visible role of implementing child survival programs, focusing on the dissemination of a few simple, low-

cost, and effective health techniques widely known by the acronym "GOBI-FF"--growth monitoring, oral rehydration, breast-feeding, and immunization, food supplements, and family planning (World Health Organization and UNICEF, 1978; UNICEF, 1988; Jamison and Mosley, 1991). Sierra Leone is one of the countries in West Africa where UNICEF initiated an ambitious objective of immunizing all children against six diseases which were then claiming high infant deaths, making Sierra Leone infant mortality level one of the highest in the World (U.N. Fund for Population Activities, 1984). That goal was to be achieved by the end of 1990 (UNICEF, 1988). A 1990 household survey in Freetown showed that targeted high immunization coverage of the UNICEF was indeed achieved together with a significant decline in infant mortality (Amin, 1991^a; Amin, 1991^b). While this success of UNICEF's program strategies seemed to have been greatly facilitated by the concentration of existing health facilities in Freetown, the question remains as to whether the same program strategies worked in the rural areas of Sierra Leone where medical facilities are few and far between because of urban bias familiar in the developing countries (MacCormack, 1984). These deficient health facilities of rural Sierra Leone have been further adversely affected by the recent stagnation in the underdeveloped rural economy together with the population growth (MacCormack, 1984).

The question naturally arises: is it possible that a primary health care program can be effective in the face of the prevalence of a very high morbidity and mortality, combined with a very low and falling expenditure on an already insufficient health system in the rural areas? The present research proposes to examine this question by collecting household data from selected rural areas of Sierra Leone where UNICEF initiated a massive child

immunization program since the mid-1980s, but have not yet conducted any systematic analysis of the impact of the program (Kim, 1990).

The proposed study has both basic and applied research objectives with respect to the selective health intervention strategies in the developing countries (Walsh and Warren, 1979; Evans, 1981). First, one of the basic research objectives of this proposed study concerns the delineation of the major factors which contribute to high infant and child mortality in rural areas of a developing country. It will seek to rank childhood diseases in some priority ordering, based on considerations of prevalence, morbidity, and risk of mortality. Second, given the recent initiation of a mass immunization program in rural areas by the UNICEF, the study would assess the impact of this health intervention program and other preventive measures such as prenatal care, use of ORT, or other medical services on the reduction of infant mortality and disease prevention. Third, since too frequent births and fertility regulation are also related to infant mortality and mother's health, the study will delineate the factors underlying high fertility and limited contraceptive use in the rural areas of Sierra Leone. Finally, through the application of the focus group analytical approach, the research will seek to obtain additional qualitative data from key informants, health care practitioners, public health administrators, and lay people aimed at extracting indepth and qualitative data on the range of factors which contribute either to increased utilization of primary health care services, or reduction of infant and child mortality, or both. All this will help policy recommendations aimed at the establishment of new program interventions as well as the improvement and reorientation of the existing health services.

2. In-Country Collaboration

The proposed project would be a collaborative undertaking of Morgan State University, Baltimore, MD, U.S.A., the Division of Community Health Care of the University of Sierra Leone in Freetown, Sierra Leone, and the Sierra Leone Ministry of Health.

During his last visit to Freetown in June, 1990, in connection with a previous U.S.AID project (Amin, 1991^a), the proposed Principal Investigator has already established contact with the University of Sierra Leone and the Ministry of Health and received full assurance of their participation and cooperation in the proposed project. We have also initiated contact with the Central Statistics Office of Sierra Leone and received assurance of their full cooperation in the event of project funding (see attached letters of commitment from the in-country counterparts).

The project plan to utilize interviewers from the existing pool of field interviewers employed by the Ministry of Health, Government of Sierra Leone, as well as from a readily identifiable pool of university students from The College of Medicines and Allied Health Sciences of the University of Sierra Leone. All the interviewers selected for the project will be specially trained in field interviewing for the proposed project.

In addition, students from the University of Sierra Leone, as well as investigators from the Ministry of Health, Government of Sierra Leone, will be trained and utilized to edit, code, and enter data into the computer for data-tape preparation. Finally, African students, at Morgan State University, will be involved as research assistants in the data analysis stage of the project, which will prepare them for future research careers in their respective native countries.

C. Scientific Aspects of Proposed Work

1. Introduction and Review of Literature

Past studies indicate the continuation of high infant and child mortality in rural Sierra Leone (Kandeh, 1986; Kandeh and Dow, 1980; World Health Organization and Sierra Leone Ministry of Health, 1980). Inadequate access to modern health facilities and unhygienic environment in which most newly born babies are delivered by untrained traditional birth attendants often contributed to this high infant mortality (West, 1979). During the child delivery, the traditional birth attendants indulge in practices that expose both the mother and the new born child to infection, especially tetanus. As a result, tetanus was found to be the leading cause of infant mortality in rural areas (MacCormack, 1984; Kruger, 1984). Other leading causes of infant and child deaths were pneumonia, diarrhea, measles, and malaria (Kandeh, 1986; Kruger, 1984).

While many of these endemic diseases prevailing in the rural areas could be prevented by modern health technologies, neither the provision nor the utilization rates of these public health services were adequate enough to have any significant effect in the reduction of endemic environmental diseases (MacCormack, 1984; Kandeh, 1986). Consequently, high mortality conditions have continued for Sierra Leone since the start of the colonial era (1807) when Sierra Leone was referred to as the "White Man's Grave" because of the high fatality rate of British colonial officers from yellow fever (Rankin, 1836). Despite modern medical technology, these high mortality conditions did not change much in the recent past due to declining health expenditure as a proportion of total government expenditure and inadequate rural health services, arising out of

increased oil prices, super-inflation, fluctuating exchange rates, and rising interest rates on loans (MacCormack, 1984).

In the context of these external and internal constraints, it would be difficult either to launch an integrated 'horizontal' health care delivery system or to apply expensive and sophisticated medical facilities and equipments by trained physicians (Evans et al., 1981; MacCormack, 1984). Under these circumstances, selective primary health care has been suggested as the most cost-effective program alternative (Walsh and Warren, 1979; Evans, 1981). This may be particularly true in rural Sierra Leone where access to health services is very uneven and large segments of the population are not reached by the existing public health services (MacCormack, 1984; Ministry of Health, 1989). To achieve effective health service coverage of these underserved populations, in a situation in which neither modern health services nor socioeconomic developments are favorable, would require great ingenuity, tenacity, and judicious application of available simple medical technology. This is exactly what seems to have been done by UNICEF in the mid 1980s.

Being cognizant of the fact that some common childhood diseases had been the major killers of infants and children in rural Sierra Leone, UNICEF initiated an Expanded Program on Immunization (EPI) in the mid 1980s with the goal of immunizing all children by the end of 1990. What has been the impact of this EPI? Was it possible to achieve targeted coverage with intended mortality reduction and morbidity prevention? What program strategies have been most effective in reaching all sections of the population? What have been the program benefits? These are some of the questions that the proposed research seeks to answer. By assessing the relative effectiveness of the

various components of the EPI, the study would reveal alternative strategies for policy planners.

However, effectiveness of a program strategy depends on several factors, such as the efficiency of the intervention, quality of task performance, perceived needs of the population as well as cultural consideration in the care process (Bergman, 1982). Other factors that are important are epidemiological understanding of the causes of deaths, changes or additions in the existing health services, surveillance, supervision, and supply logistics (Walsh, 1982; Chen et al., 1980).

Over the past two decades, there has been renewed interest in studies focusing upon infant and child mortality in the developing countries (Preston, 1980, 1978; Casterline et al., 1989; Ruzicka, 1983; Flegg, 1982; Halstead et al., 1985; Caldwell, 1986; DaVanzo, 1988; Jamison and Mosley, 1991; Pan American Organization, 1990). This renewed interest has been spurred by the controversy as to whether the ultimate constraints on mortality decline are those of economic living standards or whether the economic shackles could be loosened to a very marked extent by the application of new medical technologies and by social change (Mosley, 1983; Caldwell, 1986; Jamison and Mosley, 1991).

Some past studies indicated declining trends in infant and child mortality, which was attributed to the introduction of medical technology and corresponding socioeconomic development (Davis, 1956; Stolnitz, 1965; Arriaga and Davis, 1969). A decade ago, a series of studies by Preston (1978, 1981) suggested that the influence of medical technology and socioeconomic modernization had equal influence in the overall decline

of mortality in the developing countries. On the other hand, Gwatkin (1980) presented data which suggested that the pace of improvement in mortality levels had slowed considerably during the late 1960s through the mid-1970s. But this contention of slowing down the pace of improvement in mortality has been challenged by Preston and Bhat (1984) who showed new evidence from India, indicating that the mortality decline did not slow down.

Clearly, the constraints of material resource can be very largely overcome in the contemporary developing countries. In recent years, the availability of some simple modern health technologies have opened the possibility of improving health and mortality situations in developing countries (UNICEF, 1984, 1988). Thus, an extensive, well-organized, and low-cost system of health services and a vigorous malaria eradication program as well as relatively high levels of female education explained Sri Lanka's low infant mortality (Gray, 1974). Similarly, public health programs, especially primary health care, implemented during the 1970s are estimated to account for nearly three-fourths of Costa Rica's infant mortality decline (Rosera-Bixby, 1986), and a considerable portion of Nicaraguan child mortality decline (Sandiford et al., 1991).

Devoting large resources to the health sector as well as a selective program had positive effect on child survival in the developing countries (Nag, 1985; Jain, 1985; Berggren et al., 1981). On the other hand, the continuation of high infant and child mortality in rural Sierra Leone in the recent past may have been due to the inadequate resources devoted to health sector as well as the absence of a selective health intervention program aimed at preventing major childhood diseases. Is it possible to

improve child survival in rural Sierra Leone without concomitant socioeconomic gains or heavy investments in expensive training programs for "conventional" doctors and sophisticated facilities and equipments? Rural Sierra Leone provides a particularly interesting setting for examining this question since some of the modern medical technologies such as EPI, delivery of some basic medicines, and training and utilization of large numbers of less skilled personnel, and fixed outreach health clinics have been recently introduced there (Kim, 1990). An earlier AID-sponsored study by the present Principal Investigator showed that EPI had significant effect in the reduction of infant mortality in Greater Freetown, the primate city of Sierra Leone (Amin, 1991^a; and Amin, 1991^b). The present study will examine whether similar infant mortality reduction has been achieved in rural Sierra Leone, whether these simple health technologies are equitably reaching the rural population, and whether the rural population can effectively adopt and use these technologies. To answer these and similar questions and to delineate socioeconomic differentials in infant and child mortality, the present study would conduct a first ever comprehensive household survey in rural Sierra Leone after the initiation of UNICEF's massive EPI. This survey will collect and analyze data on immunization coverage, retrospective maternity history, infant and child mortality, cause of infant and child deaths, infant and child morbidity, fertility, contraceptive use, and related issues.

2. Analytical Design, Research Hypotheses, Data, and Methods

1) Analytical Design and Research Hypotheses

The analytical design of this study for analyzing infant and child mortality will be drawn on the conceptual framework proposed by Chen (1983) and elaborated by Mosley and Chen (1984). It will be based on the premise that although the ultimate cause of death is biological, the determinants of the fatal biological factors could be a chain of biological, social, and behavioral factors, including access to, and utilization of, health care services (Bouvier and van der Tak, 1976).

The reorientation in research focus implicit in the Mosley-Chen model is highly relevant to the proposed study since the assumptions in the model depart both from traditional medical and social science approaches which have alternately focused on the biological processes of disease, clinical assessments of mortality and morbidity or, on the interrelationships between socioeconomic factors and the incidence of child morbidity and mortality. The Mosley-Chen model not only avoids the mutual exclusivity maintained in the traditional approaches, but also combines essential aspects of the medical and social science approaches in a unified framework with explicit causal ordering. In so doing, the model introduces a dynamic approach which examines the dynamics of infant and child mortality operating through intermediate and proximate determinants that, in turn, influence the risk of disease and the outcome of disease processes.

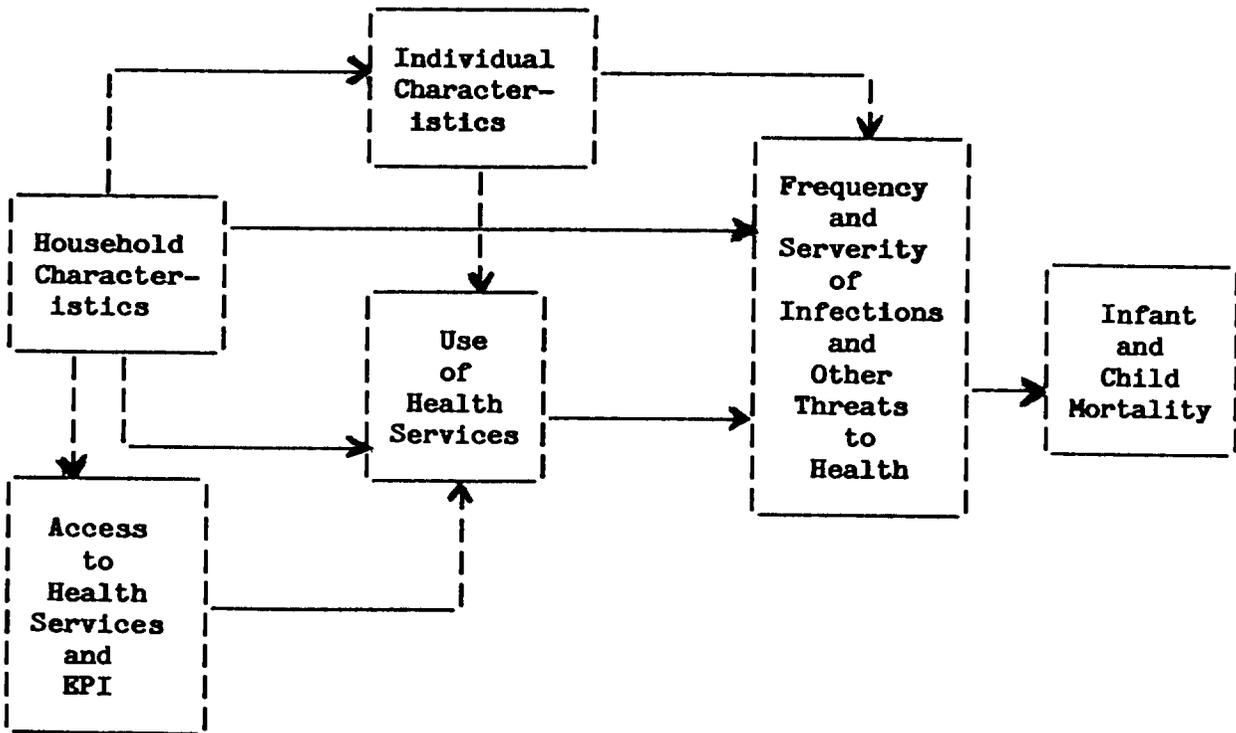
The following illustrative hypotheses are offered to show the effects of particular socioeconomic and proximate determinants on infant and child mortality in rural areas of Sierra Leone:

- a) The higher the utilization of modern simple medical technologies and other modern health care facilities by the mother, the lower the infant and child mortality.
- b) The higher the proximity to free modern health care facilities, the higher the utilization of modern health technologies and health care facilities.
- c) The higher the coverage of a rural population by EPI program or other simple medical technologies, the lower the socioeconomic differences in infant and child mortality.
- d) The higher the proximity to free modern health care facilities, the lower the socioeconomic differences in infant and child mortality.
- e) The higher the contact between a community health worker and a mother, the higher the likelihood of immunization and child survival.
- f) The higher the duration of breast-feeding, the lower the infant mortality.
- g) The lower the birth-spacing between subsequent births, the higher the infant mortality.
- h) The higher the environmental contamination due to the lack of household sanitation, the higher the childhood disease and infant and child mortality.
- i) The higher the antiseptic measures taken for new born child, the lower the infant mortality.
- j) The higher the sanitary quality of food and water supply, the lower the prevalence of childhood diseases and infant and child mortality.

- k) Infant survival is strongly influenced by the social class of the parents. Lower class households are likely to have a higher rate of child morbidity and mortality than moderate or high income households. This class effect gathers strength with age from the neonatal period to early childhood, as the relative role of the maternal factors diminish and the roles of environmental contamination, nutritional status, and personal illness control increases.
- l) The higher the level of mother's education and her employment outside home, the lower the prevalence of childhood diseases and infant and child mortality.
- m) Prompt medical intervention can often cure many of the common childhood infections and diseases. Higher educated mothers are more likely to seek prompt medical care when the child's illness is manifested, reducing the recurrence of infections and illnesses among children.

Figure 1 depicts the broad analytical framework under which these hypotheses will be tested. As evident in Figure 1, the dependent variable is infant and child mortality. The model assumes that household and individual maternal characteristics not only directly influence infant and child mortality by influencing infant and child health, but also indirectly by influencing access to and use of health outreach services. Thus, household characteristics such as proximity to health centers or household socioeconomic status may not only influence infant and child health by influencing use of health services, but also by influencing nutritional level and child-spacing of mother. Not displayed in Figure 1 are several interactions of interest among certain independent variables that may influence infant and child mortality. A novel aspect of framework in Figure 1 is that it

FIGURE 1



emphasizes both the traditional socioeconomic variables and the recently emphasized sets of proximate determinants of infant and child mortality. However, empirical testing of this framework for the study of infant and child mortality requires both a definition of the proximate determinants of mortality and a definition of the independent and dependent variables. These definitions are implied in the hypotheses presented earlier, but greater precision and elaboration of their measurements are presented below.

ii) Data and Measurement of Variables

The twin objectives of measurement of infant and child mortality and analysis of their determinants in the rural areas of Sierra Leone will be achieved in the present project by collecting and analyzing household data through a sample survey in the rural areas of the Western Area, Port Loko District, and Moyamba District of Sierra Leone.

a) Mortality Measures

The generally accepted techniques for analyzing mortality data from sample surveys will be applied to estimate mortality rates. Primary emphasis will be to estimate infant and child mortality on the basis of data on children ever-born and children surviving. One uncertainty is the quality of age reporting. If the age reporting is poor, the Brass-technique and its modification (United Nations, 1983) will be used to estimate mortality. If the age reporting is good, more detailed analysis will be made, using date of birth and date of death of each child born. In this case, an estimate of the trend in the mortality rates will also be made.

The indirect methods of measuring infant and child mortality will be supplemented by a more direct method based on data on deaths during recent periods (5 years prior to the survey).

The determinants of mortality in infancy and early childhood will be examined separately. It is plausible that the relative importance of each proximate determinant will vary with the age of the child.

Infant mortality analysis will be confined to children alive at the beginning of birth intervals in question, i.e., live births and any deaths during the first 12 months of life. Early childhood mortality analysis will consist of births surviving first 12 months of life.

a) **Independent Variables**

Household-level Variables: A variety of goods, services, and assets at the household level operate on child health and mortality through the proximate determinants (Mosley, 1984). In the present research, household socioeconomic status will be measured alternately by type of dwelling, household assets, or household income. Other characteristics of household such as sources of drinking water, sanitation, and food shortage, will also be used to reflect on household environments. Information on these characteristics will be collected in our proposed survey.

Access to Health Services: Access to health services will be measured by the extent of contact between household members and health care personnel and any health service received by former from the latter. Other alternative measures of accessibility will be distance of each household in relation to a source of health care services. Information on these items will be collected under the proposed survey.

Food: Proper dietary intake, especially during illness, is essential to child care and survival. Lack of adequate food supply or variety could lead to undernutrition and malnutrition. Information on habits and food pattern will be collected in the survey.

Water: Water sanitation is an important determinant of exposure to disease. Safe drinking water had been in scarcity in rural Sierra Leone (Gunartnam, 1981). The proposed survey will collect data on water sanitation.

Preventive Health Care: An axiom of public health is that prevention is better than cure, and if that is the case, the straightforward analysis of causes of death and their elimination by simple health technologies need to be considered. The range of preventive care is diverse and includes proper immunization, nutrition-supplement, prenatal care, and other measures with broad health impact. Data on these preventive measures will be collected to assess their coverage and impact on child mortality and morbidity.

Health System Effects: The health systems of a country play an important role in the provision of maternal and child health services, including control of the major infectious and parasitic diseases of children under five. While effective technology for such services is now available and affordable even within the financial constraints of the less developed countries, the challenge is to allocate the necessary resources and to manage, organize, and operate a system of services for the rural populations that uses multi-purpose community-health workers (Evans et al., 1981). To what extent this has been done in rural Sierra Leone will be assessed in the proposed study.

Individual Characteristics of Mother: Information on the age of mother, her parity status, and interval since previous birth will be measured from data collected in the proposed survey. Younger and older women both have higher rates of infant mortality (Bouvier and van der Tak, 1976). Higher parity births and births following shortly after a previous birth are also more likely to result in infant death (Bouvier and van der Tak,

1976; Wolfers and Scrimshaw, 1975). Sex of the child will also be measured from proposed survey data. Sex differences in infant mortality may reflect innate biological differences in infant viability as well as sex differentials in the quality of infant care (Scrimshaw, 1978; Chen et al., 1983).

Education: Educational level will be measured by the highest level of education achieved by the mother and her male counterpart. According to Caldwell (1986), a marked degree of female autonomy and an increase in female education are central to any exceptional mortality decline in poor countries.

Occupation: Detailed information about mother's occupation and her male counterpart's occupation will be collected. The higher the female labor-force participation outside home, the higher the female autonomy, which increases her likelihood to take action about sick children by traveling to health center, by waiting in queues of mixed sex, and by receiving treatment from modern medical services (Caldwell, 1986).

Breast-feeding and Contraceptive Use: Breast-feeding and contraceptive use status of the mother will be measured from the data collected in the proposed survey data. Both duration and regularity of breast-feeding and contraceptive use will be measured. Breast-feeding and contraceptive use can influence infant and child mortality through birth spacing and other mechanisms (Chen et al., 1983). An earlier study by the present Principal Investigator revealed a modest beginning of contraceptive use in urban Sierra Leone (Amin and Chowdhury, 1991).

Infections and Causes of Death: Each death will be classified according to infections or the causes of death such as diarrhea, tetanus, measles, and other common diseases.

These common causes of death can be reconstructed from the narrative accounts of the symptoms leading up to death, which will be collected from the mothers in the proposed survey. Recent studies show that retrospectively verbal autopsies from mothers can determine with acceptable sensitivity and specificity the major illnesses contributing to deaths in children in a developing country (Kalter et al, 1990; Garenne and Fontaine, 1986).

Other demographic variables such as age of mother, age at marriage, length of gestation will also be used in data analysis.

3. Sampling

The sampling plan of this project will be finalized after consultation with the Central Statistics Office (CSO) and the Planning, Management, Information, and Statistics Union (PMISU) of the Ministry of Health, Government of Sierra Leone. Assistance of Dr. Myint Tin, United Nations Statistical Expert and Advisor on Sample Surveys to CSO, of Mr. G.D. Katta, Sampling Statistician to CSO, and of other statisticians at the CSO will be available to the proposed sampling plan. Both CSO and PMISU assisted the present Principal Investigator in a sampling design in the 1990 household survey in the primate city of Sierra Leone (Amin, 1991^a). At this stage, we plan to adopt a modified version of that sampling procedure for the rural areas of Sierra Leone, taking advantage of the availability of a sampling frame developed for a 1990 rural nutrition survey by the Ministry of health. Thus, in our rural sampling plan, we propose to divide the proposed rural survey areas of West Area, Port Loko District, and Moyamba District into several zones depending on topography and other socioeconomic characteristics. Each zone will be further divided into enumeration areas (EAs) along with their 1985 population (the last

time a general census was taken). Several EAs together form the smallest administrative unit, which is, in turn, identified by the EA codes. This permits easy identification of the administrative district or chiefdom and ward in which the EAs are located.

The sampling design will be implemented on the basis of multistage probability. There will be three stages in sampling. In the first stage, our proposed rural survey areas will be demarcated into several zones, each consisting of numerous EAs. In the second stage, from each of the zones, EAs will be selected with probability proportionate to size (PPS). In the third stage, a certain number of households from each enumeration area will be selected so as to yield a sample size of 2,400 respondents. A sample size of 2,400 women will be sufficient enough to detect a 25 percent reduction in under-five mortality for the two-year period before the survey. The calculation assumes an initial level of under-five infant and child mortality (${}_5q_0$) of 200 per thousand live births. Earlier infant and child mortality surveys in West African countries, including Sierra Leone, found this size was sufficient for either detecting 25 percent reduction in under-five (${}_5q_0$) mortality for a two-period before the survey or for adequate statistical analysis (Becker et al., 1990; Bailey, 1989; Dow, 1971). Because of the in-kind contributions of the Ministry of Health in terms of using their interviewers for the survey, availability of a sampling frame--developed for a 1990 rural nutrition survey by the Ministry of Health--and other in-kind contributions by the Morgan State University and the University of Sierra Leone for data collection, data management, and data analysis, it would be possible to complete all 2,400 interviews within the U.S. AID Small Grant's budget limit of \$100,000. One woman between the ages of 12 and 49 with at least one live birth within the last five years in each selected household will be interviewed.

While the PPS sampling method may be biased in favor of larger units, correction of bias will be made by using reverse systems at the household sampling stage, i.e., sampling with probability inversely proportional to the measure of size used at the area sampling stage. This means that if the sampling fraction for household in enumeration area 'A' will be smaller than numeration are 'B', then by using reverse systems, 'A' will have the same probability of selection as a household in unit 'B'. Since no weight is necessary to counter the bias, overall probability will be constant. Thus, by working out the actual selection probability at each stage, overall probability will be constant throughout the sample.

Although Creole, Mende, and Temne--the three major tribes of Sierra Leone--constitute about 9.4 percent, 9.8 percent, and 49.1 percent of the population in the rural areas of Western Area, respectively, their representation in the Port Loko District, Moyamba District, and elsewhere in the nation is not proportionately the same as in the Western Area (Ministry of Health, 1989). Since MCH-related behavior and concerns may vary by major tribes, our findings may not represent all major tribes of the country. Nevertheless, at least for the limited portion of the country's population to be sampled in this survey, any well-supported conclusions could be of considerable relevance in terms of comparison with the findings from the earlier work carried out in Freetown (Amin, 1991^a; 1991^b; Amin and Chowdhury, 1991).

Moreover, while survey frame of whole country would have been ideal for the proposed study, it was abandoned because of insufficient time, resources, communication facilities, and logistics-related problems. As roads in the remote provinces from Freetown are not generally as good as in the Western Area, Port Loko District, and Moyamba

District (the proposed survey areas), the problems related to organization, communication, and logistics would be several times more difficult in the more remote areas. Moreover, since EPI program have been more vigorously pursued in the proposed survey areas than in the remote rural areas, these areas have been purposely selected. About 32 percent of the population of Sierra Leone live in the proposed sample areas (Sierra Leone Government, 1986).

4. Data Analysis

To assess the net effect of an independent variable on infant and child mortality, we shall adopt multivariate analysis. The statistical technique for this multivariate analysis would be logit analysis, because of dichotomous nature of the dependent variable (Murrells et al., 1985; Swafford, 1980). Such application of logit analysis will involve dichotomization or polytomization of some of the continuous variables such as education or age of mother. Interaction among independent variables will also be examined.

Since our interest is to delineate the independent effect of socioeconomic and health care accessibility, demographic and other factors will be controlled to provide clearer analysis of whether factors other than social status and program accessibility account for the differences in infant and child mortality. Thus, since maternal age at the time of a child birth, birth order of a child, marital status, birth weight, gestational age, prenatal care, or lactation may influence infant and child mortality, they will be controlled.

Lastly, in addition to our multivariate estimates, we shall analyze and present the results of the data analysis in the form of tables, charts, and diagrams in order to convey the essential findings of multivariate analysis in a simple manner.

The above quantitative analysis will be complemented by focus group analysis. The central aim in adopting the focus group approach is to extract indepth and detailed qualitative data on the range of factors which contribute to child mortality and influence child survival. This approach is expected to yield significant insights and knowledge about maternal behavior and health care services in a relaxed setting. Focus group facilitators and moderators will be used to encourage free exchange of views and ideas among the participants and insure dynamic interaction by pacing discussions and introducing new topics in a timely and systematic manner.

While there is considerable quantitative data on the infant mortality and related health issues in the developing countries, there has been little qualitative analysis of the perception of the people involved. We share the conviction of Caldwell et al. (1982) that "most actors involved in major social changes know that something is happening, have some ideas of the direction and shape of the changes, and have speculated--at least to themselves--about what is happening and why." This is no less true in infant mortality, morbidity, and related health problems as in other demographic and socioeconomic areas. With proper scrutiny and interpretation, the information, opinions, and attitudes expressed by various community leaders, health care workers, administrators, and lay people regarding the infant mortality pattern and related health issues can yield useful insights.

One way of gathering and analyzing such qualitative data is focus group session in which a small number of participants, under the guidance of a moderator, informally talk about topics of relevance to the particular research study. Similarly, informal discussion with key informants can also yield valuable insights. The informal situation

and open-ended nature of the questions are intended to encourage participants to comment on conditions and elaborate opinions to an extent that is difficult in more formal individual situation. The purpose of our focus group session or informal discussion will not be to provide statistically generalizable data, but rather to obtain qualitative information. In this sense, it will be a complement rather than an alternative to our sample survey approach.

Our focus group sessions and informal discussion will be designed to obtain additional qualitative data from community leaders, health care workers, administrators, lay people regarding the infant mortality, health programs, and related health issues. Five sets of focus group sessions and seven informal discussions with key informants will be held. While the total sample is not statistically representative of the population of survey areas, some major occupational categories of people will be included in the sample.

Time-phased Implementation Plan

The work on the project will begin as soon as U.S. AID's fund will become available. A tentative time table is as follows: (starting from the day the funds are available to support the project).

0-2 months: Preliminary activities such as modification and finalization of interview instrument (which was used in 1990 Freetown Survey) for rural adaptation, orientation of in-country collaborators on project's objectives and activities by the Principal Investigator, recruitment and training of field supervisors, field investigators, coders, arrangement of field logistics, etc.

2-4 months: Pre-testing of questionnaire, printing of questionnaires, etc.

4-6 months: Field Work: selection of specific communities where household interviews will be conducted, interviews with leaders of those communities to explain the purpose of the study and to gain their cooperation, mapping of the communities, and selection of houses and families to be interviewed.

5-10 months: Actual interviewing of selected mothers in their homes, scrutiny of data in the field, and preliminary acceptance of completed questionnaires for data coding after field editing.

6-12 months: Office scrutiny of the data, editing, punching, and preparation of data tape.

12-15 months: Preliminary preparation of tables on survey findings.

12-17 months: Analysis of infant and child mortality differentials, immunization coverage, childhood disease pattern, fertility differentials, and fertility regulation pattern.

17-24 months: Preparation and submission of the final report to U.S. AID; preparation of reports for publication, and dissemination of study results through seminars in Sierra Leone.

5. References

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- World Health Organization and UNICEF (1978). *Primary Health Care*. Presented at the International Conference on Primary Health Care, Alma Ata., USSR, September 6-12, 1978. Geneva: World Health Organization.

D. Qualifications of Investigators

The Principal Investigator, Dr. Ruhul Amin, Dr. Stefan Goodwin, Consultant, and the in-country collaborators, Dr. Clifford Kamara, Mr. S.A.T.P. Horton, Ms. Glen Sawyer, Dr. Myint Tin, and Mr. G.D. Katta are all trained and experienced researchers in the field of survey research, sampling, field interviewing, data editing, data coding, and data analysis. Dr. Ruhul Amin, who has a Ph.D. in demography, was trained at the University of Chicago and the Catholic University of America in the U.S.A. He has a long experience in survey research, including research in the area of health care utilization, fertility, infant mortality, and family planning in Freetown, a primate city of Sierra Leone (Amin, 1991^a; Amin, 1991^b; Amin and Chowdhury, 1991). Mr. S.A.T.P. Horton, who has a diploma in Medical Statistics from the U.K., is a Fellow of the royal Society of Tropical Medicine and Hygiene. Dr. Clifford Kamara, who has a M.D. from the U.S.S.R., is the Head of Planning, Management Information, and Statistics Unit (PMISU) of the Ministry of Health, Government of Sierra Leone. He has been responsible for all the recent health care and nutrition surveys conducted by the Ministry of Health, Government of Sierra Leone. Ms. Glen Sawyer, Demographer, PMISU, has a Master's degree in Health Science from Fourah Bay College in Freetown, has also participated in all the recent health care and nutrition surveys conducted by the Ministry of Health, Government of Sierra Leone. Dr. George Gage, Division of Community Health Care, College of Medicine and Allied Health sciences, University of Sierra Leone, was trained in West Germany, England, and Canada. He has extensive research experience in primary health care, diarrhoeal disease, and health manpower in Sierra Leone. Mr. G.D. Katta, Sampling

Sampling Statistician, Central Statistics Office (CSO) of Sierra Leone, has a Master's degree in Statistics from Indian Statistical Institute in Calcutta, India, and has participated in various survey research endeavors of the CSO, and Dr. Tin, U.N. Advisor on sample surveys to CSO, has been associated with various sample surveys and national Censuses in Sierra Leone. Finally, Dr. Stefan Goodwin, Chairman, Department of Sociology and anthropology, Morgan State University, has a Ph.d. in Anthropology from Northwestern University, Illinois, U.S.A. He has extensive experience in focus group and qualitative analysis. In short, all the investigators of the proposed study have been associated with various health and demographic research projects in Sierra Leone.

Title: Immunization Coverage of Children and Determinants of Infant and Early Childhood Mortality In Rural Sierra Leone: A Household Survey.

E. Budget (1/1/92 to 12/31/94)

Estimated Total Funding Request of AID \$99,960

Cost Sharing Arrangements:

In-kind 55 days contribution by Principal Investigator 10,175
 --Fringe Benefits 3,053

In-kind computer time contribution by
 Morgan State University 10,000
 --Indirect Cost 7,631

Total In-kind Cost Sharing \$30,859

Detailed Budget (requests of AID):

Personnel (salaries):

<u>Name/Title</u>	<u>(% Time)</u>	<u>Per Day</u>	<u>Salary</u>
Principal Investigator (Dr. Ruhul Amin)	10 days	\$185	\$ 1,850
Research Assistants (Unassigned)	140 days	50	7,000
Secretary (Unassigned)	140 days	50	<u>7,000</u>
Subtotal			\$15,850
Fringe Benefit*			1,703
Consultant (Dr. Stefan Goodwin)			2,000
Supplies (Stationery, duplicating supplies, office supplies; computer paper = \$500; Local and international telephone calls = \$800; photocopying letters, reports, etc., 5,000 pages @ .04 = \$200.)			1,500

Travel	\$13,960
(Two international trips to Freetown by Morgan State University (MSU) Investigators--two round trip tickets at the rate of \$2,000 each trip = \$4,000; 47 days stay at Freetown by MSU Investigators at the per diem rate of \$180 = \$8,460. Two trips to professional meetings in U.S. by MSU staff = \$1,500.)	
Other Direct Costs	\$53,059
(Fees for in-country collaborators; fees and expenses for sampling activities; training of interviewers and coders, etc. = \$11,500; field data collection by interviewers = \$18,600; data editing and data coding operations = \$4,800; computer entry and data tape preparation = \$7,875; transportation costs of sending interviewers and supervisors to the fields for data collection = \$10, 284.)	
Indirect Cost^b	\$11,888
Total Cost Requested of AID	\$99,960

^aFringe benefit is 30% of salaries for regular employees (Dr. Amin) and 8.2% of salaries for contractual employees (other personnel) at Morgan State University.

^bIndirect cost at DHHS negotiated rate of 75% of salaries at Morgan State University (Agreement dated March 28, 1989).

The Principal Investigator, Dr. Ruhul Amin, will guide the substantive, methodological, and analytical aspects of the project. He will plan, initiate, and implement the project through its different phases. He will need the assistance of two Research Assistants in completing the computational tasks of the project. International trips to Freetown by the Investigators would be needed to ensure quality of data to be collected and to ensure timely and rigorous implementation data collection phase.

While Dr. Goodwin, the Consultant, will guide the substantive, methodological, and analytical aspects of the focus group analysis, the in-country collaborators will help implement the different phases of the field work, field data collection, and data processing. Finally, the in-kind contribution of the Ministry of Health, in terms of using their interviewers and other facilities (as used in the 1990 urban survey by present PI), availability of a sampling frame (developed for 1990 rural nutrition survey by the Ministry of Health), and other in-kind contributions by Morgan State University, University of Sierra Leone, and other agencies in Sierra Leone would help smooth and timely implementation of the proposed project.

APPENDICES

BIOGRAPHICAL SKETCH
RUHUL AMIN, PH.D.

EDUCATION:

- Ph.D., Demography, 1979, Catholic University, Washington, D.C.
- M.A., Sociology, 1968, University of Chicago, Chicago, IL, U.S.A.
- M.A., Sociology, 1962, Dacca University, Dacca, Bangladesh
- B.A., Sociology, 1961 (with honors), Dacca University, Dacca, Bangladesh

CURRENT POSITION:

- 1979 - Present: Senior Research Scientist, Institute for Urban Research and Adjunct Associate Professor, Department of Sociology, Morgan State University, Baltimore, MD, U.S.A.

PREVIOUS POSITIONS:

- 1972 - 1978: Associate Professor, University of Chittagong, Bangladesh
- 1971 - 1972: Assistant Professor, University of Chittagong, Bangladesh
- 1968 - 1971: Deputy Director, East Pakistan Research and Evaluation Center (EPREC) for Family Planning, Dacca, Bangladesh
- 1967 - 1968: Research Associate, East Pakistan Research and Evaluation Center (EPREC) for Family Planning, Dacca, Bangladesh
- 1965 - 1967: Health Educator, University of California Family Planning Health Education Research Project, Dacca, Bangladesh
- 1963 - 1964: Social Worker, Department of Social Welfare, Government of East Pakistan, Dacca, Bangladesh
- 1962: Health Educator, Pakistan Malaria Eradication Program, Government of Pakistan, Dacca, East Pakistan

CONSULTANCY EXPERIENCE:

- 1983: Consultant, Population, Health and Nutrition Department, The World Bank, Washington, D.C., U.S.A.
- 1979: Consultant, Population and Human Resources Division, The World Bank, Washington, D.C., U.S.A.

PROJECT IMPLEMENTATION EXPERIENCE:

- 1987 - 1988: Project Director/Principal Investigator, U.S. AID-funded Health and Family Planning Project, entitled, "An Evaluation of Companiganj Health and Family Planning Project in Rural Bangladesh," U.S. AID Grant No. DAN-5053-G-SS-5082-00.

PROJECT IMPLEMENTATION EXPERIENCE: (continued)

- 1981 - 1982: Project Director, "Black-White Differences in Housing Quality: An Analysis of Trends and Differentials," U.S. Department of Housing and Urban Development, Contract #H-5570SG, Washington, D.C.
- 1980 - 1981: Project Director, "Black-White Differences in Income, Occupation, and Unemployment," U.S. Department of Labor, Contract #36-24-80-14, Washington, D.C.
- 1987 - 1991: Project Director, "Socioeconomic Determinants of Infant Mortality, Fertility, and Contraceptive Use in Freetown, Sierra Leone," Agency for International Development, Contract No. DAN-5053-G-SS-9060-00.

PUBLICATIONS AND RESEARCH PAPERS:

- "Fertility and Its Regulations in Bangladesh," World Bank Staff Working Paper, No. 383, Washington, D.C., 1980.
- "Socioeconomic Development, Contraceptive Use, and Fertility in Bangladesh," Demography India, Vol. 14, No. 1 (June 1985).
- "Socioeconomic Factors, Intermediate Variables, and Fertility in Bangladesh: An Application of the DRAT Measure of Cumulative Fertility" (with Che-Fu Lee), Journal of Biosocial Science (April 1981): 179-188.
- "Contraception in Bangladesh," International Family Planning Perspectives, Vol. 11, No. 4 (December 1985).
- "Black-White Differences in Housing: An Analysis of Trends and Differentials, 1960-1970," The Negro Educational Review, Vol. 36, No. 1 (January 1986).
- "Son Preference in Bangladesh: A Persisting Barrier to Fertility Regulation," Journal of Biosocial Science, Vol. 19, April 1987.
- "Knowledge of Family Planning Methods in Bangladesh," Biology and Society, December 1986.
- "Family Planning in Bangladesh: An Examination of Recent Trends and Differentials," International Family Planning Perspectives, Vol. 13, No. 1, March 1987.
- "Field Experiment Comparing Family Planning Education Programs Directed at Males and Females" (with L. W. Green), International Journal of Health Education, Vol. XVI, Issue 4 (October 1973), pp. 1-14.
- "Paths to the Adoption of Family Planning--A Time Lagged Correlation Analysis of the Dacca Family Planning Experiment" (with L. W. Green), International Journal of Health Education, Vol. XVII, Issue 2 (April-June 1974), pp. 1-12.

PUBLICATIONS AND RESEARCH PAPERS:

"Infant and Child Mortality in Bangladesh, 1959-1976," Demography India, Vol. 15, No. 1, January 1986.

"Racial Differences in Housing: Trends and Differentials," Urban Affairs Quarterly, Vol. 22, No. 3, March 1987.

"Trends and Differentials in Knowledge, Ever Use, Current Use, and Future Intended Use of Contraceptives in Rural Bangladesh: Evidence from Three Recent Surveys," The Pakistan Development Review, Vol. 26, No. 2, Summer 1987.

"Infant and Child Mortality in Bangladesh," Journal of Biosocial Science, Vol. 20, No. 1, January 1988.

"Menstrual Regulation in Bangladesh: An Evaluation of Training and Service Programs," International Journal of Gynecology & Obstetrics, Vol. 27, November 1988.

"Characteristics of Traditional Midwives and Their Beliefs and Practices in Rural Bangladesh," International Journal of Gynecology & Obstetrics, Vol. 29, February 1989.

"Community Health Services and Health Care Utilization in Rural Bangladesh," Social Science and Medicine, Vol. 29, No. 12, 1989.

"An Evaluation of MR Training and Service Programs in Bangladesh: Results from a National Survey," Studies in Family Planning, March 1989.

"Helping Pregnant Adolescents: A Case Study of An Alternative School in Baltimore," Negro Educational Review, Vol. 39, 1988.

"Recent Evidence on Trends and Differentials in Bangladesh Fertility," Journal of Biosocial Science, Vol. 22, April 1990.

"Socioeconomic Differentials in Contraceptive Use and Desire for More Children in Greater Freetown, Sierra Leone," International Family Planning Perspectives (Forthcoming).

OPERATIONAL RESEARCH AND ADMINISTRATIVE EXPERIENCE:

Dr. Ruhul Amin has 22 years of combined administrative and operations research experience in the field of demography and "MCH-Family Planning programs. Dr. Amin's research experience has been extensive, covering such topics as fertility dynamics, contraceptive use, child mortality, teenage pregnancy, maternal morbidity, child health, health care utilization, determination of the relative effectiveness of various educational and communication approaches in family planning, and service delivery programs in national family planning and health programs in rural and urban areas of Bangladesh and erstwhile Pakistan. Among his research activities in the United States are included several federally funded research projects on housing access to low-income groups, analysis of national youth employment data collected during the Job Corps Programs, studies of recent immigrant groups, and the cost-effectiveness of adolescent pregnancy programs, and a household survey to ascertain knowledge,

attitude, beliefs, and behaviors about AIDS and HIV infection in the black community of Baltimore City.

In all the research projects, in which Dr. Amin served as Principal Investigator, he was personally in charge of initiation, direction, and oversight. Among his activities are included the initiation of action and substantive research projects, grantsmanship, instrument design, sampling drawing, recruiting, hiring and training of supervisory staff and interviewers, site visits, field management and supervision of field activities, data editing and data coding, execution of computer programs for data cleaning and data analysis, analysis of national and local level survey data on health, family planning, fertility, and mortality, as well as the writing of research reports with policy recommendations. Dr. Amin has good working experience in FORTRAN and in standard computer package programs such as SPSS, ECTA, or BMDP. Over the past eight years, Dr. Amin has been involved in various research projects at the Institute for Urban Research at Morgan State University, Baltimore, Maryland, U.S.A. He has also taught graduate courses in statistics and research methodology in the Department of Sociology. As the Senior Research Scientist in the Institute, Dr. Amin has been directing the Institute's technical activities, including, among others, questionnaire development, sample implementation, data reduction, and analysis of large-scale and multi-scale surveys.

Between 1972 and 1975, Dr. Amin was involved in teaching and research at Chittagong University in Bangladesh. As a researcher, Dr. Amin was responsible for instrument design, interviewer training, field interviewing, data coding, data analysis, and writing of reports on family planning and rural development projects.

Between 1979 and 1983, Dr. Amin served as consultant to the World Bank, Washington, D.C. In this capacity, Dr. Amin lent his expertise in the area of demographic data analysis and interpretation which resulted in several World Bank monographs on fertility, child mortality, family planning, and population projection in a developing country.

Between 1968 and 1971, as Research Associate and Deputy Director, East Pakistan Research and Evaluation Centre (EPREC) in erstwhile East Pakistan, Dr. Amin was involved in the collection, analysis, and interpretation of MCH-Family Planning data as well as demographic data. He was responsible for instrument design, pretesting of questionnaire, interviewers' training, field supervision, data editing, data coding, data tape preparation, data analysis, and report writing with policy recommendations. He was also involved in the training of field family planning personnel engaged in service delivery programs of the national family planning program.

Between 1965 and 1967, as Health Educator, University of California Family Planning Health Education Research Project (an experimental project) in erstwhile East Pakistan, Dr. Amin had the major responsibility of researching practical educational approaches to disseminating information, gaining community support, and instituting intensive family planning service delivery programs. He was responsible for instrument design, interviewers' training, site visits, data gathering, data coding, data analysis, and report writings.

OPERATIONAL RESEARCH AND ADMINISTRATIVE EXPERIENCE:

Between 1962 and 1963, as health Educator in erstwhile Pakistan National Malaria Eradication Program, Dr. Amin designed and executed educational and communication activities aimed at getting public cooperation and participation in the eradication of malarial disease from the then East Pakistan.

Between 1963 and 1964, as a Social Worker, Department of Social Welfare, Government of erstwhile East Pakistan, Dr. Amin was responsible for organizing and administering various projects aimed at improving maternal and child health as well as fostering income-generating activities among low-income families. In addition to supervising field workers, Dr. Amin was responsible for evaluating and monitoring various program activities of the Department.

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:

Population Association of America, Washington, D.C.

NATIONALITY: American

DATE OF BIRTH: July 3, 1938

FAMILY STATUS:

Wife - Umme Kulsum; Age - 44
Son - Mahmudul Amin; Age - 19
Daughter - Renita Amin; Age - 12

MAILING ADDRESS:

10507 Gateridge Road
Cockeysville, Maryland 21030
U.S.A.

REFERENCES:

Dr. Rashid R. Faruqee
Senior Economist
The World Bank
1818 'H' Street, N.W.
Washington, D.C. 20433, U.S.A.

Dr. N. I. Khan
International Resource Development
& Management, Inc.
3000 'M' Street, N.W.
Washington, D.C. 20007, U.S.A.

Dr. Robert B. Hill
Director
Institute for Urban Research
Morgan State University
Baltimore, Maryland 21239-9972

CURRICULUM VITA

Name Stefan Cornelius Goodwin, Ph.D.

Date of Birth: February 13, 1941

Address at Residence: 3016 St. Paul Street
Baltimore, Maryland 21218

Address at Business: Sociology-Anthropology Department
Morgan State University
Baltimore, Maryland 21239

(301) 444-3518

Specialty: Sociocultural Anthropology and
Comparative Sociology

Culture Area Interests: Mediterranean Basin and Circum-
Saharan Africa

Education: B.A. in French. Tennessee State
University; Nashville, Tenn. (1960)

M.A. in International Relations. New
York University; New York, NY (1964)

M.A. in Anthropology. Northwestern
University; Evanston, IL(1972)

Ph.D. in Anthropology. Northwestern
University; Evanston, IL (1974)

Graduate Certificate in African Studies
Northwestern University (1974)

Graduate Certificate in French. McGill
University. Montreal, Canada. (1962)

Other Graduate Studies at University of
Iowa and Michigan State University.

Formal Language Study: Arabic, French, German, Hausa, Spanish

Computer Language Study: BASIC, COBOL, SPSS

Academic Positions: Senior Education Officer at Okene Teachers College in Okene, Nigeria and at Government College in Zaria, Nigeria (1966-1968)-U.S. Peace Corps assignments through appointment by the Northern Nigeria Ministry of Education

Lecturer in Jeddah, Saudi Arabia for the Institute for Modern Languages (1968-1969)

Assistant Professor of Anthropology in the Department of Anthropology. Wayne State University; Detroit, Michigan (1974-1976)

Associate Professor of Sociology in the Department of Sociology-Anthropology. Morgan State University; Baltimore, Maryland (1976-Current), including eight years as Department Chair

Honors and Grants: National Science Foundation Field Research Grant (1973-1974)

Fulbright-Hays Group Project Grant (1978) Morgan

State University Faculty Development Grant (1983, 1984)

Scholarly Publications
(selective)

The Partition of Western Africa: Reactions and Counter-Reactions. New York University, M.A. Thesis, 1964.

Facets of Life in a Village of Northern Nigeria (with Ann Hofer Holmquist). In Anthro 70. Binghamton: SUNY, 1970.

Anthropology and Economics: An Interdisciplinary Approach to Current Problems. In Cobweb Economics Journal, 1(2):37-39. Tal-Qroqq: The Royal University of Malta, 1971.

Time-Allocation and Urban Adjustment: A Maltese Case Study. Northwestern University, Ph.D. Dissertation, 1974.

Islam: A Dimension of Status for Women of Sudanese and Saharan Africa. Paper delivered at the Seventy-Fifth Annual Meeting of the American Anthropological Association, 1976.

Dimensions of Social Stratification in the Maltese Islands. In Proceedings of the Seventh Annual Alpha Kappa Delta Sociological Research Symposium, 1977.

Review of Culture and Language: The Black American Experience by William S. Hall and Roy O. Freedle. In Association of Third World Anthropologists Research Bulletin, 1978, 1(10) 13-15.

Stratification in the Philippines. In The Morgan Journal of Research. 1984, 2(4): 33-39.

International Study and Socio-Economic Dimensions of Brain Drain (with Marcellina Okehie-Offoha). In Understanding the International Student. S. Kaikai and R. Kaikai, eds. McGraw-Hill, 1991.

**BIOGRAPHICAL SKETCH
GEORGE N. GAGE**

Education:

MD., 1978, University of London, U.K.

M.Sc., 1980, McMaster University, Canada.

D.P.H., 1986, University of Tuebingen, West Germany.

Current Position:

1981 - Present: Head, Division of Community Health Care and Vice Principal,
College of Medicine and Allied Health Sciences (COMAHS),
Sierra Leone.

Previous Positions:

1978-79 - Deputy Chief (Ag.) Medical Officer, Ministry of Health, Government
of Sierra Leone

1976-78 - Provincial (Principal) Medical Officer, Ministry of Health, Government
of Sierra Leone

1973-76 - Senior Medical Officer and Head, Endemic Diseases Control Unit,
Ministry of Health, Government of Sierra Leone

1971-72 - Medical Officer, Connaught Hospital, Freetown, Sierra Leone

Research Papers:

1. Health Care Delivery for Underfives in Rural Sierra Leone.
2. Incidence of diarrhoeal disease in Western Area, Sierra Leone.
3. Health Manpower Training and Evaluation, Sierra Leone.
4. Primary Health Care, National Action Plan, Sierra Leone.

**BIOGRAPHICAL SKETCH
S.A.T.P. HORTON**

Education:

MB, CHB, 1954, University of Liverpool U.K.
Intermediate LLB, 1968, University of London, U.K.
Diploma in Statistics, 1969, London - Polytechnic Central London,
London, U.K.

Current Position:

1977 - Present: Head, Medical Statistics Unit, Ministry of Health, Government
of Sierra Leone

Previous Positions:

1965-77 - Officer-in-charge - Medical Statistics Unit, Ministry of Health,
Government of Sierra Leone
1973 - Consultant and In-country counterpart to WHO Research Program
on Infant Mortality

Project Implementation Experience:

1990 - In-country co-ordinator to U.S. AID funded Morgan State University's
project, entitled, "Socio-economic Determinants of Infant Mortality,
Fertility, and Contraceptive Use in Freetown, Sierra Leone."
1990 - Member, Field Co-ordinating Team, Sierra Leone National Nutrition
Survey funded by UNICEF.
1989 - Field Co-ordinator to Primary Health Care Baseline Survey of
Western Area jointly sponsored by UNICEF and the Ministry of
Health, Government of Sierra Leone.

Research Papers:

1. Health Problems and Their Implications for Manpower Development in Sierra
Leone, Ministry of Health, Government of Sierra Leone, 1985.
2. Final Report on Primary Health Care Baseline Survey--Western Area, Ministry of
Health, Government of Sierra Leone, 1989.
3. A Survey of Urban and Rural Health Facilities in Western Area of Sierra Leone,
1989.
4. Infant and Early Childhood Mortality in Freetown, Sierra Leone: Results of a
Survey in 1990 (with Ruhul Amin; paper submitted for publication).