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Research and Intervention Issues Concerning Infant and Child Mortality and Health

Proceedings of the East Africa Workshop

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RESEARCH AND INTERVENTION ISSUES CONCERNNG INFANT AND CHILD MORTALITY AND HEALTH

Proceedings of the East Africa Workshop

Co-organized by

Muhimbili Medical Centre, Faculty of Medicine
University of Dar-es-Salaam, Tanzania

and the

International Development Research Centre

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FOREWORD

The need for inter-disciplinary research on the persistent problems of high infant and child mortality and poor health is well established. Although initial reductions in infant deaths, which account for 40% or more of all deaths in developing countries, can often be achieved through health technology, it is now widely recognized that sustained reductions in infant mortality can be achieved more effectively through programs that address the biomedical, socioeconomic, cultural, and environmental determinants of infant mortality. The design and successful implementation of programs that address these determinants require the collaborative efforts of researchers from various disciplines including health scientists, nutritionists, social scientists, demographers and educators.

The Population, Health and Development (PHD) project of the Social Sciences Division of IDRC was initiated in 1983 as a temporary mechanism to support and to strengthen the capacity of developing country researchers in carrying out interdisciplinary investigations of high levels of infant and child mortality and poor health. To this end, and with the active involvement of the Health Sciences Division, the project organized a number of activities including a series of workshops for health scientists and social scientists active in child health research; the preparation of two large research bibliographies; the sponsoring of several researchers to international conferences; and the commissioning of a series of technical research papers on specific problems or gaps in infant mortality research.

Of the six regional workshops, all of which focussed on the discussion of conceptual and methodological issues in the study of infant/child health and mortality and its determinants, three were held in francophone West Africa, one in anglophone West Africa (Ghana 1986); one in Latin America (Argentina 1985) and one in East Africa (Tanzania 1987).

This volume represents the proceedings of the East Africa workshop on **"Research and Intervention Issues Concerning Infant and Child Mortality and Health".** This workshop, jointly organized by the Muhimbili Medical Centre (MMC), University of Dar-es-Salaam, and the Health Sciences Division and the Social Sciences Division of the IDRC, was held in Arusha, Tanzania on August 17-20, 1987.

The general objective of the workshop was to discuss critically the different methodological approaches and data sources presently being used by health science and social science researchers in East Africa in their study of perinatal and infant mortality and its biomedical and socioeconomic determinants. The topic of perinatal and infant mortality was intended to include morbidity and inter-related variables such as nutrition and

health care. Discussions emphasized the importance of considering the human and economic costs of different research methodologies from both research traditions and the applicability of research results to practical solutions of community problems.

Specific workshop objectives were to:

a) present and evaluate methodologies and data sources being used for the measurement of levels and differentials of perinatal and infant mortality and health and their biomedical, socioeconomic, cultural and environmental determinants;

b) present and evaluate health and development interventions;

c) examine and discuss some of the conceptual frameworks now being used in East African research on infant mortality and health;

d) encourage the further development of research methodologies which can incorporate social and biomedical research traditions; and,

e) facilitate the exchange of research experiences among East African health and social scientists and to identify priorities for future research.

A total of 28 researchers from 5 East African countries (Ethiopia, Sudan, Kenya, Tanzania and Zimbabwe), equally divided among health scientists and social scientists, were invited to attend the workshop. A total of 23 participants were able to attend; 16 from the social sciences and 7 from the health sciences. This total included a representative from two previous workshops on the theme, one from Latin America and one from West Africa. The workshop received presentations of 26 papers because several of the invited participants sent their papers with colleagues. 20 of these papers have been revised for publication and are included in this volume. It is hoped that these papers from the Workshop will help to encourage further interdisciplinary research on infant/child health and mortality.

The PHD project of IDRC wishes to express its gratitude to the Muhimbili Medical Centre and to Dr. Eustace Muhondwa in particular. Without his hard work and dedication to the planning and execution of the workshop, a successful workshop would not have been possible.

Sandra Witt
Coordinator
Population, Health
and Development Project
I D R C

Introduction

by

**E.P.Y. Muhondwa / Muhimbili Medical Centre,
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East Africa and much of Sub-Saharan Africa is characterised by high infant and child mortality rates. According to the World Bank (1987) the East African countries had Infant Mortality Rates which ranged from 91 per 1000 for Kenya to 168 per 1000 for Ethiopia in 1985.

Indeed until China, Sri Lanka, Costa Rica and the Kerala State in India were shown to be exceptions to the rule (Halstead et. al. 1985) high infant mortality and low life expectancy were taken to be the sine qua non of socioeconomic underdevelopment.

The performance of these exceptional countries suggests that specific interventions in the areas of education, health services and nutrition can break the economic shankles to improving the health of populations in less developed countries (Caldwell 1986).

It is increasingly being accepted that a high level of economic activity as manifested by high gross domestic product per capita is not essential to improving a population's health status. Consequently the contribution towards this end by Primary Health Care and specific interventions within it (Walsh & Warren, 1986) have credence as viable routes to lowering mortality and improving health.

The workshop whose proceedings this publication disseminates should therefore be seen in the context of continuing efforts directed at finding how best to maximise the effectiveness and impact of interventions and programmes which have the potential of lowering infant/child mortality thereby improving health. Indeed most of the papers proceed from an explicit or implicit acceptance of the notion that improved health status in East Africa does not have to await the advent of the millenian of high levels of socioeconomic development. The papers all share a concern for the lack of reliable measurement of infant/child mortality within less developed countries which not only hampers sensitive evaluation of interventions aimed at its reduction, but precludes the monitoring of its trends over time. The workshop addressed infant/child mortality differentials among different sections of society, the lack of full understanding of the determinants of infant/child mortality, the sociocultural context, and the difficulty of correct targetting of the relevant interventions for maximum impact.

This is not to suggest that the health and social scientists who came to the workshop were not aware of constraints which the ailing economies of the four East African countries pose to efforts at modifying the determinants of infant/child mortality. Neither did they overlook the biomedical problems of interaction between common infections, nutrition and environmental conditions present in singling out particular health problems for control.

Nevertheless a spirit of optimism in what has been called "the art of the possible" (Ramahingaswaini 1986) pervaded the discussions and it is in this spirit that these proceedings are being shared with others who are also concerned about health and welfare in less developed countries but who might be exploring alternative routes to its betterment.

The proceedings also recognised the fact that East Africa countries, let alone less developed countries in general, are not homogeneous and that their health problems are at different stages of evolution and transition from the classical health problems of infections, malnutrition and poverty to those of affluency. This evolution can pose serious political problems in health policy formulation by focussing on a limited set of problems before addressing the problems which currently affect the large majority of the population.

Three major items run through all the papers. These relate to the problems of measuring infant/child mortality in the absence of reliable sources of mortality data, the multifacetted nature of the determinants of infant/child mortality, and, the targetting of interventions for maximum impact on the reduction of infant/child mortality.

Several papers deal with the issue of infant/child mortality measurement from incomplete and unreliable data. One of these papers explores the potential of an alternative method for collecting mortality data to enhance the validity of mortality statistics. The papers in question are those by Banda, Garssen, Mbaruku, Muganzi, Muhwava, Sawyer, Mtango and Feyisetan.

The paper by Banda describes the absence of viable civil registration systems in Sub Saharan African countries and notes the dependence by policy makers and planners on the population census and national demographic surveys for demographic data which they need for planning purposes. The paper examines the methodologies and data sources used and assesses the validity of the mortality estimates made, of the differentials in mortality among different sections of the population, and of trends over time. The multiround demographic survey conducted in Zambia in 1978 is used to illustrate the problems highlighted.

Garssen's paper also documents the lack of reliable mortality statistics which are based on census and demographic surveys. Mortality statistics were derived from a demographic survey carried out in Zanzibar. In particular, it highlights the finding that there has been only a slight reduction in infant mortality over the past decade despite a considerable increase in medical care with resultant high immunisation coverage.

Mbaruku's paper takes up the issue of vital registration. It reviews the progress and problems in the implementation of the civil registration in Tanzania. It notes that even though a law recognising the registration of births and deaths was first enacted in 1921 and amended in 1966 coverage has remained very low. New moves were taken in 1979 to revamp the registration system but its viability is yet to be assured. The paper discusses some of the problems which have hampered the implementation of the system in Tanzania.

Muhwava's paper examines the data of the 1982 Population Census in Zimbabwe highlighting the lack of plausibility of the low Infant Mortality Rate which he attributes to underreporting of deaths. The paper calls for community based studies which would delve into the proximate and indirect determinants of infant mortality to complement Census data and to provide information which can be used in planning and instituting interventions aimed at reducing infant mortality.

Sawyer's paper makes the point that both Africa and Latin America face similar problems with the measurement of infant mortality due to lack of viable civil registration systems. The paper highlights the problems and deficiencies of conventional indirect methods of measuring mortality differentials under the conditions of rapid demographic change. The author discusses this problem with reference to Brazil, a country which is experiencing rapid demographic change.

The paper by Mtango reports on a project in Bagamoyo district, Tanzania, which is testing the feasibility of a community based system for collecting mortality data as well as information about causes of deaths. The project seeks to demonstrate a method for overcoming problems arising from the fact that a large proportion of deaths occurs outside health institutions. Some results from seven years of project implementation are presented and discussed.

Feyisetan's paper offers a critique of the survey method and shows how the analysis of the data obtained by demographic survey fails to go beyond establishing correlates of mortality. The paper calls for the use of demographic research methods which can obtain data on how such correlates operate.

Muganzi's paper is of the same vein as Feyisetan's. It too advocates the use of alternative methods to supplement population census and demographic surveys which generally yield aggregate data on socioeconomic factors associated with mortality as opposed to explanations for differences in mortality between regions and districts. The paper observes that at least in the context of Kenya where the strategy in rural development is to focus on data gathering approaches at the district level, detailed information could be obtained to complement census and demographic survey data. The Focus Group Discussion method is offered as the appropriate method for gathering the required data.

The second group of papers deals, in different ways, with interventions aimed at reducing infant/child mortality. Papers by Hasen, Mkumbwa, Muganzi, Muhondwa and colleagues, and Wafula fall into this broad category.

Hasen's paper reviews the evidence for the decline of mortality in Ethiopia. The decline from 155 per 1000 in 1970 to 114 per 1000 in 1981 is associated with the expansion of health services during this period. The paper documents a notable exception to this trend in the regions of Bak Hararge and Gojam where the infant mortality appears to have increased despite a substantial increase in medical facilities and personnel: an exception which calls for specific studies to examine more closely the mortality situation and its determinants.

Mkumbwa's paper reports on the achievements of the Joint WHO/UNICEF Nutrition Support Programme in Iringa Region, Tanzania. The programme is shown to have contributed to the decline of the Infant Mortality Rate in the region from 152 per 1000 in 1978 to 107 per 1000 in 1986. A major intervention by the programme was the establishment of a system for monitoring the growth of children at the village level. This had the effect of raising the level of consciousness of parents and village leaders concerning the role of malnutrition in child health and to the implementation of corrective measures. One major obstacle which has yet to be overcome is the reluctance by the menfolk to assume a bigger share in domestic chores and child care which would relieve women of heavy workloads particularly during pregnancy.

The paper by Wafula and his colleagues reviews the preliminary results of an intervention programme aimed at controlling Acute Respiratory Infection which hitherto contributed greatly to infant mortality in Muranga District, Kenya. The results show that there has been a significant reduction in ARI - specific mortality. The paper suggests that efforts should be diverted to specific causes of mortality. This would allow for the implementation of appropriate interventions which can be shown to have impact rather than focussing on overall mortality, particularly in areas with low levels of mortality where decline may be slight.

The paper by Muhondwa and colleagues describes the salient features of the process and results of a research project in Tanzania which seeks to formulate indicators of effectiveness and impact for use by auxiliary personnel to monitor their work in maternal and child health care. The project proceeds from the premise that as much as specific interventions within maternal and child health care have proven efficacy, their effectiveness and impact in any situation are not a function merely of their correct application. The project seeks to provide auxiliary personnel who are the major providers of Maternal and Child Health Care in Tanzania, with a tool for monitoring the effectiveness and impact of the interventions which they apply routinely.

The third group of papers on different aspects of determinants of infant/child mortality are those by Bantje, Boerma, Kavishe and colleagues, Munjanja, Nguma, Olenja, Fawcus, Sanders and Sanders, and Sempebwa.

Boerma's paper offers a framework for incorporating the different types of infant/child mortality determinants when evaluating the impact of the health interventions currently being promoted by UNICEF for child survival. It makes the point that since the causes of morbidity and mortality change dramatically as age increases an analysis of age specific morbidity and mortality offers the best entry point in discerning the diseases and other causes of mortality for different age categories and in different settings thereby providing basis for effective intervention. The paper advocates close collaboration between demographers and epidemiologists in designing and carrying out surveys to ensure coverage of relevant demographic and socioeconomic factors which operate together in influencing morbidity and mortality patterns.

The papers by Nguma and Olenja report on studies which trace the determinants of child health and mortality to the micro level of child rearing practices within families. Nguma reports about a study in Tanzania which proceeds from the premise that child health and maternal health for that matter is not simply a matter of succumbing to infections, not getting enough to eat or not making appropriate use of available health services. Rather such "failures" are themselves intervening variables within a complex chain of events whose causes are embedded within the socioeconomic and cultural context where the mother and child live and which in turn determine the kind and level of care which the child gets.

Olenja's paper in turn reviews the findings of the study done in Busia district in Kenya which showed that cultural perceptions play an important part in the management and outcome

of malnutrition. Her review suggests that the influence of cultural perceptions on malnutrition is accentuated by environmental (water shortage, poor sanitary conditions) and socioeconomic factors (low income, production of nutritious foods outweighed by cash crops). She concludes that successful health interventions must incorporate the cultural background and the means to apply health knowledge in the community.

Sempebwa's paper reviews the studies undertaken within the context of the Aga Khan Health Services Programme of Primary Health Care in Kisumu district in Kenya. The studies showed that the longer the mother is away from home or is involved in activities which are incompatible with child care the higher the morbidity and mortality risk to her children. The studies also show that children of mothers who spend over six hours away from home had less chances of being taken to child welfare clinics even when ill, and, when they were, it was often too late. Those who were taken to the clinic earlier also failed to benefit because often there was no responsible person at home with the children to administer the medication appropriately.

The paper by Kavishe and colleagues reviews some findings of a community-based study in Iringa, Tanzania, which sought to monitor maternal and infant morbidity and mortality. The paper discusses the causes of morbidity and mortality and in particular the significance of low birth weight.

Low birthweight as a major determinant of perinatal mortality is dealt with at great length in the papers of Bantje, Munjanja, and Fawcus, Sanders and Sanders.

Bantje's paper discusses some results of a study of birthweights which were obtained by reviewing routine delivery records of live single births for a number of years in rural hospitals in Tanzania. The data were complemented by maternal data obtained from a review of antenatal records and rainfall data obtained from methodology centres. The use of mean birth weights, percentage low birthweights, lagged regression analysis and running means is shown to be highly informative about the influence of the physical environment, the sociocultural milieu and the maternal system as determinants of early infant health and infant mortality.

The paper by Munjanja and colleagues examines the relationship between gestational age, birthweight and perinatal mortality in Zimbabwe. It demonstrates the lack of sensitivity of the international standard of 2500 gms as a cut-off point for lowbirth weight within the Zimbabwean context and presumably, within similar countries where there is also a preponderance of small but healthy infants.

The paper by Fawcus, Sanders and Sanders also illustrates the problem of low birthweight in Zimbabwe through a study of incidence, aetiology and outcome of low birthweight in an urban high density area. Preliminary analysis of the findings highlight some methodological difficulties of using a questionnaire to obtain reliable data on diet and physical activities of mothers during pregnancy.

When viewed as a surface volume, the unique contribution which this publication makes is of bringing together health and social science papers which deal with a common problem from different perspectives. All the papers are by people who are involved in different ways and in different settings with the causes and effects of high mortality rates. This fact alone should serve as a spur to concerted action by all interested parties in obtaining a better understanding of the dynamics of the determinants of infant mortality and in sharpening our focus for health interventions. For as Foege, and Henderson (1986) have observed there is an

> "extraordinary array of current, imminent, and potential interventions... that modern science and technology can offer for the alleviation of major health impediments...our problem is with a paucity of ideas, techniques or effective prevention and treatment for improving health."

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OPENING ADDRESS

by
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Ladies and Gentlemen,

May I take this opportunity to welcome you all to this Workshop. And to those of you who have come from our neighbouring countries and beyond, may I welcome you to Tanzania. It is my sincere hope that your stay in our country and the time that you will spend at this workshop will be a memorable experience.

This workshop has been jointly organised by Muhimbili Medical Centre and the International Development Research Centre of Canada (IDRC). The Workshop however owes a great deal in terms of inspiration and financial support to the IDRC. I wish to pay special tribute to Ms. Sandra Witt from the IDRC Headquarters in Ottawa and to Dr. Stephen Moses, the Organization's Representative in East Africa, for their tireless efforts which have resulted in our meeting here today. We from Muhimbili Medical Centre feel honoured to have collaborated in this endeavour. We ask you to bear with us for any organizational problems that might affect the smooth running of the Workshop. May I assure you that we shall do all we can to minimise any hitches.

Ladies and gentlemen, may I at the outset make explicit my perception of what this Workshop is all about, just in case mine is different from yours, so that at least you can follow what I have to say. I take it that this Workshop is about conceptual and methodological problems in research about infant and child mortality, as well as the operational problems of ensuring the effectiveness and impact of interventions directed at reducing infant and child mortality. All of you have travelled long distances and you have left your important duties to come to this Workshop to deliberate on Infant and Child Mortality and Health. The fact that very few people whom we invited were unable to come signifies the great importance which you, and all of us together, place on the subject. It also justifies our concern that there is a great deal that is not yet understood about the dynamics of infant and child mortality in our East African societies and about cost effective as well as cost efficient methods of improving child health.

The World Health Organization considers Infant Morality to be an appropriate indicator for use in developing countries for measuring the attainment of an acceptable level of health for all. A maximum Infant Mortality Rate of 50 per 1000 live births in these countries would indicate that:

"the health status of the population is becoming a decreasing burden on individual, family and community development"(1).

Recently UNICEF has recommended the Under-five Mortality Rate, defined as the annual number of death of children under five years of age per 1000 live births (2), as a new index of infant and child mortality for use in its child survival programmes (3). This rate is supposed to overcome the lack of compatibility between the Infant Mortality Rate and the Child Mortality Rate because they use different denominators.

But the calculation of either one of these rates, as well as of any other mortality rate, in our setting is not without problems.

The data needed for calculating these rates, cannot usually be gathered through the health service information system. Civil registration of deaths in our countries is either incomplete or nonexistent. We still rely on censuses and other types of demographic surveys which have inherent inadequacies.

It is my hope that you will examine this problem of sources of data and suggest innovative approaches for enhancing the validity of the rates calculated from the data we have while we wait for the development of civil registration. It might be a bit of consolation, though it should not be a cause for complacency, to note that even in developed countries they have not yet come up with a civil registration system which is not without shortcomings. Thus in his study of child health and socioeconomic status in the United States, Mare (4) found that death certificates did not provide the data he needed to study the relationship in children. No socioeconomic information is included on the death certificates of children, nor have children's death certificates been linked to census information on family socioeconomic conditions.

Associated with the problem of data source is lack of reliable data about the cause of death. The data we have, even for deaths due to immunizable diseases, are poor. Besides being limited to only a proportion of the deaths occuring in the community, their validity is further weakned by the poor diagnostic ability of the medical auxiliaries who man most of our health facilities, and who often work without the support of laboratory and other diagnostic aids.

Is it feasible to augment such data by establishing a surveillance system based on a number of communities chosen to represent a cross section of the society, and have every death among children in these communities investigated, with a view to determining its cause? One health project in Tanzania is currently trying out a variant of this system. They rely on lay reports of conditions antecedent to the death to arrive at a diagnosis of the cause of death.

I hope you will have the opportunity to discuss the Tanzania and any other experiences in this endeavour and suggest how such approaches can be improved.

There is also the problem of demonstrating and explaining the socioeconomic differentials of infant and child mortality in our societies. It is one thing to know that children from deprived families are more likely to become ill, more likely to suffer adverse consequences from the illnesses, and more likely to die than those in well-to-do families. But in what way does social class here affect health? As it is, not only do we lack precise data reflecting social class differentials, we do not even have a reliable and generally accepted methodology for operationalizing the concept of social class.

Ladies and gentlemen I would like to put it to you that an understanding of the socioeconomic differentials in mortality, coupled with that of the specific causes of mortality among different social classes is a necessary prerequisite to the formulation of much more sharply focussed interventions.

I should mention at this juncture that the World Health Organization has come up with the Risk Approach (5) which is aimed more or less towards the same end. The measurement of relative and attributable risk provides a quantified base for action in the planning and management of health care, resource allocation, appropriate intervention and use of technology. How much can this approach help us in targetting, and hence enhancing the impact of, our interventions within the constraints of our weak data base?

As regards interventions against infant and child mortality, David Morley in his book entitled Paediatric Priorities in the Developing World states categorically that.....and I quote:

> "In the past, medical workers and planners have often assumed that any large reduction in (child) mortality would need to await an improvement in socioeconomic conditions and in environmental hygiene. However, we now realise that doctors with the relevant paediatric training can organise a service which will prevent more that one-half of the deaths in infancy and early childhood without awaiting any great change in environment. Moreover such prevention must not wait until living standards approach those currently existing in more developed areas of the world"(6).

But in a paper on "Socioeconomic factors affecting mortality in rural Tanzania" Sembajwe echoes the views expressed by John Bryant. In his book entitled Health and the developing world (7) by postulating that.....and I quote,

> "...although it is true that the supply of health facilities and services play an important role in reducing mortality, efforts to improve the health conditions of people may be futile if they are not accompanied by improvements in the overall conditions of the people...."(8).

Sembajwe contends that socioeconomic development is more important in lowering mortality than the provision of health facilities and services. Obviously the two views are not mutually exclusive. Socioeconomic development encompasses health development. Indeed even though his analysis led him to the conclusion that villages with better socioeconomic conditions in Tanzania experienced lower mortality thereby indicating the impact of socioeconomic development he hastened to add that...and I quote

> "It should be emphasized that while the government of the United Republic of Tanzania strives to provide health care for all by the year 2000 an integrated approach to rural development should be adopted. The decline in mortality is subject to a variety of factors including improved agricultural production, education, better housing, clean water supply, improved health facilities and services and transport and communication. No single factor alone can lead to the well being of the population" (9).

But integrated approaches or multisectoral collaboraton have now been reduced to empty slogans. The question is what should be integrated with what, and also with what differences in emphasis?

Those of us who are concerned with the practical realities of implementing health programmes would wish to have valid models and specific guidelines so that we can be sure of the expected results of our effort and dedication.

One final thing: The underlying causes of many infant deaths particularly those within the perinatal period can be traced to poor maternal health as well as the complications of pregnancy and child birth. In many of our East African societies Maternal and Child Health Care seem to be the concern of mothers alone, and yet their control over the resources which would enable them to implement what they learn at the Clinics is limited. Even the little that they earn from their domestic income generating activities is often controlled by the menfolk who may not appreciate what appropriate care for the expectant mother entails, particularly with regards to reducing her workload and catering for her increased nutritional requirements.

What approaches are available for motivating, winning, and sustaining the participation of the menfolk in Maternal and Child Health Care? Can the clinics provide a "pedagogy of the oppressed" so that the subjugated women-folk can champion their own liberation? Are the clinics going to continue to be placed where only orthodox health education about the nutritional requirements of the mother and the child and about the nutritional content of the available local food stuffs, coupled with demonstration of how to prepare weaning foods is imparted?

Ladies and gentlemen it was not my intention to chart out the research and intervention issues concerning infant and child mortality and health in East Africa. What I was simply trying to do was to share with you my own concerns about research and intervention in infant and child mortality and health.

You do have a tight schedule before you and I don't think four days are enough for thorough examination of all the issues which will be raised in each of the papers which will be tabled before you.

I will therefore not take more of your valuable time. I wish I were able to be with you throughout the workshop and quench my thirst for knowledge on this important subject. Unfortunately prior commitments elsewhere have to be honoured.

I wish you fruitful discussions. I also wish you a profitable stay in Arusha.

Ladies and Gentlemen, I DECLARE THE WORKSHOP OPEN

Thank you!

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RECENT MORTALITY TRENDS IN LATIN AMERICA AND NEW NEEDS FOR DATA COLLECTION

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Introduction

The knowledge that has been gained in recent years about the levels, trends, and determinants of mortality in developing countries owes a tribute to African demography. The techniques developed by William Brass and published in 1968 in The Demography of Tropical Africa have been used in developing countries all over the world. Brass-type questions have been included in most national censuses. There are very few countries for which the level of mortality is unknown.

Further development of the original Brass techniques now make estimates possible in situations where mortality is not constant, and one can also use cross-section data to estimate retrospective mortality rates 15 years before the census (Feeney 1976, 1980; Coale and Trussell 1977; Brass 1981). The original Brass technique and its variants can be used with caution to study mortality differentials among social groups as well as the determinants of mortality.

In spite of this progress, new challenges are presented by changing demographic trends and by the needs for more disaggregated levels of analysis, as in the case of planning and evaluation of health programs at the level of regions within a country.

Rapid declines in fertility and mortality in the 1970s, with demographic parameters that change every year, create a need for continuous, up-to-date information, which is not possible with indirect estimates based on demographic censuses.

Programmes directed at the health of mothers and children also create a need for timely estimates for small areas or specific target populations. In order to be more efficient and more effective, programmes should be aimed primarily at groups at greatest risk, which requires estimates of differential risks.

In a previous paper, we pointed out some of the main methodological problems which arise when differentials and determinants are studied using various possible sources of data (Sawyer and Fernandez 1987). In this paper, we would like to share with our colleagues some of our academic concerns and discuss some practical problems related to planning. Such discussion is particularly important as preparations are made for the 1990 round of censuses, which could benefit from suggestions about information needed for better and more appropriate demographic estimates.

Many of the problems encountered in the study of mortality are common to both Latin America and Africa. Since the participants in this seminar have wide experience in this field and have given serious thought to the problems and prospects of mortality studies, we would like to take advantage of this occasion to compare notes, exchange ideas, and perhaps imagine some new directions for studies of mortality.

Our paper is divided into three parts. The first contains a brief summary of levels and trends of mortality in Latin America and includes a few comments on possible determinants of recent trends in Brazil. The second deals with some of the deficiencies of conventional indirect methods for situations of rapid demographic change and for the measurement of differentials. It includes a few comments on questions which are being tried out in experimental censuses and which might be included in the 1990 censuses. The third is a discussion of the indirect technique for measuring infant mortality based on the survivorship of previous births (Brass and Macrae 1985). This method receives special attention because of its simplicity of application and because of the encouraging successful results obtained so far in Latin America.

Recent Mortality Trends in Latin America

In most Latin American countries, mortality decline began in the 1940s or 1950s. Before the decline, life expectancy is estimated to have been between 40 and 45 years. For two decades, life expectancy increased substantially until the curve flattened around 1960. For 1975-80, life expectancy is estimated to be about 60 years (Arriaga 1969, 1981; Chackiel 1983).

Life expectancy varies considerably within the region. In the 1950s Argentina and Uruguay already had life expectancies at birth of over 60 years. Other countries, such as Cuba and Costa Rica, underwent rapid decline, reaching life expectancies at birth of above 70 years in 1975-80. Still other countries, because of very high mortality in the past or slow rates of decline, have life expectancies at birth of only 50 years, as is the case of Bolivia and Haiti (Chackiel 1983).

The different rhythms or paces of mortality decline have raised questions as to which groups or segments of society have benefitted most. In spite of overall decline in general mortality, rates of infant and child mortality were still quite high in the 1960s, when most countries had infant mortality rates of about 100 per thousand live births. Rates under 50 were only achieved by a small number of countries in the 1970s.

It is possible that measures taken to reduce mortality, most commonly by control of infectious and contagious diseases, benefitted the adult population first, and that these and other measures, such as extension of medical services, only recently

began to have greater impact on infant mortality. Unfortunately, many years passed before demographic censuses included questions which permitted estimation of adult mortality. In countries where such information is available, there are indications that adult mortality indeed began to decline before infant and child mortality.

Studies of infant and child mortality differentials have been carried out by applying indirect techniques to census data, by conducting surveys and, in a few cases, by matching registrations of births and deaths. Such studies show excess mortality for children of mothers who are very young or over 30, for short birth intervals, and for first births or births of high order. The common denominator with regard to socio-economic, cultural, and environmental factors is that the groups or strata that are worst off have the highest mortality. This is no surprise, since the time and way of death are the most dramatic expression of how a population lives. What is most impressive in our countries is the magnitude of the differences among strata. In some countries children born to illiterate mothers have mortality rates five times higher than those whose mothers have more than ten years of education (Behm 1979).

Some studies have shown that with the decline of mortality there is a greater concentration in less favored groups (United Nations 1985). This reflects the differential velocity of decline. Such a tendency points to the necessity of not only measuring differentials among groups, but also of quantifying how many people are exposed to the greatest risks. Studies showing how many are at high risk and why might contribute to the design of more appropriate policies and programmes.

In some parts of Brazil there has been a lack of correspondence between economic growth and the living conditions of the population. Between 1964 and 1974, when Brazil experienced its economic "miracle", infant mortality in Sao Paulo, the industrial center of the country, increased 56%, reaching a rate of nearly 80 per thousand in 1974. The model of development for this period excluded much of the population from the benefits of growth. When economic recession followed the miracle, infant mortality declined once again, and in less than 10 years it fell 63%. There is evidence that infant mortality is also undergoing rapid decline in less developed parts of the country.

Although the causes for this recent decline are not known, they are thought to include sanitation in urban areas and the rapid decline in fertility (Sawyer, Fernandez, and Monte-Mor 1987). More than two-thirds of Brazil's population is now urban. The sharp drop in fertility (the most recent estimates place Brazil's Total Fertility Rate at 3.0) could have reduced infant mortality rates by reducing the number of infants exposed to risk without change in the risk of death (Fernandez 1986).

It should be noted that extension of the water and sewerage network is not part of Brazilian health policy, but the responsibility of the National Housing System. Its massive sanitation programmes helped save the construction industry from bankruptcy. The fertility decline, on the other hand, is not a direct result of policy initiatives, but seems to have been the population's response to economic crisis, without any official programme of family planning (Carvalho, Paiva, and Sawyer 1981).

These examples from Brazil's recent experience show how infant mortality is sensitive to material living conditions and to direct or indirect interventionist measures. Because of the complex inter-relationships, one finds apparent paradoxes between economic and demographic trends.

It was possible to use this example because the State of Sao Paulo has reliable vital statistics. If it were not for this, little would be known about fluctuations in years between the censuses. Rapid changes make the need for continuous data more imperative. In the absence of reliable vital statistics, in addition to efforts to improve their quality, it might be advisable to select areas for gathering data on survivorship of the previous child before the most recent birth. We discuss this system, as well as techniques for estimates, later in this paper. First, let us see ways to improve the 1990 round of censuses to avoid some of the problems presented by conventional techniques for indirect estimates.

Reflections of the Upcoming Censuses

Indirect methods for estimation of mortality have been tested all over the world. Their unquestionable value for acquiring knowledge of mortality levels, trends, and differentials need not be emphasized here. Questions on the number of children ever born, the number still living and births in the year before the census, as well as survivorship of mothers, have their place in the census of any country with deficient mortality statistics.

With all the proven value of these questions, some comments can also be made on their shortcomings.

In Latin America, where the majority of countries has undergone rapid demographic changes with declines in fertility and mortality, there is great interest in the identification of recent trends in the variables. This type of information cannot be obtained with the conventional indirect techniques. Rapid changes in fertility can affect mortality estimates due to inappropriate determination of the Ki multipliers, which transform proportions of deceased children into probabilities of death at exact ages. The multipliers depend on mean parities of women in each age group (P1, P2, P3). Such parameters do not

provide appropriate corrections for the proportion of children dead when fertility is changing. If fertility is falling rapidly, the values of P1 and P2, for younger cohorts, may be lower than the real values observed in older cohorts at equivalent ages. This causes overestimation of the level of mortality. Other methods to transform proportions into probabilities have been proposed (Preston and Palloni 1977) and will be discussed later in this paper.

In addition to the problem which can arise due to incorrect selection of the Ki multipliers, the retrospective character of the methods does not permit the determination of levels for dates near the census. Ideally, the solution to this problem could come from the questions about births during the previous 12 months, by asking about survivorship, or by the alternative method, commonly used, of asking about the date of the last live birth and adding a question about the survivorship of the same child. The proportion of survivors of the children born in the previous 12 months provides a direct estimate of the value of Lo from the mortality table, which can easily be transformed into an estimate of infant mortality.

Such estimates would solve many of the problems found in indirect estimates of mortality. Measures of mortality would be concommitant with socio-economic data revealed by the census. There would be no problem of the kind that appears in studies of differentials and determinants based on retrospective data, in which mothers are classified according to the characteristics of housing, residence, or occupation at the time of the census, while mortality refers to a time several years earlier, when such characteristics could be different (Sawyer and Fernandez 1987). Multivariate analysis of mortality based on the survivorship of children born in the last year in relation to characteristics observed in the census would use information from the same time period, with clear methodological and theoretical advantages.

For the various reasons mentioned above, there is a great temptation to include questions on survivorship of the last born in the 1990 censuses. Such enthusiasm should be tempered by the negative experiences which have occurred when such data have been gathered. Although there have been some positive experiences (Fernandez and Somoza 1978), failures were much more frequent with this type of data in Latin America. The reason seems to be respondents' misunderstanding of the question. Some women may report the last child still alive as the last child born alive, omitting children who were born later but subsequently died. The Experimental Census of Junín de los Andes, in Argentina, showed that this type of error actually occurs in some cases. After the question about the date of birth of the last child born alive, women were asked if there were later births and if so, whether the child was born dead or alive. The intentional contradiction in these questions showed that some women had reported as the last live birth the youngest child still alive, not mentioning later births that resulted in deaths.

It is not possible to use contradictory questions in an actual census, but this type of exercise is very useful in an experimental census in order to detect the source of errors and guide efforts to correct them. In the experiment in Junín de los Andes, the information on births in the last 12 months led to mortality consistent with that obtained by the conventional Brass method if the trend is extrapolated. The level of mortality is greater than that found in vital statistics.

We recommend that a question on survivorship of the last born be included in the experimental censuses to be conducted in African countries in preparation for the census of 1990, in order to test how it functions and to see if questions can be designed in such a way as to eliminate errors that may seriously affect estimates derived from this data.

As for adult mortality, trials were also conducted in several countries with the question about deaths which had occurred in the household. The results were discouraging. The need to improve the estimates of adult mortality is even greater than for infant and child mortality. Estimates obtained using data on maternal orphanhood generally refer to points in time about eight years before the census. Specifically, orphanhood data from the 1990 census would permit estimation of adult mortality in the first years of the 1980s and the last years of the 1970s. In the absence of other sources of data on mortality levels in adult ages, the information is of great interest, but far from ideal.

In such conditions, high priority should be given to efforts to detect the reasons why questions on deaths in the last 12 months (or 24 months) have not provided satisfactory results, at least in most cases. It should be emphasized that all that is expected of this information is that it provide an age structure of deaths that is compatible with the age structure of the population. In these circumstances, the level of mortality can be corrected using methods that have been proven effective, regardless of the degree of omission of the total number of deaths reported.

There are various reasons why deaths in the household are not reported. Besides cultural aspects, which may make it painful or traumatic to recall such circumstances, it is also possible that deaths escape being reported because of dissolution of the households where they occurred. If such omissions do not affect the age distribution of deaths, the information can still be useful for mortality estimates.

Another possibility for the 1990 round of censuses is the identification of the biological mother on the census form for all children under age 15 in each household. When nuclear families are not predominant, it is complicated to carry out matching of mothers and children by the well-known own children technique for estimating fertility (Cho 1973). As regards

mortality, data on the age distribution of the surviving children of mothers classified by specific age groups would contribute greatly to the study of differentials according to characteristics which vary with the age of the mother, using the Preston-Palloni technique. The inclusion of an additional column in the table of relation to head of household, in which mothers of the various children can be identified, would be of great use for studies of fertility and mortality when one uses categories subject to "inter-category migration" or in situations of rapid fertility change.

The Previous Birth Method for Estimates of Infant Mortality

Even with the inclusion of the questions suggested in the previous section, and in spite of the enormous advance that would occur if they functioned properly, census data cannot escape the limitation of discontinuity in time. Information is only available every ten years. The intercensal period should be covered by smaller operations, such as sample surveys, which could also deal with specific topics. Forms of continuous data collection are still of great interest, particularly when it is necessary to monitor changes in specific areas.

In most of Latin America and Africa, the method recently proposed by William Brass and Sheila Macrae (1985) would be an important addition to the arsenal of techniques available for estimates of mortality when vital statistics are deficient. This technique is not based on the same philosophy as conventional indirect estimation techniques, since data collection is not carried out in a single set of household visits, as in censuses and household surveys. Rather, the data are obtained in a system of continuous registration in hospitals and birth clinics. Women who give birth are asked about the survival of the child born previously. The suggestion made by Brass and Macrae is extremely simple: ask if the previously born child is still alive or not. On the average, the quotient of the total of children born previously and the total of survivors corresponds to the probability of surviving from birth to a certain exact age, which the authors estimate to be 0.8 I, when I is the average birth interval.

Presently, a study of this method is being carried out by Jorge Somoza (1987) with support from IDRC. In addition to the question proposed by Brass and Macrae, questions have been added on the date of birth of the previous child and, for cases in which this child has not survived, the date of death. Somoza's opinion is that this information can be obtained relatively easily and is of reasonably good quality. Since the attending nurse asks the question, the dialog occurs in an atmosphere of trust and good communication. In these circumstances, adding questions about dates of events would in no way overburden the nurse's tasks. The data would make it possible to calculate exactly the time of exposure to risk and arrive at very exact estimates of infant mortality.

Many countries are implementing programmes of maternal and child health in which services are provided to pregnant women, births are performed, and care is provided for mothers and their young children. Questions on previous births would complement the programme and contribute to it by providing a statistical basis for evaluation of these programmes and for estimates of mortality for the areas served. The cost of implementation is minimal, the calculations to arrive at rates can be carried out by health personnel themselves. This information helps planning and evaluation at the local level.

The advantages offered by the previous child method are enormous and the results obtained to date in Latin America are very encouraging. With support from IDRC, experiments in Argentina have been extended to include five hospitals in various rural regions. This experiment seems to be one that should be tried in Africa too.

Conclusion

The experience of some Latin American countries is instructive about how rapid demographic transformations occur. Besides the overall decline of mortality that began in the 1940s or 1950s a substantial decline in fertility is now under way. Regional time series data in Brazil show that the relationship between trends and levels of infant mortality and overall economic growth is not a simple matter. Less careful analysis could lead to contradictory conclusions about those relationships.

Although standard techniques of estimating mortality for regions with deficient data have been valuable for the advancement of the knowledge about levels, trends and determinants of childhood and adult mortality, there is a need for non-biased and timely estimates for monitoring the state of mortality at socio-economic and geographically disaggregated levels, in situations of rapid demographic change.

Questions that could help meet the needs mentioned above should be included in the upcoming demographic censuses. Although some of them have had negative experiences in the past, they could be included in experimental censuses in order to identify and correct the sources of error.

The previous birth method has been tested in Latin America and so far the results are very promising. Because of its simplicity and usefulness for planning and evaluation of health programmes at local levels it should be tested in other similar regions, such as Africa.

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DATA COLLECTION IN CHILD MORTALITY STUDIES: EMERGING NEEDS FOR COMPLEMENTARY USE OF AN ANTHROPOLOGICAL METHOD

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Introduction

Certain issues need to be addressed by new research in the area of child health, child morbidity, and mortality in Africa today. These issues should search for factors that could account for the persistence of high levels of infant and child mortality inspite of the many research studies (medical and social) already undertaken. Infant and child mortality may still be high in this part of the world probably because the series of data generated from different research have not provided an insight into the problem. There is therefore a need to examine the adequacy of data collected through the usually adopted formal tools, ie., the questionnaire, and formal interviewing in gathering data. This examination should be geared towards providing an understanding of the real causes of infant and child morbidity as opposed to an understanding of the correlates (which are not necessarily causes) of infant and child morbidity. This is the goal of this paper.

Data Source and Research Findings on Child Mortality in West Africa

In child mortality studies, data have usually been collected for four albeit related purposes: estimation of levels (using direct and indirect techniques); investigation of causes; determination of changes over time (trend); and examination of differentials with respect to certain demographic, socio-economic and cultural factors. The purpose for which data are to be used has often influenced the type of data collected.

Traditionally, data on infant and child mortality are obtained from three sources: the population census, vital registration systems and sample surveys. These major processes of data collection are discussed in many works and hence are not discussed here (see for instance, Shryock et al, 1976). The infrequent conduct of censuses in Africa, the little value of data from that source, the narrow scope and unreliability of vital registration data, have given rise to a high dependence on sample surveys (Bulmer, 1983). In addition, there have been few epidemiological studies in this area.

This paper focuses on the sample survey. An attempt is made to assess the extent to which the joint or separate use of the questionnaire and formal interviews - has afforded the researcher an adequate understanding of the link between identified proximate determinants of child mortality (Mosley and Chen, 1984) and the incidence of mortality. The assessment is based on an examination of the extent to which they have provided adequate information on the actual behavioural practices of the people as they relate to child health and child mortality.

In West Africa, as in other parts of Africa, researchers in the different areas of child mortality have been searching for ways of reducing the high levels of child mortality by manipulating medical, socio-economic and demographic variables. The two approaches which appear to dominate the study of child mortality and morbidity have collected data on the major childhood killer diseases, and the important demographic and socio-economic variables that are associated with differentials in infant mortality. While the medical approach has often focused on the identification of greatest killer diseases (see McGregor, 1961, 1970, 1979; Wilkinson 1969; Morley, 1968; Baxter Grillo and Leshi, 1964; Gwatkin 1980), the demographic approach has focused on identifying important demographic and socio-economic variables associated with variations in the incidence of child mortality (see Caldwell, 1979; Okorafor, 1979; Tawiah, 1979; Feyisetan, 1987a, 1987b; Feyisetan et al. 1987).

The medical approach relies on the assumption that the identification of major killer diseases is the first step towards eradicating them. Once identified, adequate preventive and therapeutic measures can then be suggested. The demographic approach, on the other hand, relies on the assumption that once socio-economic and demographic variables associated with high child mortality are identified, they can be manipulated to reduce the levels. The two approaches can only bring child mortality to a reasonable low level in West Africa and other parts of Africa if they are able to collect relevant data related to the cultural practices of the people, that may determine the susceptibility to disease attack and consequently death; and information which may influence the impact of demographic and socio-economic variables on child mortality.

However, research findings on child mortality in West Africa, as in other parts of Africa, south of the Sahara, has tended to suggest that these methods of collecting data have not produced data on the conditions that culminate in infant and child mortality.

This is because of the persistence of high levels of mortality in spite of the identification of killer diseases, the determination of manipulatable variables and the development of modern medical technology to combat identified diseases (See UNICEF, 1986 for rates in 1960 and 1980). This reflects the fact

that the data collected so far, through structured interviews, have not provided adequate information on certain behavioural practices that determine child health and child mortality. Data collected have not afforded an adequate understanding of the people's ways of life as they relate to health, disease and death. It therefore shows that little is known about the compatibility between the populations' beliefs about diseases and the preventive and therapeutic measures that are introduced in such populations.

The structured interview or questionnaire approach assumes that responses match actual behavioural practices of the people. When there is disparity, the formal interview becomes an inadequate tool of collecting information. A high disparity can only be avoided if respondents behave naturally and do not want to appear "sophisticated", or "Westernized". They must also be psychologically prepared for the type of questions being asked. This observation is true when measuring such variables as respondent's perceptions of disease aetiology; disease control measures; child and maternal nutrition, all of which have impact on child survival chances. It is important to understand the link between cultural practices and child mortality. This depends on the identification and observation (or measurement) of relevant variables or social situations that have been (or may be) identified to have direct or indirect impact on child health and child death. It is imperative that the variables to be measured are identified before determining the methods of collecting information on them.

Some Identified Variables of Interest in Child Mortality Studies

Various studies of infant and child mortality have identified variables that have direct or indirect impact on child health and child mortality. These include:

1 (a) Maternal and Household factors: maternal factors include current age, age at marriage, parity, birth interval, education and occupation. The household factors include household density, age and sex composition of household members, family income, occupation and income of household heads, balance of power in the household, and accessibility to modern health facilities;

(b) the Biological Attributes of the child at birth (if available) and at the time of the survey: weight, height, and birth order.

2 (a) Maternal and Child Nutrition: This could be measured by the quantity and quality of food consumed by mothers and by their children. Maternal nutrition could be examined by both dietary recall method and a clinical examination of food samples to determine the extent of iodine and iron

deficiency, protein-energy malnutrition, and vitamin A deficiency. Information on breastfeeding and other child feeding practices (who feeds the child, how the child is fed, how the food is prepared and how often it is fed) and information on weaning practices should also be collected. Attempts should also be made to understand the people's conception of "real" food;

(b) the Extent of Malnutrition: Anthropometric measurements may be undertaken. Age, height, weight, mid-upper arm circumference, and tricept skinfold thickness may be measured.

3. Sanitation and Environmental Variables: These include drinking water, toilet, cooking, and waste disposal facilities.

4. Disease Control Variables:

   (a) Perceptions of disease aetiology - fatalistic or rational; if rational, the degree of accuracy;

   (b) Diagnosis of diseases: respondents may be asked to explain how they have been able, or will be able, to identify the attack of certain diseases;

   (c) Respondent's awareness of the incidence and prevalence of childhood diseases such as diarrhoea, measles, malaria, tetanus. Level of awareness may be measured by the degree of compatibility between responses and data in the health institution(s) around that place;

   (d) Perceptions of the effects of attacks of certain diseases on their children could be measured by the promptness of attention given when the child is attacked.

5. Preventive and Curative Measures (Traditional and Orthodox). Attempts should be made to investigate:

   (a) Birth practices, where a child was born, by whom delivered, and with what the umbilical cord was cut. Observation of the delivery processes would be useful to obtain this information;

   (b) Preventive measures against disease attacks such as sacrifices or immunisations; for obtaining information on immunisation, the actual number of vaccinations a child has against each disease could be compared with the expected number of vaccinations against that disease to determine the extent of prevention. In addition the age at immunisation should be obtained;

(c) Mother's level of knowledge and use of modern health facilities;

(d) Immunisation during pregnancy;

(e) Curative measures - where and how long after attack was attention given; what was or could be given to cure a specific disease (traditional or orthodox);

(f) Perceptions about the efficacy of traditional and modern biomedical therapeutic measures.

6. Accidents and Intentional Injuries.

7. Child Mortality: The incidence of infant and child death within a specified period of time; age at death; perceptions of cause of death, etc.

These variables, which are neither exhaustive nor original to the present work, were adapted from earlier works. These variables have been presented with suggestions on how to measure some of them in order to show that these variables are affected by behavioural practices and are therefore not easily measured or detected through data collecting procedures. This will make it easier to understand their relationship to infant and child health. It is not suggested that all the variables should be examined in one study. The suggestion here is that whatever variables are examined should be measured adequately.

Collecting information on the variables: The adequacy of different data collection methods

Reliable and accurate information on many of these variables could be collected in sample surveys using either the questionnaire or formal interviews or both methods. Accurate data on demographic socio-economic, and environmental variables can also be easily collected through these methods using some reliable standardized responses. However, variables pertaining to maternal and child nutrition, and disease control, which have direct influence on child survival and influence the impact of the demographic, socio-economic and environmental variables, have many dimensions that are difficult to measure through few standardized responses. In fact it is possible that responses on some of the dimensions of these variables do not match actual practice and hence are misleading. If this is so our conclusions are simply based on perceived normal behaviour. If this is done, it may be difficult to get the real behavioural practices or the social situations that are associated with high probabilities of child death in Africa. If formal interviewing yields inadequate data to get us to the root of the problem, then we use other means. This is why we suggested ethnographic observation to complement sample surveys.

Ethnographic Observations

Formerly restricted to the study of the so-called "primitive" society, ethnographic observation has been extended to the study of certain phenomena in modern societies (Pelto and Pelto, 1973). Ethnographic observation can be fruitfully combined with sample surveys. In the context of ethnography, observation is perceived in terms of an examination, with all senses, an object, one or several people, a social event with the objective of describing it. When fruitfully combined with sample surveys, ethnographic observation, carried out in few selected households in each community, affords a comparison of what respondents do with what they say.

To study the cultural practices of the people as they relate to child health, observation of the following practices in selected households is desirable and recommended.

Child Feeding Practices

There is the need to observe among others:

(i) who feeds the child- is it the mother? If not, the relationship of that other person to the family must be ascertained;

(ii) how the food is prepared;

(iii) how the child is fed (with hand, cup and spoon and whether each of these is properly cleaned before use); observing this may provide an insight into the possibility of food contamination;

(iv) the frequency of breast feeding;

(v) the level of hygiene during food preparation;

(vi) the types and quantities of food given to the child; also the regularity of feeding the child;

(vii) care of the food before it is being fed to the child, ie., placed in an open bowl where it can be contaminated;

(viii) the level of hygiene of the person feeding the child;

(ix) how mothers determine baby's satisfaction;

(x) the types of foods consumed in-between major meals;

(xi) the level of hygiene of the environment in which the child is being fed.

An observation of the different behavioural patterns associated with child feeding and the social milieu in which child feeding takes place affords the researcher a higher quality of data with which to assess the impact of child nutrition on child survival chances. Certain aspects which may not be easily measured with the structured interviews may come out to be more important than those aspects usually measured in surveys. For instance, the type of food a child is fed may sometimes not be as important to the child's susceptibility to disease attack and consequently to its survival chances as how the food is prepared, how the child is fed, or the level of hygiene of the environment in which the food is prepared. Thus it will be revealed that the education of mothers on adequate preparation of available food items is more urgent than education on efficient foods which they may not be able to afford.

Maternal Nutrition

The mother's health and nutritional status as well as her reproductive pattern influences the health and survival of the child because of the biological links between her and the infant during pregnancy and lactation (Mosley, 1984). Important to the nutritional value of the food eaten by the mother are adequacy of preparing, and the hygiene of the environment in which the food is prepared. The types of food eaten and the regularity of eating the food are also important. Those factors are important to the researcher since information gathered from such observation may shed more light on how maternal nutrition affects infant and child health.

Health seeking behaviour - (Disease Control)

Good nutrition, clean environment and the possession of all other attributes that enhance child survival chances do not ensure total absence of susceptibility to disease attacks. These only reduce the frequency of susceptibility. Child survival chances therefore depend on the quality of disease control behaviour of parents. It depends on their assessment of risks, treatment and recovery of their children from identified childhood diseases. It will be necessary to observe:

(i) how a child is identified to be ill and the timeliness of identification.

(ii) how diseases are being diagnosed.

(iii) parents' reactions to disease attacks, mild if disease attack is perceived not to be serious, for instance diarrhoea among the Yorubas of Nigeria; sharp if it is perceived that disease attack may lead to death.

(iv) where parents seek curative assistance when the child is ill - church, traditional or medical practitioner, or modern health institution.

(v) what people do to prevent disease attacks - rituals, immunisation.

(vi) receptability to modern health facilities.

(vii) level of how use of orthodox methods is complemented by use of traditional ones.

(viii) balance of power with respect to making decisions on where and when to seek medical assistance when the child is ill.

These are some of the dimensions of the health seeking patterns of the people that are highly important to the survival chances of the child. We may not however adequately measure them through structured responses in social surveys.

Conclusions

A case has been made for the use of ethnographic observation as a complement to the questionnaire and the formal interviewing of the sample surveys in the study of child mortality in Africa. Attention was drawn to the fact that data collected from two tools of sample surveys have not afforded researchers an adequate understanding of the relationship between some cultural practices of the people and the survival chances of their children. Hence high infant and child mortality levels persisted inspite of the identification of major killer diseases and the availability of biomedical facilities to combat them.

To understand the links between behavioural patterns and infant and child mortality, it is necessary to intensively observe selected households in communities where the survey is being undertaken. Such intensive observation provides adequate information and cross checks the accuracy of responses.

It is noted that use of ethnographic observation is expensive and cannot be afforded by many researchers. I however, hope that the International Organizations which assisted in the efforts to make African children survive will contribute more towards research efforts aimed at getting at the root of the problem. In fact, with a little more money in this direction, these organisations may experience higher dividends from their investments.

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PERINATAL, NEONATAL AND INFANT MORTALITY IN ETHIOPIA

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Introduction

Ethiopia started organised and systematic demographic data collecting very recently. The results of the first-ever national census, carried out in 1984, have started to come out only partially. The major sources of mortality data therefore have been demographic surveys undertaken in the country since the early sixties by the Central Statistical Office.

The major surveys undertaken are: the first multi-purpose national sample survey of 1964-67 and the second round done during 1969-71. The surveys covered the rural and urban areas of the country and had an overall sampling fraction of one percent. Despite the small sample size, national and regional estimates on mortality and especially infant mortality were obtained. Mortality data were also collected in the 1981 demographic survey, which was part of the on-going Rural Integrated Household Survey Programme started in late 1979. These data have however not been augmented by a viable vital registration system. So far the country lacks a national vital registration system and only information on experimental registrations in a few urban and rural areas are available.

Thus the source for data on infant mortality is the 1981 demographic survey, while information on perinatal and neonatal mortality is derived from limited studies undertaken by some researchers and institutions in the country.

Population Size and Distribution

The first Population and Housing Census of Ethiopia was carried out in May 1984. The population was found to be 42.185 million of whom 21.028 million were males and 21.157 females. The census also revealed that 10.22 percent of the total population lives in urban areas.

The total rural and urban population estimates by region as per the 1984 census and the proportion urban for July 1987 are shown in Table 1.

Table 1. Population Distribution By Sex And Region; And Percentage Distribution of Urban Population: 1987

REGION	TOTAL			RURAL			URBAN			PERCENTAGE URBAN POPULATION
	MALE	FEMALE	BOTH SEXES	MALE	FEMALE	BOTH SEXES	MALE	FEMALE	BOTH SEXES	
ARSSI	898,525	909,987	1,808,512	841,807	844,181	1,635,988	56,718	65,806	122,524	6.77
BALE	542,203	552,926	1,095,129	507,103	511,984	1,019,087	35,100	40,942	76,042	6.94
GAMO GOFA	677,882	678,805	1,356,687	650,317	647,758	1,298,075	27,565	31,047	58,612	4.32
GONDAR	1,614,420	1,564,272	3,178,692	1,517,622	1,431,473	2,949,095	96,798	132,799	229,597	7.22
GOJAM	1,768,954	1,761,586	3,530,540	1,662,351	1,626,073	3,288,424	106,603	135,513	142,116	6.36
ERITREA	1,423,294	1,429,630	2,852,924	1,233,646	1,195,766	2,429,412	189,648	233,864	423,512	14.84
HARARGE	2,301,915	2,225,508	4,527,423	2,157,050	2,061,821	4,218,871	144,865	163,687	308,552	6.82
ILLUBABOR	515,698	532,595	1,048,293	487,885	503,296	991,181	27,813	29,299	57,112	5.45
KEFFA	1,335,232	1,329,325	2,664,557	1,268,055	1,257,016	2,525,071	67,177	72,309	139,486	5.23
SHOA	4,380,452	4,424,820	8,805,272	4,067,800	4,063,797	8,131,597	312,652	361,023	673,675	7.65
SIDAMO	2,071,264	2,052,088	4,123,352	1,946,482	1,920,296	3,866,778	124,782	131,792	256,574	6.22
TIGRAY	1,331,246	1,293,116	2,624,362	1,220,527	1,152,258	2,372,785	110,719	140,858	251,577	9.59
WELLEGA	1,331,356	1,362,267	2,693,623	1,266,011	1,292,124	2,558,135	65,345	70,143	135,488	5.03
WELLO	1,965,969	1,996,049	3,962,018	1,851,003	1,856,743	3,707,746	114,966	139,306	254,272	6.42
ADDIS ABABA	752,363	836,813	1,589,176	-	-	-	752,363	836,813	1,589,176	100.00
ASSEB ADMINISTRATION	49,517	48,639	98,156	31,979	31,260	63,239	17,538	17,379	34,917	35.57
TOTAL	22,960,290	22,998,426	45,958,716	20,709,638	20,395,846	41,105,484	2,250,652	2,602,580	4,853,232	10.56

The data reveal that of the 46 million population estimated for July 1987, 50 percent were males. The country is divided into 16 regions and the population distribution is shown by region. The Table shows that (ignoring the Assab Administration) the regional population distribution ranges from 8.8 million in Shoa to 1.0 million in Illubabor. Six of the regions have a population estimate of over three million each while five regions have estimates ranging from one to two million each.

The table shows the urban population constituted 10.6 percent of the total population. There are considerable variations in this proportion by region. Again ignoring the Asaab Administration and Addis Ababa the urban population ranged from 4.3 percent to 14.8 percent in Gamo Gofa and Eritrea regions, respectively.

The average population density in 1987 was about 37 persons per Km^2. Considering the density by region, Addis Ababa, the capital city of the country, has the highest density of 7,159 person per Km^2. Shoa and Arssi regions also have a relatively high population density of 104 and 76 persons per Km^2, respectively. The table reveals that Bale and Hararge regions have lower density. In general, six regions have a density which is lower than the national average (see Table 2).

Table 2. Population Distribution And Density By Region: 1987

REGION	POPULATION	AREA IN (Km^2)	DENSITY
ARSSI	1,808,512	23674.7	76.4
BALE	1,095,129	127052.8	8.6
GAMO GOFA	1,356,687	40347.8	33.6
GONDAR	3,178,692	79579.4	39.9
GOJAM	3,530,540	61224.3	57.7
ERITREA	2,852,924	93679.1	30.5
HARARGE	4,527,423	272636.9	16.6
ILLUBABOR	1,048,293	46367.1	22.6
KEFFA	2,664,557	56633.6	47.0
SHOA	8,805,272	85093.6	103.5
SIDAMO	4,123,352	119760.4	34.4
TIGRAY	2,624,362	64921.3	40.4
WELLEGA	2,693,623	70481.0	38.2
WELLO	3,962,018	82143.6	48.2
ADDIS ABABA	1,589,176	222.0	7158.5
ASSEB ADMINISTRATION	98,156	27464.5	3.6
TOTAL	45,958,716	1251282.1	36.7

The 1981 Demographic Survey

This survey, conducted in two rounds, was carried out as part of the ongoing Rural Integrated Household Survey Programme.

The population characteristics, current and retrospective fertility and mortality information were collected during the first round in January 1981. During the second round, conducted in January 1982, changes in household composition and the number of vital events that occurred during the year were recorded and measured. Unfortunately, the results of the second round have not been processed and could not be included in this paper.

The 1981 demographic survey covered the settled rural population of all the regions except Eritrea and Tigray. A stratified two stage sample design was adopted for the survey: the stratification being at awraja (Stratum) level. Thus, in each awraja, peasant associations (PAs) were selected as primary sampling units. Measures of size were taken as total members of the respective PAs. A total of 500 PAs were selected and in each PA, 100 households were randomly selected from lists of households in each PA obtained after the selected PAs were identified. A total of 50,000 households were included in the survey. The survey revealed a total population estimate of 36.4 million for January 1981 (CSO, 1985). Data on the following topics were collected to estimate fertility and mortality:

(a) the number of children ever born alive and number surviving by age group of women,

(b) number of children born alive and number surviving in the 12 months prior to the survey.

The response to the above questions revealed a crude birth rate of 46.9/1000, a general fertility rate of 239.1/1000, and a total fertility rate of 7.7 children per woman. Furthermore, the survey gave a crude death rate of 18.0/1000. The observed crude birth and death rates implied a yearly rate of natural increase of 2.9 percent (CSO 1985).

In addition infant mortality rates were obtained through computer packages adopted using Trussel's and Sullivan's methods based on the North Model Life Tables (UN,1983). The two methods gave infant mortality rates of similar magnitude for individual regions and for all the regions combined. Table 3 contains the information obtained.

Table 3. Estimated Infant Mortality Rates by Region and Sex from Current and Retrospective Data

Region	Infant Mortality Rates			
	Reported (Current)[1]		Adjusted (Retrospective)	
	Male	Female	Male	Female
Arssi	219	165	151	139
Bale	233	168	205	157
Gamo Gofa	111	132	152	138
Gojam	122	69	177	144
Gondar	123	131	111	111
Hararge	103	110	155	162
Illubabor	138	156	136	121
Kefa	106	112	170	138
Shoa	120	99	131	116
Sidamo	113	83	120	109
Wellega	111	74	119	96
Wollo	89	108	125	130
Total (12 Regions)	119	106	124	103

1/(CSO, 1985: 375-76).

The Table reveals that the reported infant mortality rate was 112/1000 for both sexes, 119/1000 for males and 106/1000 for females. The reported infant mortality rate was highest in Bale region for both males (233) and females (168). The lowest rate for males was in Wollo (89) and for females in Gojam (69).

Table 3 also shows that the adjusted rates are slightly higher than the reported ones with a rate of 114/1000 for both sexes, 124/1000 for the males and 103/1000 for the females. These rates show considerable variations by region. For males, it ranged from as low as 111/1000 in Gonder to as high as 205/1000 in Bale, while for the females it ranged from as low as 96/1000 in Wellega to as high as 162/1000 in Hararge. The table shows that the two sets of infant mortality rates for the same period have similar patterns of mortality in that the rates are higher for males than females. Infant mortality rates are based on current mortality and are derived from information on births and infant deaths that occurred in the households during the 12 months before the survey. The adjusted infant mortality rates are however based on the number of children ever born alive and those surviving, tabulated by age group of women.

The results obtained from the current mortality were affected by selective age reporting. The degree of selection varied widely amongst the regions. This is shown by the sex ratios of the reported number of births and those reported as dead (CSO, 1985: 275-76). The infant mortality rates estimated from the retrospective inquiry also show variations by sex and regional distribution.

The infant mortality rates for some of the regions appear to be too high (even for a country such as Ethiopia), while others appear to be too low. There is therefore a need to mount a follow-up study for the regions with high infant mortality rates such as Bale, Hararge, Gojam, and Keffa and those with low mortality rates such as Wellega, Sidamo and Gonder. This will confirm the data already obtained.

Studies that led to Perinatal and Neonatal Mortality Estimates

Maternal Mortality Study in Addis Ababa

This study was conducted through a two survey approach over a two year period (September, 1981 - September, 1983). The aim was to determine the incidence and aetiology of maternal mortality and the use of maternity services. The study was a community based survey where incidental information on perinatal and infant mortality for the city was collected.

In this study perinatal mortality refers to the death of an infant occurring before, during, or after birth, within the period from the end of the twentieth week of pregnancy to the end of the seventh day of life. The successful collection of such data depends on availability of personnel with specialised skills in determining or assessing the gestation period of pregnancy. In the absence of such personnel perinatal deaths would be considered either as still births or lumped along with the neonatal deaths. The perinatal mortality for Addis Ababa was established by qualified personnel to be 46.0 per 1000 live births.

The study indicated a close association between gestation period and outcome of pregnancy. The longer the gestation period the higher the probability for a live birth. Gestation periods of 20 to 36 weeks and 36 weeks and over, by current status of infant, are shown in Table 4.

Table 4. Percentage Distribution of Infants by Current Status and Gestation Period at Birth

Current Status of Infant	Gestation/Period in Weeks			Total	
	20-36 %	>36 %	Not Known %	n	%
Alive	1.1	98.8	0.1	8,637	97.4
Died within Less than 8 days	18.9	81.1	0.0	175	2.0
Died within 8-28 days	7.0	93.3	0.0	57	0.6
Total %	1.5	98.4	0.1	100	100
n	(129)	(8,729)	(11)	8,869	100

Source: (Swedish Save the Children Federation, 1984:74)

The study further indicated that of the 455 infant deaths, 38.5 percent occurred within less than 8 days; 11.0 percent within 8 - 28 days, and 49.0 percent between 29 days and 12 months. This has resulted in a rather too low infant mortality rate of 59.2 per 1000 live births for the city (Swedish Save the Children Federation, 1984 : 81).

Earlier in 1974-75, a team comprised of a paediatrician and three pathologists undertook a study to find out the cause of perinatal mortality in Addis Ababa.

The study was carried out in hospitals and clinics affiliated to Addis Ababa University, Faculty of Medicine. The study involved 1424 still births and neonates from all the hospitals and clinics. In order to find out the causes of perinatal deaths, the team carried out an autopsy on 72% of the total still births and neonates. The study revealed an overall perinatal mortality rate of 65.3/1000 live births. Furthermore, it indicated that maternal factors were the dominant cause of the deaths.

One third of the deaths were due to amniotic fluid infections, 15% to obstructed labour, 8% to abruptio placentae, and the rest to more than 20 other specific disorders (Naeye, et al, 1977:63).

The Population and Health Baseline Survey of Shoa and Arssi Regions

The baseline survey of Shoa and Arssi regions conducted by the Ministry of Health from February to March 1986 provided estimates of neonatal, post neonatal, infant mortality and child mortality rates. The survey was set up as part of a wider population, health and nutrition project. Its objectives are to reduce infant and maternal mortality and improve the access to

family planning services among the populations in the selected regions. The overall sample size was 3,500 households of which 2,500 were in the rural stratum and 1,000 in the urban.

Neonatal mortality is defined as death of a live infant within 28 days after birth. As in the case of perinatal mortality, such classification of death requires a highly organised and systematic vital registration system. The identification of the phenomenon can be determined only by qualified personnel for some time to come. The estimates of neonatal deaths in Ethiopia are therefore limited to some specialised studies.

The baseline survey of Shoa and Arssi indicated a neonatal mortality rate of 48 and 82 per 1000 live births for Shoa and Arssi regions, respectively. The results obtained from the survey are shown in Table 5.

Table 5. Estimates of Neonatal, Post Neonatal, Infant and Child Mortality Rates by Sex and Study Area.

Study Area	Neonatal Under one month	Post Neonatal 1 - 11 months	Infant under one year	Child 1-4 Years	Total Under Five
Total	55	78	129	63	184
Male	62	82	140	75	197
Female	46	74	117	58	169
Urban	50	52	99	51	145
Rural	55	81	132	72	188
Shoa	48	83	126	62	181
Arssi	82	62	138	65	194

Source (J.G.C. Blacker, 1986:5).

The probabilities of dying from direct estimates of infant and child mortality could be inputed using techniques developed by Brass and others. However, caution is needed in interpreting the figures, as the rates heavily depend on the accuracy of the recorded ages of the living children, and those who have died. This is further complicated when ages under one year are considered in non-numerate societies such as Ethiopia.

The table reveals differentials in mortality which favour females, and also favour the urban areas as opposed to the rural areas. Except for the post neonatal deaths, mortality is lower for Shoa than for Arssi. However, the rates shown for these areas are lower than those obtained for three small towns in Gonder region. The study carried out in the vicinity of the Gonder Public Health College in 1978 by D. Shamebu resulted in a post neonatal death rate of 152/1000. The high post neonatal deaths in the study correspond to observations that countries

with high infant mortality rates have a continuing high risk of mortality throughout the first year of life, whereas countries with low infant mortality rates have a low proportion of infant deaths during the first few weeks of life (D. Shamebu, 1978).

Expansion of Medical Facilities and Personnel and their Effect on Infant Mortality

Expansion and improvement of medical facilities and personnel have an impact in improving health and other conditions affecting mortality. For instance, the expansion of the immunisation programme and/or the control of infectious and parasitic diseases play an important role in lowering the infant mortality rate. Appendix Table 1, shows that medical and health facilities increased substantially between 1970 and 1981 and a further increase is observed between 1981 to 1986. Between 1970 and 1981, the number of beds showed an expansion of 33.1 percent, the number of health centres increased by 61.7 percent, and the number of clinics by 326.5 percent. Similar expansions in the facilities were indicated between 1981 and 1986.

The number of medical personnel also showed an increase between 1970 and 1986. The number of medical doctors increased by 50 percent between 1970 and 1981; and between 1981 and 1986 the number increased by 70 percent. Similarly, all the other medical personnel, except health officers[1], showed substantial increase during this period (see Appendix Table II). The per capita budget allocated by the Ministry of Health (MOH) showed a steady increase from 1.86 Birr[2] in 1975 to 2.80 Birr in 1980 and 3.52 Birr in 1984 (MOH, 1986). This indicates the emphasis given to the improvement and expansion of health services in the country.

The expansion of medical facilities and personnel between 1970 and 1981 lowered the infant mortality rate from 155/1000 in 1970 to 114/1000 in 1981. The data revealed a decline in all the regions except Bale, Hararge, and Gojam where the rate increased despite a substantial increase in medical facilities and personnel. We earlier, suggested a follow-up study to validate the authenticity of the high infant mortality rates in these three regions and in Keffa region (see Table 6). The increased infant mortality rates in these regions as shown by this data confirms the need for the follow-up study.

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[1]The observed decline in the number of health officers is attributed to the censure of the training programme for these personnel and the training opportunity given to them such that some of them qualified as medical doctors.

[2]One $U.S. is equivalent to 2.05 Birr.

Table 6. Adjusted Infant Mortality Rates Per 1000 Live Births By Regions (Both Sexes)

Region	1970	1981
ARSSI	180	145
BALE	153	181
ERITREA	-	-
GAMO GOFA	193	145
GOJAM	148	168
GONDAR	152	111
HARARGE	152	158
ILLUBABOR	142	129
KEFA	187	154
SHOA	124	124
SIDAMO	151	116
TIGRAY	134	-
WELLEGA	143	108
WOLLO	156	128
ADDIS ABABA	-	-
ASSEB ADMINISTRATION	-	-
TOTAL	151	114

Prospects for Mortality Study

The demographic surveys carried out since the early sixties indicate that the mortality level in the country has been declining. As shown in Table 7, the infant mortality rate for the rural populations of the country has declined from about 200/1000 in 1964 - 67 to about 114/1000 live births in 1981.

Table 7. Adjusted Mortality Measures for the Rural Population of Ethiopia 1964-1981

YEAR	CRUDE DEATH	INFANT MORTALITY
1964-67[1]	25.0	200
1969-71[2]	19.8	155
1981[3]	18.4	114

1/ (CSO,1971:24)
2/ (CSO,1974:71)
3/ (CSO,1985)

An infant mortality rate of 114 is still high and efforts should be made to lower it. There is need to expand the health services so that the goal of "Health for all by year 2000" is achieved. This can be achieved by expanding maternal and child health services and the immunisation drive that has been started.

Data collection also needs to be intensified. The first national population and housing census was carried out in May 1984. Its preliminary results have already been published (CSO,1984) and the computer processing of the data is in progress. The census included information on number of children ever born alive and number surviving, number of children born alive and surviving in the 12 months preceding the census data, and number of deaths in the household during the 12 months before the census to get mortality data. The census data are expected to yield mortality measures including infant and childhood mortality.

Furthermore, the Central Statistical Office (CSO), in September 1983, started an experimental vital statistics registration in farmer's associations (FA) in the Rural Integrated Household survey Programme. Initially the registration covered 500 FA's, however, in September 1986 the number was raised to 750. An additional expansion is expected in September, 1987 to reach a target of about 1000 FA's. In the sample registration system vital events: births, deaths, marriages, and divorces are registered continuously as they occur. It is obvious that it takes some time before one gets complete data from vital registration system. The registration system should therefore be given the necessary support, so that it is strengthened and carried out on a continuous basis.

Until the data from the registration system are complete and reliable, the need for demographic data in general and on neonatal, infant and childhood mortality in particular should be derived by undertaking detailed demographic surveys. The CSO has therefore planned to undertake an intercensal demographic survey towards the latter half of 1988. The intercensal survey is scheduled to be followed by a detailed "Fertility and Family Survey" and the preparation for these surveys are underway. The intercensal demographic survey is expected to be a conventional census type of demographic survey, whereas the Fertility and Family Survey is of the Westinghouse Fertility Survey type. The detailed survey will have a major mortality component and include data that will assist in deriving trends and age patterns of neonatal, infant and childhood mortality. Also, factors that lead to the determinants of childhood mortality and morbidity such as breast feeding, birth spacing, access to and use of health facilities, immunisation, etc... are included.

Finally, to assist health planners with information on perinatal, neonatal, infant and childhood mortality, specialised and limited case study type of surveys should be initiated, supported, and executed.

APPENDIX - TABLE I

Medical And Health Facilities By Region (Excluding Police And Armed Forces).

REGION	HOSPITALS			BEDS			CLINICS			HEALTH CENTERS		
	1970	1981	1986	1970	1981	1986	1970	1981	1986	1970	1981	1986
ARSSI	3	2	2	94	176	232	15	90	110	3	7	7
BALE	1	1	1	25	140	140	9	71	81	1	5	6
ERITREA	17	16	15	2,225	2,628	2,680	120	136	165	5	4	6
GAMO GOFA	2	3	3	91	138	178	16	73	80	4	7	7
GOJAM	2	3	4	200	258	356	23	91	111	5	8	8
GONDAR	2	3	3	211	353	438	30	105	126	8	13	13
HARARGE	0	10	11	795	862	1,006	55	140	160	7	13	13
ILLUBABOR	2	2	2	90	165	140	16	80	79	5	7	7
KEFFA	3	3	2	244	246	290	25	92	123	6	9	9
SHOA	2	11	10	533	979	883	59	223	281	11	18	18
SIDAMO	5	5	5	401	471	469	42	137	163	5	9	11
TIGRAY	4	4	4	260	475	570	22	99	102	7	9	10
WELLEGA	4	4	4	294	330	597	33	159	217	6	9	14
WOLLO	4	5	5	211	516	491	24	122	154	8	13	14
ADDIS ABABA	3	13	14	2,580	3,041	3,257	50	135	127	-	-	13
ASSEB ADMINISTRATION	-	1	1	-	215	210	-	8	9	-	-	-
TOTAL	54	86	86	8,254	10,993	11,935	539	1,761	2,088	81	131	156

Source: Ministry of Health

APPENDIX - TABLE II

Medical Personnel By Region (Excluding Police And Armed Forces)

REGION	DOCTORS			HEALTH OFFICERS			PHARMACY ATTENDANTS AND PHARMACISTS			SANITARIANS & HEALTH ASSISTANTS			NURSES			TECHNICIANS		
	1970	1981	1986	1970	1981	1986	1970	1981	1986	1970	1981	1986	1970	1981	1986	1970	1981	1986
ARSSI	11	10	17	7	7	2	-	3	7	72	246	327	30	37	66	-	12	10
BALE	1	6	8	4	5	1	-	1	5	31	155	224	10	25	52	-	7	12
ERITREA	66	39	74	15	4	5	26	7	22	507	483	547	159	141	199	-	36	39
GAMO GOFA	4	5	16	6	5	1	-	2	8	65	179	338	24	35	62	-	9	14
GOJAM	8	11	41	18	11	7	1	2	12	114	292	359	21	61	126	-	19	34
GONDAR	12	19	57	15	17	2	-	2	9	125	347	433	50	81	131	-	37	52
HARARGE	26	32	58	13	19	6	1	5	32	223	447	656	47	100	166	-	46	53
ILLUBABOR	5	7	26	9	3	2	-	2	11	85	197	321	31	33	74	-	12	20
KEFFA	9	9	36	11	11	4	-	2	8	103	263	430	31	43	95	-	14	24
SHOA	18	38	66	23	25	3	-	8	20	314	876	803	80	173	202	-	51	47
SIDAMO	6	17	32	9	10	4	-	2	20	201	352	644	36	86	163	-	15	31
TIGRAY	6	8	23	14	3	2	-	1	10	136	277	333	29	59	107	-	19	19
WELLEGA	9	17	30	12	7	-	-	1	9	138	418	651	41	76	149	-	15	33
WOLLO	6	15	36	11	15	5	1	2	14	132	412	470	33	52	123	-	23	29
ADDIS ABABA	149	267	336	9	89	101	57	50	196	946	1,367	1,349	410	660	782	-	215	227
ASSEB ADMINISTRATION	-	4	7	-	2	1	-	3	3	-	48	76	-	18	14	-	6	7
TOTAL	336	504	863	176	233	146	86	93	386	3,196	6,359	7,958	1,042	1,680	2,511	-	536	651

Source: Ministry of Health

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THE CIVIL REGISTRATION PROJECT AS A POTENTIAL MAJOR SOURCE OF MORTALITY INFORMATION

by

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Introduction

Legislation to register births and deaths came into force in 1921 without a provision for compulsory registration for the whole country. In 1966 it became compulsory to register births and deaths in Arusha, Bukoba, Dar es Salaam, Dodoma, Iringa, Kigoma, Lindi, Mbeya, Morogoro, Moshi, Musoma, Mtwara, Mwanza, Tabora and Tanga. These 15 major urban areas had a total of about 12% of the country's population then. However even in these areas less than a third of births and deaths were registered. This inefficiency was caused by the fact that offices of district registrars changed hands several times from one officer to another. The officers were also charged with other duties leaving little time to register births and deaths. Registration of births and deaths was given low priority among the various responsibilities of District Registrars. Moreover those doing the actual registering had no formal training in this aspect. As a result the district registrars were not submitting returns of births and deaths regularly to the Registrar General as required by law. Besides, few efforts were made to educate and motivate the public on the importance and need for the registration of births and deaths. No insistence was made on the production of birth and death certificates for various purposes like admission to school, voter registration, marriage licence, burial permit, etc.

The Civil Registration Project

In 1979 when the government needed demographic data for social-economic development it reorganised and expanded compulsory registration of births and deaths. This was done stage by stage so that eventually the whole country was covered. Due to lack of personnel and funds the government solicited UNFPA through project number URT/79/P05. This organisation provided both the finances and expertise to initiate the project. UNFPA provided US$580,062 between 1981 and 1984 in a sliding scale. That is, 100% in 1981, 75% in 1982, 50% in 1983 and 25% in 1984. At the moment, it costs about Tshs.964,000/(US$14,831) to include a district in the project and run it for one year.

Objectives

The short term objectives of project "URT/79/P05" were:

- To establish an experimental compulsory civil registration system of births and deaths in selected districts, and

- To use the findings obtained to establish a civil registration system in sample registration areas from which data could be used to estimate vital rates.

The long term objectives were:

- To establish an efficient system for the registration of births and deaths throughout the country, and

- To use the data from the registration system to estimate vital rates and other related measures for the country.

Methodology

Districts covered by the Project

The first phase which started in July, 1981 covered Bagamoyo, Morogoro Urban, and Moshi Rural districts; and later in April 1982, Zanzibar Town/West, Moshi Urban, and Morogoro Rural. The second phase started in July, 1983 and covered Iringa Urban and Rural and Tarime Districts. Later in 1985, Tarime was dropped and replaced by Hai, Kinondoni, Temeke, Ilala, and Kilosa districts in Tanzania Mainland and Wete and Micheweni districts in Pemba. As of 1.7.87 the project covered the whole of Zanzibar (all ten districts) and 12 districts in Tanzania Mainland (Iringa Urban and Rural, Kilosa, Morogoro Urban and Rural, Kinondoni, Ilala, Temeke, Bagamoyo, Moshi Urban and Rural, and Hai).

Basic Rules

The registration system of births and deaths operates under the following basic rules:

- A birth or death is registered where it occurs. Normally there are two possible places where these vital events occur, either in a health institution or at home (not attended by a physician). Events occurring in health institutions are registered by the respective health institution, while those occurring at home are registered by the respective village secretary (Mainland) or Branch Secretary (in the Islands). Events occurring in transit are registered at the first place of destination by the relevant authority.

- Registration is free if done within the time limit provided by the law. However, a birth or death certificate is sold at a prescribed fee (shs.10/ in Zanzibar and shs.5/ in the Mainland).

- Only authorised officers handle birth and death registers.

- Only the Registrar General or District Registrar sign Birth and Death Certificates.

Procedure

The registration system operates through the administrative and political structure of the country. Tanzania is administratively divided into regions, the regions are subdivided into districts, the districts are classified as either urban or rural areas. The rural districts are subdivided into divisions, which are in turn subdivided into wards. The wards are subdivided into villages in Tanzania Mainland and branches in Zanzibar. Each village/branch is subdivided into ten cell units. Each unit is headed by the "Ten-Cell leader".

Reporting. When a Birth or Death occurs at home in rural areas, an informant (parents, relatives, traditional birth attendants, ten-cell leader, etc.) notifies the secretary of the branch/village (BS/VS) orally depending where the event has occurred. In urban areas, the informant reports the event directly to the District Registrar. In the case of a health institution (HI) an informant (who could be any of the two parents, relatives, etc.) gives orally, the necessary particulars of the event to the officer in-charge of registration in the health institution.

Registration. The branch or village secretary after receiving the particulars of the event, would fill-in a registration form. Similarly in a health institution the officer in charge of registration (who could be: a Doctor, Sister, Matron, Nurse etc.) would fill in the relevant registration form depending on the event. The cause of death can only be certified by an authorised officer within the health institution.

Signing. The branch or village secretary/officer in-charge then certifies and signs the registration form to the effect that the information received is correct and has been correctly recorded.

Acknowledgement. The branch or village secretary/officer incharge would then issue acknowledgement of birth notification (the upper part of the registration form) or a burial permit.

Transmission. Every first day of each month, the branch or village secretary/officer in charge will transmit the registration forms through the ward secretary to the District Registrar. The forms are carried in an official envelope provided by the Registrar General.

Registration Proper. The District Registrar after receiving completed registration forms, verifies the details on the form and its full acceptance. If there are errors, he makes a follow-up to rectify them. He then puts the seal, date, and signature thus making the form a legal document. The forms are filed and bound in volumes comprising two sets, Birth and Death registers.

Issue of Certificate. An individual makes an application either orally or in writing to the District Registrar for a certificate. The District Registrar will locate the relevant registration form and use the particulars to prepare the Birth or Death Certificate. The District Registrar personally seals, dates, and signs the certificate before handing it over to the applicant in person or sending it by mail.

Data Processing. Every 15th day of each month the District Registrar transmits the originals of the births and deaths registers to the Head Office, Mambo-Msiige in Zanzibar and Dar es Salaam in the Mainland. The District Registrar retains the second copies of the Births and Deaths registers for issuing certificates. The Head Office checks the registers and if satisfied, makes summaries manually (see appendix I). From them, registration rates in each district (see appendix 2 and 3) are calculated based on the expected number of births and deaths in each district. The forms are then coded and forwarded to the Bureau of Statistics for further computer processing and analysis of the output. The registers are then returned to the Head Office for safe custody.

Training. This is an important component in the implementation of the project. Apart from the training of the Head Office staff, which included study tours to neighbouring countries running similar projects, key persons at each stage of the field operation were trained. The list includes: village, ward and division secretaries together with personnel from health institutions in the mainland and Branch Secretaries, Chairmen, Councillors, and personnel in health institutions in Zanzibar. At the regional and district level, Party and Government leaders were briefed and pledged their support in the implementation of the project. The most intensive training was probably that of the district registrars and their assistants. Re-training programmes were also carried out from time to time to ensure that key persons are kept up to date.

Enlightenment. A publication unit was started at the head office to inform the public, and develop a civil registration programme to be fitted in the school education system. The unit deals with civil registration, preparation of resource material, write-ups, messages and radio announcements. The Unit also addresses various audiences and serves as secretary to the coordinating Inter-ministerial committee.

Discussion

Sample registration areas

The project has been in operation for the last 6 years. However, it has been difficult to fully achieve the objectives set out in the original project document. Firstly, the idea to establish a civil registration system in sample registration areas was dropped as early as 1983. 21 sample districts had been identified throughout the country, but as it turned out the project could not be started in these districts due to lack of adequate funds. There was no reliable transport, trained manpower, operational materials or equipment. In addition, the low registration rates (below 50%) observed in the experiment districts (Bagamoyo, Morogoro, and Moshi) discouraged an expansion programme. An evaluation report on the experiment districts revealed the inadequacy of public enlightenment. This had been caused by lack of trained manpower and reliable transport. The field staff had difficulties in obtaining allowances. All this ended in a low registration rate. It was therefore recommended to concentrate the project in the experiment districts and later include a few districts at a time when resources allowed. This has been the trend to date, except for Zanzibar where all the districts have been covered.

Current Trend

On the whole, coverage of vital events has been increasing with time in the districts under study. Monthly trends have been unreliable and hence difficult to follow. This is because parents are given up to 3 months to register a new born and within one month to register a death. The annual totals however seem to be more reliable and are therefore used to calculate the registration rate achieved in each project district. Similarly, the urban rural differences are rather artificial since rural populations are admitted in big health institutions in the urban centres, thereby inflating the registration rates in the urban districts. Hence a more reliable registration rate is obtained by combining the rural and urban figures.

Another problem is the inevitable use of the out-dated fertility and mortality levels recorded in the 1978 population census to determine the current registration rates. Current expected number of births and deaths based on these levels tend to be on the high side thereby deflating the current registation rates in the project districts. In addition the recorded levels refer only to regions and not districts. It is therefore highly probable that the registration rates shown in appendix 2 and 3 are on the lower side. Computer processing of the filled-in registration forms collected in 1985 and 1986 has started and is being done by the Bureau of Statistics. At the moment, the coding and punching work is completed and the test tables are in

progress. Until these tables are completed and the data analysed, it is difficult to arrive at meaningful conclusions of the data so far collected.

Role of the Registrar General's Office

The office of the Registrar General, under which the project operates, continues to try to iron out the problems that hinder the smooth operation of the project. The office managed to borrow a qualified statistician from the Bureau of Statistics to assist in the management of the project. However a lasting solution would be for the department to recruit its own qualified statistician. The office is also planning to recruit young graduates, to be trained to man the district Registries as (DRs). The head office will be strengthened by recruiting and training Form VI and IV leavers as supporting staff.

On transport and other equipment, the office has already requested UNFPA to provide new vehicles and other equipment necessary for the project. There are also efforts to recruit a publications officer to handle the public enlightenment campaign. A cabinet paper has also been written requesting the formation of a more powerful National Committee comprised of Ministers and a Technical Coordinating Committee comprised of Principal Secretaries. The Ministry of Justice has also been contacted regarding difficulties faced by the field staff as regards field allowances.

It is obvious that all these efforts made by the department will succeed only if higher authorities within the government and the donor agency will give the required attention to the prevailing problems within the project.

Role of the Bureau of Statistics and other Interested Parties

The Bureau is interested in this project just as is the Ministry of Health and researchers in this field. The data collected through the project is important for population studies. It is therefore necessary for all interested parties to ensure that this data is of high quality and is acceptable for analysis and publication. Constant consultations among the interested parties therefore is inevitable.

Expansion Programme

With the present problems, especially the low coverage, it is proposed that work in the present districts be consolidated before expansion to new areas is made. However, given the high percentage of vital events registered in health institutions, UNFPA is getting interested in an expansion programme aimed at a total coverage of all health institutions in the country (Mainland only). Contributions on how to implement such a big programme are welcome.

APPENDIX I

CIVIL REGISTRATION PROJECT(CRP)
NUMBER OF REGISTERED BIRTHS AND DEATHS IN
PROJECT DISTRICTS - 1984, 1985 AND 1986

DISTRICT	REGISTERED BIRTHS			REGISTERED DEATHS		
	1984	1985	1986	1984	1985	1986
Bagamoyo	2,696	2,608	3,250	246	239	363
Morogoro Rural	5,362	4,377	6,990	565	429	983
Morogoro Urban	5,126	3,520	4,671	267	206	864
Moshi Rural	4,322	3,855	4,460	560	641	730
Moshi Urban	6,029	5,810	6,174	1,180	1,244	1,507
Iringa Rural	382	1,408	4,247	28	137	1,076
Iringa Urban	2,665	3,032	3,720	14	92	280
Hai	199	1,987	3,543	22	358	468
Kilosa	463	2,278	4,672	26	428	964
Kinondoni	4,545	9,651	10,967	13	503	808
Ilula	8,972	18,097	20,795	190	3,516	6,912
Temeke	3,219	8,414	10,463	14	642	892
TOTAL	43,980	65,037	83,952	3,125	8,435	15,847

APPENDIX 2

CIVIL REGISTRATION PROJECT (CRP)
REGISTRATION PERFORMANCE IN ALL PROJECT
AREAS FOR 1984 AND 1985

DISTRICT	REGISTRATION RATE				Percentage of events which occured and were registered in Health Institutions for 1985	
	BIRTHS (%)		DEATHS (%)			
	1984	1985	1984	1985	BIRTHS	DEATHS
Bagamoyo	38	36	9	9	57	26
Morogoro (R&U)	47	35	9	6	94	77
Moshi (R and U)	54	49	39	42	98	80
Iringa (R&U)	15	20	0	2	86	66
Hai (a)	2	20	1	16	92	61
Kilosa (a)	3	15	0	7	73	73
Dar es Salaam	33	63	1	18	98	97
TOTAL	30	42	6	14	85	68

(a) Hai and Kilosa districts were included in the Project in 1985

APPENDIX 3

CIVIL REGISTRATION PROJECT (CRP)
REGISTRATION PERFORMANCE IN ALL PROJECT
DISTRICT FOR 1985 AND 1986

DISTRICT	REGISTRATION RATE				Percentage of events which occured and were registered in Health Institutions for 1986	
	BIRTHS (%)		DEATHS (%)			
	1985	1986	1985	1986	BIRTHS	DEATHS
Bagamoyo	36	43	9	13	56	26
Morogoro (R&U)	35	50	6	18	79	74
Moshi (R + U)	49	54	42	48	95	81
Iringa (R & U)	20	36	2	14	75	51
Hai	20	35	16	20	93	64
Kilosa	15	30	7	14	-	-
Dar es Salaam	63	68	18	36	97	97
TOTAL	42	52	14	26	90	85

LEVELS OF INFANT MORTALITY IN ZANZIBAR SOME RESULTS FROM THE 1987 PILOT SURVEY ON FERTILITY AND MORTALITY

by
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Introduction

Zanzibar consists of two large and some smaller islands. It has its own Ministry of Health which is responsible for both curative and preventive medical care and for several special health programmes. Most important of these are: the essential drugs programme; the child growth monitoring and food supplementation programme; the expanded programme on immunisation; a family planning programme and programmes to control malaria and schistosomiasis.

Medical Care is largely decentralised and is increasingly focused upon preventive services. Curative, as well as some preventive services are provided through a network of primary health care units (PHC-units, formerly called dispensaries), the lowest echelon in a referral system, PHC-centres (formerly called cottage hospitals), and hospitals. At present there are for a population of about 600,000 people, 89 PHC-units, 4 PHC-centres, 4 general hospitals and 6 special hospitals (mental care, TB, leprosy and maternal care). The PHC-units are well distributed over both islands of Zanzibar. Consequently, over 90 percent of the population live within 5 kms from a PHC-unit.

Most important cause of morbidity in children under five years of age is malaria, followed by bronchitis/pneumonias, and diarrhoeal diseases (see annex I). More than a third of all young children dying in Zanzibar hospitals in 1986 died as a consequence of malaria. Important causes of death are further pneumonias, anaemias, malnutrition and measles (annex II). Infectious and parasitic diseases cause more than half of hospital deaths (53% in 1986).

Causes of morbidity are known due to wide use of the PHC-units. Information on mortality however is rather inferential in character, since most deaths occur outside medical facilities. The available medical statistics cannot therefore serve the purpose of estimating a level of (infant) mortality. A vital registration system, although in operation, is incomplete and likewise fails to yield an insight into fertility and mortality patterns and trends.

The only comprehensive sources of demographic information were the Tanzania population census of 1967 and 1978 and a national demographic survey of 1973. Since several new medical programmes were started from 1978, there is a growing need for

more up-to-date information for monitoring and evaluating them. This is especially true of the family planning programme which took off only two years ago. A population census for Tanzania which could yield more recent demographic and socio-economic data is scheduled for 1988, but results are not likely to be available before 1990/91.

It was therefore decided that the Statistical Unit of the Ministry of Health execute a special survey which would yield more comprehensive and more reliable results on some topics than a general population census. Included would be questions on the use made of, and attitudes towards, modern medical facilities and questions on family planning of the KAP-type (Knowledge, Attitude and Practice).

The Statistical Unit of the Ministry of Health is relatively young. A consistent series of comprehensive medical statistics has been published since 1983 (35 bulletins averaging 30-40 pages up to present), but there is still further need to improve the quality of staff and data and to strengthen the integration of statistics and planning, monitoring, and evaluation activities. All data are processed manually, but some computerisation will be introduced in the second half of 1987.

No survey had ever been undertaken by the Statistical Unit. Conducting a survey would provide up-to-date information and practical training of the Statistical Unit staff.

A locally funded pilot survey had to be mounted because of lack of specific research budget. The pilot survey was limited to basic demographic information. For the main survey, questions of a behavioural or socio-economic nature should be added to the questionnaire at a later stage, to accommodate funding agencies suggestions. Socio-economic information is excluded because a relatively small pilot survey suffices to evaluate such information. A larger pilot survey is needed to evaluate demographic information. Application of demographic estimation techniques, which need a relatively large sample, may reveal biases and enumerator errors which cannot be detected from mere reading of the data. The relatively large scale of the pilot survey would yield useful basic demographic parameters even in case a main survey would not follow.

Objective of the Survey

The objectives of the pilot survey were:

1. To provide more up-to-date demographic data which would serve as base-line information for health programmes recently started. Such information is missing from previous censuses or surveys, the vital registration system, and medical statistics. The most

recent demographic information was collected in the 1978 population census. Due to the nature of the demographic techniques applied to these census data, several of the estimated parameters actually refer to a situation as it existed at some point in time (up to about ten years) preceding 1978.

2. To serve as a pilot study for a later survey which would incorporate elements of a behavioural and socio-economic nature. The special survey may suffer from the same biases found in previous census and the demographic surveys; however with closer supervision, better educated interviewers, and more elaborate training possible in a survey, more timely data incorporating behavioural elements will be obtained. The provisional questions include issues on traditional and modern medical facilities and knowledge, attitude, and practice of modern family planning methods.

3. Being the first survey carried out by the Statistical Unit at the Ministry of Health it was expected to yield relevant research experience to staff. The survey involved sampling, pre-testing, training, field work, coding, data processing and analysis.

Sampling Procedures and Training

The type and size of the sample was mainly determined by the available funds and manpower. A joint survey with the Expanded Programme on Immunization (EPI) was planned for late 1986 to early 1987. Both surveys followed almost identical sampling procedures. The problem of lack of funds was partly overcome by making use of interviewers paid by the EPI.

The interviewers were recruited among staff from the Statistical Unit and MCH-staff, working at the rural PHC-units. The MCH-staff were expected to have a good knowledge of the survey area and its inhabitants, a sufficient educational level and to be controlled by the Ministry of Health. Home visits were thought to be in line with efforts to introduce health workers actively into the communities. This might be an important additional advantage if the interviews would take the character of multi-purpose visit during the main survey.

Due to the lack of a sampling frame, and in order to ensure cooperation from the authorities, it was decided that the sample should follow the hierarchical lines of the political party in Zanzibar (Chama cha Mapundizi, CCM). The first sample consisted of 90 randomly (by computer) selected political subdivisions known as CCM-branches. Each branch consists of a

relatively large number of ten-cells, each containing, in theory at least, ten households. A ten- cell is headed by a ten-cell leader (Balozi). Thirty branches were selected in Zanzibar town, thirty in the rural area of Unguja island, and thirty in Pemba.

The branch secretaries were informed beforehand of the visit by a team of interviewers. A ten-cell leader was selected from a list of ten-cell leaders at the CCM branch office. The number formed by the last two digits of a randomly drawn banknote was used. One ten-cell leader was selected in each branch. The final sample was thus of the stratified cluster type consisting of 90 randomly selected ten-cell communities.

The interviewers were instructed to start at the first house in the ten-cell and proceed to adjacent houses until at least thirty women between 12 and 60 years of age were interviewed. In order to make those interviewed more or less proportional to the geographical population distribution, this number was increased to at least fifty women in Pemba. The survey would therefore yield information on at least 1,800 women in Unguja and 1,500 women in Pemba.

In fact, 3,371 women were successfully interviewed (925 in Zanzibar town, 959 in rural Unguja, and 1,487 in Pemba), giving information on the survival status of 12,190 ever-born children.

The team of interviewers consisted of 35 MCH-workers and 8 staff members of the Statistical Unit. Training involved a classroom session during which the questionnaire was explained. The way to ask questions was rehearsed and a field exercise carried out in the urban area of Zanzibar town. A second classroom session discussed results and reiterated proper procedures. Due to practical problems training in Pemba only consisted of a classroom session.

1,884 women in Unguja were interviewed during the first round. A follow-up survey was conducted in which a sub-sample of these women was re-interviewed to evaluate data quality. These repeated interviews were carried out by Statistical Unit staff. The follow-up survey measured sampling errors (like incompleteness), and enumerator errors. It was also meant to act as a deterrent to those interviewers who might be tempted to "invent" data in order to avoid the tedious work that is inherent in properly conducted surveys. The follow-up survey consisted of 289 successful interviews in Zanzibar town and rural Unguja (15 percent of the first round sample, randomly selected.)

The stratified cluster sample was used involving a certain non-random selectivity. Lists of households and people to be interviewed had originally been considered, but were dropped because of anticipated similar or worse bias. Problems were expected since an unknown proportion of the ten-cell leaders is illiterate. Furthermore, it was demonstrated during the

follow-up survey that approximately a third of the respondents were very difficult to locate. In some cases different people were interviewed with (almost) identical names. Consistent interviewing of persons on a randomly compiled list would have greatly increased the field costs of the survey without guaranteeing better overall results. The biases introduced by the two-round survey as executed are discussed later in this report.

Questions asked and parameters to be estimated

For the purpose of supervision and to allow a follow-up survey, first the names of interviewer, respondent and ten-cell leader were entered on the questionnaire. Districts and the village, and the number of the selected clusters were recorded to allow regional breakdown of the data. Finally, the date when the interview took place was entered.

The following "demographic" questions were asked:

Age of the respondent. This is the most important piece of information used in all demographic estimation techniques. The interviewers were requested to enter the age as stated by the respondent if the answer seemed reasonable, and if not to enter a best possible estimate of the respondent's age. A "Historical Calendar" for estimation of age was not used as no satisfactory calendar was available.

Marital Status. This information was used to estimate mean age at marriage, the proportion remaining single and the divorce and remarriage rates. It was furthermore used to cross-check information given on the first husband.

Previous Marriage. All women, except those who stated clearly that they were widowed or separated/divorced, had to be asked whether they were married before. This information has little analytical value itself, but allows an interviewer to cross-check the information on survival status of the first husband, obtained by means of the following questions.

Survival status of first husband. The information on proportions widowed (from the first husband) is useful to estimate male adult survivorship probabilities. These estimates can be corroborated with those based upon proportions of women not orphaned (paternal orphanhood).

Number of children borne by the respondent. Information on the number of children born alive by age group of the mother is used in estimation techniques to obtain fertility and infant mortality parameters. The interviewers were asked to record live births, and exclude still-births, abortions, and adopted children. The

boxes on the form in which to write the numbers were not to be left blank in case a woman had no children (yet), in order to avoid the so-called "zero-error" which is common in this type of survey.

Number of children living at home with respondent.

Number of children living elsewhere in some other household. The answer to this and the previous question have no analytical significance but serve to make the respondent recall precisely how many living children she has. This procedure is especially useful to obtain more precise answers from older women, who often tend to exclude children who have already left the parent's home.

Number of children who have died. This information, in combination with information on the number of live births and age of the mother, is used to derive infant, child, and young adult mortality parameters.

Fertility during the past twelve months. This information on current fertility is combined with information on the number of children born alive (fertility history) to estimate fertility parameters. It has been shown that data on the fertility history are more reliable for women between 15 and 29 years, whereas the pattern of current fertility is best reflected by the information on births during the past year. The ratio of current fertility in one or more of the young age groups to the cumulated "historical" fertility in these same age groups is used as a correction factor in the fertility estimates. Since this question yields information on the fertility pattern rather than on the fertility level, underreporting to some degree does not seriously influence the estimates.

Survival status of own mother/father. The answer to this question is combined with information on mean age at childbirth, and is used to estimate adult female/male mortality by means of the so-called "orphanhood method". The interviewers were instructed that the answer to these questions should refer strictly to the biological parents.

Coding and data processing

Since the Statistical Unit did not yet have access to electronic computing facilities, the pilot survey data were processed on a private micro-computer of relatively small capacity (Apple //e). In order to manipulate the data, use was made of the dBase II software package. This package has the advantage of being straightforward, relatively easy to use, and available. The software is especially suited to quick data entry and data regrouping but does not offer a tabulation programme. Production of the tables was therefore a rather tedious process.

After a first visual inspection of the quality of the responses, the data were coded on the original questionnaire. Next, batches of about 300 records a time were key-entered and a print-out of these was produced to compare with the original questionnaires. Any misstrokes were then corrected and electronically edited. This edit programme consisted of a code range check and a consistency check.

Representativity of the sample

It was thought that the method of selecting respondents could have led to a sample which includes less mobile women to a larger extent. This could have been the case especially in the town area. Applied demographic estimation techniques are for the most part insensitive to a differential inclusion of different age groups. However estimates might be somewhat distorted if the persons included in the sample had different fertility and mortality characteristics from those excluded.

The percentages of all women surveyed by age group and by major geographical division were calculated, to examine whether all age groups had a similar chance to be included in the sample. The population upon which the coverage percentages were based, were estimated assuming a total population at the time of the survey of 600,000 with a regional and age distribution identical to that reported by the 1978 census. To eliminate the effect of age shifting observed in the census, a synthetic base population was used. This was derived from a model stable population with an annual growth rate of 2.7% (the previous intercensal growth rate) and a female life expectancy at birth of 50.0 years.

The calculations indicated that all age groups were sufficiently represented to apply demographic estimation techniques. The absence of a major discrepancy between the rural and the urban areas suggested that all estimated parameters would not be heavily biased by the non-random character of the survey.

Data Quality

Two methods were followed to gain some insight to the data quality of the pilot survey. The first method makes use of models of similar populations to be compared with the survey population. The second is based upon a direct comparison between results of the pilot survey and a follow-up survey, covering a random sample of the survey population. The subsample for the post-enumeration survey consisted of 400 women in Zanzibar town and rural Unguja. Of this sub-sample, 289 women were relocated and successfully re-enumerated.

Only answers on age showed major discrepancies between pilot and follow-up survey when results were analysed. Two different groups of surveyors interviewing the same respondents obtained rather different results. Age declaration was found to be of a better quality in town than in the rural areas. This is reflected in a larger percentage of identical ages in Zanzibar town (50%) than in rural Unguja (36%). Average age difference between pilot and follow-up survey was also smaller in town than in Rural Unguja (2.3 years versus 3.7 years).

There is also a noticeable preference for ages ending in a zero and for age 18. The extent to which such a preference exists can be expressed, for reasons of comparison, in a so-called "age-preference index". The larger the index, the stronger the preference for certain digits. The index calculated here can theoretically vary between 0 (no preference) and 180 (all declared ages ending in same digit). Since the age-preference index refers to the age span of 15 to 54 years only, the method had to be somewhat adjusted from that used to show preference for all ages.

The calculated indexes showed that digit preference was less pronounced in the survey than in the census, as might be expected with increasing awareness of age over the past decades.

Both the pilot survey and the census show the expected pattern of a lower than average preference in Zanzibar town (survey: 38.0; average for Zanzibar 57.8) and a higher than average preference in Pemba (73.4). By international comparison, all age preference indices calculated for Zanzibar can be described as very high.

In marital status the distinction between "single" and "not single" was in all cases well reported. There was some confusion in choosing between the married and widowed or separated/divorced categories in the case of remarried women.

Examination of the survey data had indicated that the questions on previous marriage and survival of first husband were poorly understood. A large proportion of young married women claimed to have been married before, while many divorced or widowed women claimed otherwise. For analytical purposes, the answers to these questions were disregarded. If the estimation technique based upon data on survival of first husband is to be successfully applied, the relevant questions will have to be carefully rephrased, and more time devoted to instructing the interviewers.

The number of children ever born according to the follow-up survey corresponded closely to those according to the pilot survey. In four cases differences were found when women proved to have included abortions. These abortions were also added to the number of children deceased. In general, splitting

the questions up in three parts yielded very satisfactory results. In only two out of 3,371 cases the sum of children at home, elsewhere, and deceased did not correspond to the total number of children ever born.

On examining the returns from the town and Unguja rural rounds, the question on births during the past year was found to lead to an underestimation of the expected current fertility.

An extra question, on date of birth of the last-born child, was therefore added in the Pemba round. This resulted in current fertility estimates that appeared too high. The combination of both questions was found more suitable to obtain a reliable impression of the age-specific fertility pattern.

The questions on survival of own father and mother were answered in an identical manner in almost all cases. However there were four cases in which the father or mother proved to have died well before the pilot survey, yet the respondents claimed them to be alive. This suggested that the respondents were not referring to their biological parents. This suspicion was confirmed upon demographic analysis of the data. To avoid this, the respondents will be asked to give the full names of father and mother in the main survey.

Infant Mortality Parameters

Infant mortality parameters were derived from information on number of children ever born and number of children surviving by means of indirect estimation techniques. The quality of the parameters depend on the accuracy with which the women reported the basic figures. Efforts were taken to ensure that women did not include abortions and still births in the number of deceased children. Adopted children were excluded from the surviving children.

Table 1: Infant Mortality Rates (number of children dying before first birthday per 1,000 live births) by survey region, 1987 survey and 1978 census.

SURVEY	TOWN	UNGUJA RURAL	PEMBA	ZANZIBAR TOTAL
Brass P(1)/P(2)	105	127	183	148
Brass P (2)/P(3)	107	117	165	138
Trussell West	110	131	198	157
Trussell North	107	127	195	156
IMR from 1(2), Tr.Nth.	119	141	138	135

CENSUS	TOWN	UNGUJA RURAL	PEMBA	ZANZIBAR TOTAL
Brass P(1)/P(2)	141	176	120	145
Brass P(2)/P(3)	124	159*	111*	132*
Trussell West	147	168	111	139
Trussell North	143	161	106	133
IMR from 1(2), Tr.Nth.	103	122	104	110

*P(2)/(3) - values outside range of table of multiplication factors (values extrapolated).

Table 2: Estimated number of children dying before first birthday and before second birthday per 1,000 live births, 1987 survey and 1978 census.

	SURVEY		CENSUS	
ESTIMATION TECHNIQUES	FIRST BIRTH-DAY	SECOND BIRTH-DAY	FIRST BIRTH-DAY	SECOND BIRTH-DAY
Brass P(1)/P(2)	148	184	145	158
Brass P(2)/P(3)	138	177	132*	148*
Trussell West	157	184	139	151
Trussell North	156	173	133	140
IMR from 1(2), Tr.Nth.	135	-	110	-

* see table 1

Different techniques were used to obtain parameter estimates. The first two techniques are based upon the average number of children born and the average number of children deceased by age group of the mother. The P(1)/(2)-ratio or the

P(2)/P(3)-ratio is used as a correcting factor. These methods are called the Brass P(1)/P(2) technique and the Brass P(2)/P(3) technique. Two further methods are based upon the average number of children ever born and the proportion of all children who are deceased, by age group of the mother. Correcting factors are obtained by use of an estimation equation and multipliers for specific mortality models. The methods used here are called the Trussell West and the Trussell North technique. The estimation procedures are extensively described in United Nations Manual X "Indirect techniques for demographic estimation" (1983). A fifth method finally derives the Infant Mortality parameter by means of converting the Trussell North below age 2 - mortality into a survival rate until the second birthday (1(2)-value), and next deriving an infant mortality estimate from a model life table corresponding to the 1(2)-value.

Table 1 shows the estimated infant mortality rates by survey region for both the census and the survey. Table 2 compares the number of children per 1,000 live births dying before the first birthday with the number of children dying before the second birthday.

On cross-examining these tables, several distortions can be noted in both the census and the survey data. At first sight, the IMR-values for the survey seem too high for Pemba whereas they are clearly too low for the census. This is confirmed by comparing the proportions of children dying before the second birthday (the q(2)-values) with those of children dying before the first birthday (the q(1)=values).

In the census, the q (2)-values are in some cases lower than the q(1)-values for Zanzibar town and Unguja rural, whereas in the survey the same is true in the case of Pemba. It shows that in the survey the Pemba q(1)-value is distorted (too high), whereas in the census the q(2)-values are too low in the case of Zanzibar town and rural Unguja, and both the q(1) and q(2)-census values are much too low in the case of Pemba. The IMR-values derived from 1(2) are therefore much too low in the case of the census, while they give acceptable results for the survey.

The too high q(1)-values and too low q(2)-values in the case of the census make it extremely hazardous to present "best estimates". The best census estimates presented in table 3 are based upon values that fall in-between the reported q(1)-and q(2)-values.

The relative smallness of the survey sample and the distortions in both census and survey data should call for caution in interpreting and drawing conclusions from these estimates.

This shows that the mortality level is still high and has possibly decreased during the past decade.

It should be realised that the estimates refer to a point in time approximately 2-3 years preceding census and survey. This therefore excludes the likely effect of a somewhat decreased infant mortality as effected by the successful expanded programme on immunisation. It is expected that the effect of this programme will be reflected in the 1988 census data.

Table 3: Best estimates of infant mortality rates by survey region, 1987 survey and 1978 census.

SURVEY REGION	1987 SURVEY	1978 CENSUS
Zanzibar Town	119	124
Unguja Rural	141	144
Pemba	138	?
Zanzibar Total	135	135 - 140

Discussion of results

As indicated earlier, one objective of the pilot survey was to obtain general information on fertility and mortality in recent years which was hitherto estimated on basis of extrapolations from the 1978 census data. As regards infant mortality, it was found that its decline over the past decade has not been significant as often assumed. About 135 out of every 1,000 newborn babies still die before their first birthday. This is a high figure in view of all efforts made in the medical fields. Most outstanding of these efforts has been an immunisation campaign resulting in full immunisation of more than 80% of all one-year old children in 1986/87. The effect of this immunisation on the level of infant mortality may not yet be evident since figures estimated on basis of retrospective data refer to two to three years preceding the pilot survey.

In 1983, malaria surpassed measles as the main cause of death in young children. In 1982, 30% of the underfives who died in hospitals were victims of measles. The figures for the following years were 28% in 1983, 14% in 1984, 21% in 1985, and 6% in 1986. Other immunisable diseases concern relatively small percentages, and do not weigh heavily on the infant mortality rate.

It will therefore be interesting to see to what extent the infant mortality rate will fall in the coming years as a result of the immunisation campaign. It may well be that this decline will not be proportional to the reduction in incidence of immunisable diseases, nor to other efforts to provide modern medical care. The little decline in infant mortality rates indicated by the pilot survey may already be an example of what will happen. Surveys on the nutritional status of young children in Zanzibar in 1985 and in 1986 showed that about 37% were to

some extent malnourished. Malnutrition makes children susceptible to infectious diseases, which in their turn lead to a further deterioration in nutritional status. As long as this malnutrition-infection cycle is not broken, non-immunisable diseases (such as malaria) may well take over the role of immunisable diseases in keeping the infant mortality at a high level.

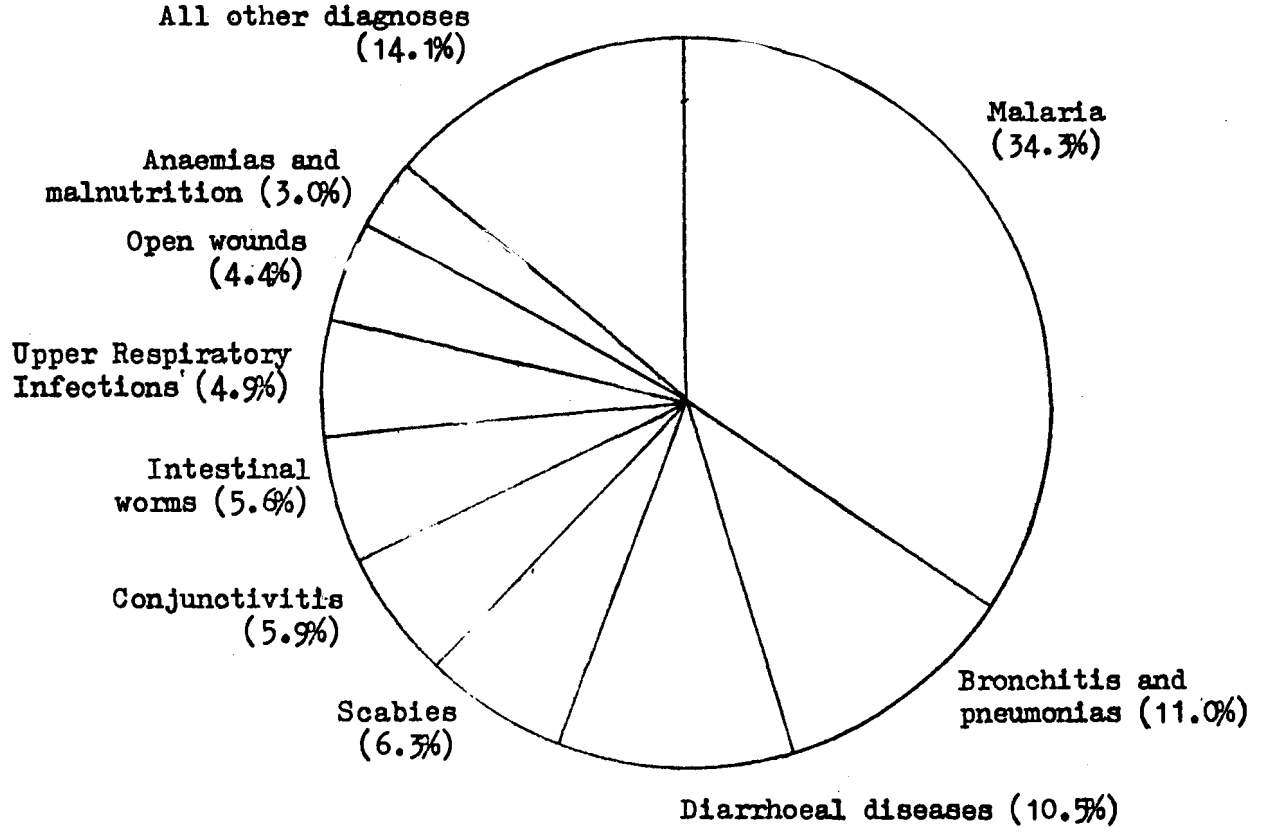
In spite of the large agricultural potential of Zanzibar, not all parents seem to be able to afford a well-balanced diet for their children. On the other hand, ignorance or other consumer preferences often seem to lead to a less than optimal diet. In order to combat this situation, the Ministry of Health should further promote and expand educational activities in addition to technical and medical programmes.

The second objective of the study was to serve as a pilot study for a later survey incorporating socio-economic and behavioural characteristics. The pilot survey has at little cost shown that a major survey is feasible but that some minor changes in the questionnaire and in the organisation of the survey are desirable.

The third objective was to train staff in survey research. The Statistical Unit staff have successfully participated in sampling, pre-testing, training, field work, and coding. Since the Statistical Unit may soon have a micro-computer at its disposal, data processing will probably be added to this list in case of a main survey.

ANNEX I

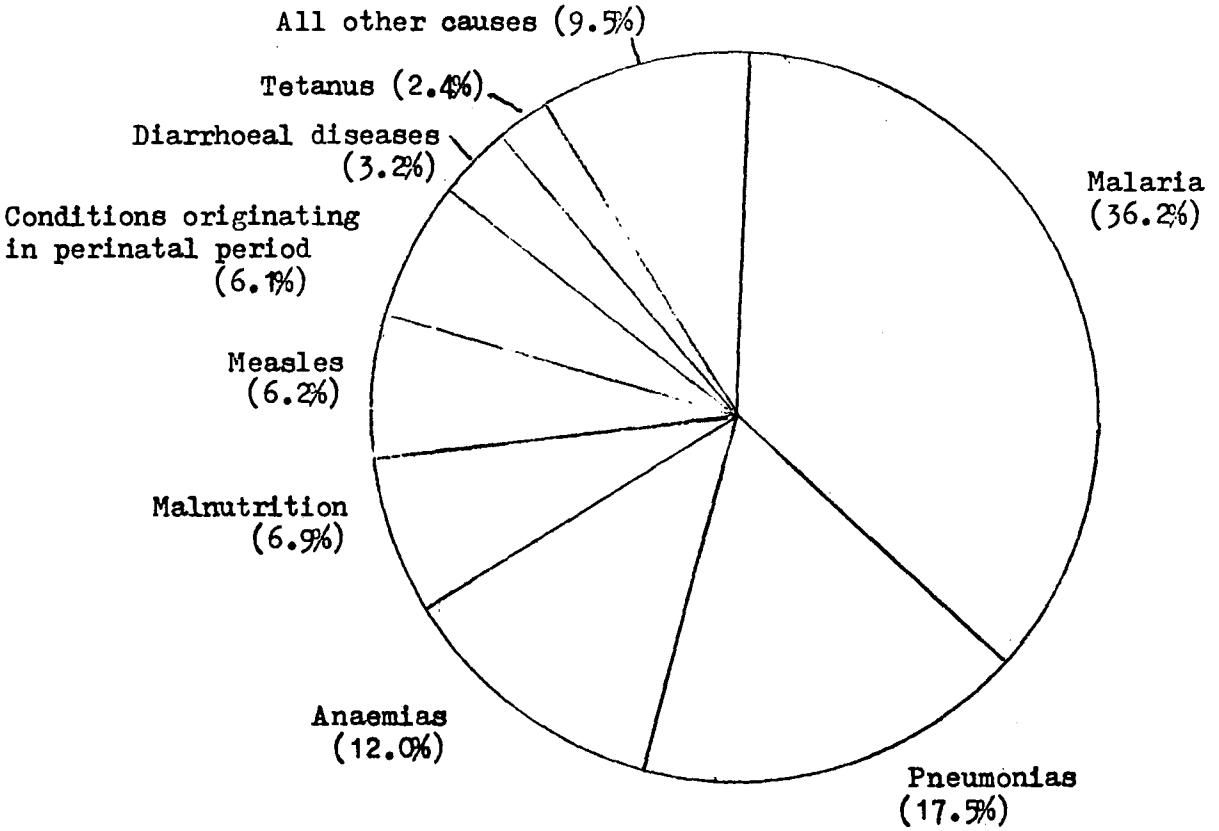
PERCENTAGE DISTRIBUTION OF NEW DIAGNOSES IN CHILDREN UNDER 5 YEARS OF AGE, ZANZIBAR PHC-CLINICS, 1986.



N = 230,301

ANNEX II

PERCENTAGE DISTRIBUTION OF CAUSES OF DEATH IN CHILDREN UNDER 5 YEARS OF AGE, ZANZIBAR HOSPITALS, 1986.



N = 594

DATA COLLECTION AND ANALYSIS FOR INFANT AND CHILD MORTALITY IN EAST AFRICA

by
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Introduction

Demographic data collection in developing countries in Africa started in the 1950's, although in only a few countries. The decade that followed witnessed many countries conducting large scale demographic data collection when, for the first time, population censuses and demographic surveys on a national scale were conducted. During the 1970's and 1980's a number of countries conducted population censuses and demographic surveys on a more regular basis. By the middle of the 1980's almost all African countries including Ethiopia and Zaire had conducted or were preparing to undertake a population census and/or a national demographic survey. At present in the region perhaps only Chad has not yet undertaken a population census or demographic survey.

The African countries keeness to collect demographic data shows the important role these data are playing in various spheres of African governments. Demographic data have increasingly become a central issue in African socio-economic development strategies and plans.

Demographic data are useful in preparing population forecasts and projections which in turn constitute essential prerequisites of orderly planning for social services, like education, health, agriculture, and transport.

Preparation of population projections and forecasts is only possible if adequate demographic information is available. Mortality for most countries is the second most important factor after fertility in determining changes in population size, structure, and distribution. Mortality information is extremely useful in the health sector where it is used to reflect more accurately the health status of the people. In this sector mortality information is hard to collect and also difficult to interpret. These data are expected to be used to identify high mortality areas and high risk population groups within areas so that in the process of planning, resources are directed at reducing high levels of mortality. Detailed mortality information is needed to determine type of health services and facilities to enable provision of maximum benefits. Information on causes of deaths and population at risk become crucial to evaluation and provision of health services and programmes.

African governments are using more and more population data for socio-economic development planning. This makes it necessary that the information on mortality be collected, analysed, and interpreted in order to make it available for various uses. This paper examines methodologies of mortality data sources being used in the analysis of levels, determinants, and differentials of infant and child mortality, in some countries in East Africa.

Data Collection

In East Africa mortality information is collected through civil or vital registration systems, population censuses, and demographic sample survey methods. All countries in East Africa have conducted several population censuses and demographic sample surveys since the 1960's. Although vital registration systems exist in these countries, coverage is still inadequate. In Kenya or Tanzania the civil registration system registers a small proportion of births and deaths. The coverage of the latter is much more incomplete compared to that of births.[1] Ironically mortality information derived from the vital registration system is the most reliable for mortality analysis; yet for various reasons and difficulties, the civil registration system does not collect sufficient data which can be used to analyse infant and child mortality in the sub-region.

The organisation of registration systems varies greatly among the East African countries. Ministries responsible for the registration work and those carrying out the statistical compilation work often differ. In different countries the responsibility of notification may fall on the family, health, religion or local administrative personnel. The hours and location of registration offices, and whether the statistical data are compiled locally, regionally, or centrally may also differ. Countries whose civil registration systems suffer from substantial incompleteness may be subject to sudden variations in the level of completeness. Although these variations are attributed to obvious organisational changes, often they are due to subtle changes in detailed procedures or to registration drives. For example, the latter often produce a substantial number of delayed registrations with respect to current events.

It is difficult to establish a national civil registration system that provides a reliable instrument of demographic measurement as it has to be more extensive both in time and space than either a population census or a sample survey. A successful civil registration system must therefore provide a means for detecting and recording all births and deaths regardless of what time of year or where in the nation each event takes place.

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[1] Republic of Kenya, Annual Report of the Registrar-General 1977, p2, Nairobi 1981.

Although a population census is equally broad in geographic scope it is a single effort carried out once, or at most twice, each decade. As a result, extensive administrative and technical resources can be specially mobilised in an effort to keep the data-gathering and data-processing operations under as much control as possible. Indeed such a special mobilisation of resources is essential if major errors in coverage and content are to be avoided.

The sample survey is restricted to a small proportion of the population. However, it is much better than either the census or the civil registration system in determining the ideal of statistical control. This is particularly true when the sample is confined to a relatively small number of geographic areas. It is then possible to train and supervise the field staff more effectively than in either a census or civil registration system and to insist, where appropriate, on direct rather than proxy interviews. Table 1 indicates that the sample survey is the most versatile of the three collection processes in terms of the techniques it can use to detect births and deaths.

However, sampling has its disadvantages. It lacks the publicity and better public understanding which is shown in a census and which may lead to improved respondent cooperation. This may be a factor in the higher coverage that has been observed in censuses as compared to many sample surveys. In addition survey estimates sometimes have sampling errors if a probability sample is employed; even greater uncertainties arise if some other sampling procedure is used. Non-probability or "new sampling designs" that depend on the validity of assumed models should not therefore be used to collect fertility and mortality data; standard probability sampling should be employed.

In the absence of efficient civil registration systems, countries in East Africa as in other developing regions devised alternative techniques which have enabled the collection of demographic information they need from population census and/or surveys. There are five techniques which have been used at one time or the other by the countries in the region. Table 1 presents the scheme of use of these procedures in collecting mortality data.

Table 1. Suitability of various techniques for detection of deaths classified by data collection method[1]

Technique	Data Collection Method		
	Civil Registration	Population Census	Demographic Sample Survey
1. Continuous recording of death	Yes	No	No[a]
2. Retrospective questions about each death	NA	Yes[b]	Yes
3. Questions about cumulative number of events	No	Yes[c]	Yes
4. Household change technique	NA	No	Yes
5. Aggregate population data classified by age and sex	NA	Yes	Yes

Source: Adapted from USA National Academy of Sciences, National Research Council, Panel on Data Collection, Collecting Data for the Estimation of Fertility and Motality, Committee on Population and Demography Report No.6, Washington D.C. National Academy Press 1981, pp. 12 - 15.

[a]Some variation in sample survey may include a continuous recording operation in sample areas of mortality or more frequent interviewing that approaches notions of contemporary recording. However, most sample surveys do not use this method.

[b]Suited only for question relating to deaths in the preceding 12 months or the data of the most recent death.

[c]Often not feasible to use the recommended full set of six questions (i.e. living here, elsewhere, born alive but now dead, each separately for males and females).

The table shows that any of the three data collection methods can either be used singly or in combination with other techniques. The selection of the technique to be used will depend on the purpose for which the user needs the data. Consequently, the questionnaire will be designed to solicit specific type of information and available methods of analysis. I now examine the five techniques in the context of mortality data collection among countries in East Africa.

[1]UN, Data Bases for Mortality Measurement, New York, 1984.

Continuous Recording of Deaths

Table 1 shows that this technique can be used to collect mortality information through the civil registration system of data collection. However, with some variation, a sample survey may include a continuous recording operation as in the case of multiround sample surveys which may include a battery of prospective questions about mortality. The technique is best suited to collect mortality information in conjunction with the civil registration system. The mortality information that would be most reliable for mortality analysis is theoretically the civil registration system, which so far has a coverage that is incomplete in all the countries in the sub-region. Registration of births and deaths in a number of East African countries has improved considerably recently. However, it is estimated to be still incomplete for various reasons and therefore there are limitations associated with civil registration systems as a means of mortality data collection method.[1]

Retrospective Questions about each Death

This technique can be used to collect mortality data from both population census and demographic sample survey. In a population census however, the technique is suitable only for data relating to deaths in a specified period preceding the census. In East Africa this normally refers to the 12 months prior to the census. It is however, known that use of this has not proved satisfactory because of reference period error, failure to report deaths, and other structural problems. Furthermore, the information about the deceased is only proxy and therefore limited. These limitations make it difficult to analyse the data and interpret the results correctly.

Questions about Cumulative Number of Deaths

This technique can be used to collect mortality data from both the population census and demographic sample survey data collection methods. However, in a population census, it may not be feasible to use the recommended full battery of six question, i.e. living here, elsewhere, born alive but now dead, each separately for males and females. Nevertheless East African countries have used the six questions with minor modification. The results of population census in the sub-region, data collected based on cumulated questions are affected by misreporting errors. The respondent may fail to report correctly since information is being recalled retrospectively by a household member who may not be necessarily well-informed.

[1]Republic of Kenya op cit, 1981
UN, Population and Vital Statistics Report 1987, New York, 1987

Household Change Technique

This technique is used to collect mortality information only through the demographic sample survey data collection method. The technique combined this approach with retrospective types of questions. In a survey conducted jointly by ECA and Government of Zambia, both prospective and retrospective techniques of data collection were used. The section on data analysis uses this information to illustrate problems of infant and child mortality analysis in the sub-region.

Aggregate Population Data Classified by Age-sex

This technique is used to collect mortality information from both population census and demographic sample survey methods of data collection. Data collection at one or two censuses in a decade can be useful for providing mortality estimates. The reliability of such mortality estimates is however, affected by the type of method of analysis. This problem is discussed in the section on methods of mortality analysis, which follows.

Methods of Mortality Analysis

In the absence of complete registration of birth and deaths in the sub-region, population censuses and demographic surveys have been used to secure information on number of deaths during the previous year in a household. Results from these methods have been found to be less satisfactory because they are influenced by misreporting age or selective underenumeration errors. Estimates of child mortality are made from data on children ever-born and children surviving by applying indirect techniques of analysis.

Mortality estimates based on direct approach require reliable data on births and deaths. Civil registration systems that would provide information on births and deaths on a continuous basis, do not exist and where they do, the information is inadequate to be used for demographic analysis. However, with some modifications this type of information may be obtained from multi-round surveys. Questions on births and deaths since the previous interview may be asked at every round of enumeration. The recorded information could then be used to obtain estimates of mortality directly from recorded events. This procedure illustrated with prospective data was obtained from a multi-round survey conducted in Zambia.[1]

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[1] ECA/CSO, Interrelationship Among Infant and Childhood Mortality Socio-Economic Factors & Fertility in Zambia: A Case Study of Lusaka & Keembe.

Estimates of mortality from prospective data are less satisfactory because deaths and births are rare events, reports on infant deaths may be omitted for various reasons, and births and deaths to women who have themselves died or moved elsewhere might not be reported. These and other difficulties hinder the estimation of reliable indices of mortality by applying direct approaches. This problem can be solved by indirect approaches to estimate mortality levels. These indirect methods use information on children ever born (CEB) and children surviving (CS) or children dead (CD) reported by women in childbearing age groups. There are four indirect techniques that are used to estimate childhood mortality from information on CEB and CS or CD. These procedures and their required data are listed below.

	Technique	Data Required for Analysis
1.	Data classified by age	(i) Number of CEB classified by mother's age (ii) Number of CS or CD classified by mother's age (iii) Total number of women in each age group
2.	Data classified by duration of marriage	(i) Number of CEB classified by duration of mother's marriage (ii) Number of CS or CD classified by duration of mother's marriage (iii) Total number of women in each marriage-duration groups
3.	Estimation of intercensal child mortality using cohort data derived from two enumerations (census)	(i) Number of CEB by age or marriage duration of mother from two enumerations (ii) Total number of women in each group
4.	Estimation of mortality when fertility experience of true cohorts is known	(i) Number of CEB by age or marriage duration for two censuses (ii) Number of CS or CD by age or marriage duration for two censuses (iii) Total number of women for both censuses

Prospective and Retrospective Survey Data[1]

The Republic of Zambia is a landlocked country situated in the heart of the southern half of Africa. Lying entirely within the tropics it is located between 7° and 18° south latitude and stretches between 20° and 35° east longitude. Its relatively large area of 752,600 square kilometers is surrounded by eight neighbouring countries (Angola, Zaire, Tanzania, Malawi, Mozambique, Botswana, and Namibia).

The relatively high altitude of the country gives it a relatively temperate climate wih three seasons: a cool dry season that lasts from late April to August, a hot dry season from September to early November; and a warm wet season from mid-November to April. Rainfall ranges from less than 30 inches per annum in the south-west to cover 50 inches per annum in the north. Much of the vegetation is deciduous savanna woodlands.

Rail links to the Indian Ocean are provided by the Tazara Railway to the port of Dar es Salaam, Tanzania, the southern railway line, through Zimbabwe to Beira and Maputo, Mozambique, and the South African port of Durban. An outlet by railway to the Atlantic Ocean is available through the Angolan Port of Lobito.

Although the country is large, it is populated by just over five and a half million people[2]. With an average population density of 7 persons per square kilometre, Zambia has one of the lowest population densities in Africa. Population density is however, much higher than the national average in the Copperbelt, in Lusaka Province, along the railway line to the south and the southeastern part bordering Mozambique. Northern Zambia also has the same national average density of population. The lower Kafue basin contains the most extensive fertile lands and the largest density populated region of the country.

Zambia is one of the most urbanised of African countries. Close to forty per cent of the estimated urban total population live in Lusaka (538,469)[3], the Copperbelt towns of Ndola, Kitwe,

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[1]Part of this text was adopted from the report of the study, on Interrelationships among the fact and childhood mortality socio-economic factors and fertility in Zambia, ECA, Addis Ababa, 1984.

[2]The preliminary report of the 1980 Census of Population and Housing published by the Central Statistical Office, Lusaka, gives the total population of Zambia as 5,679,808.

[3]Republic of Zambia, 1980 Census of Population and Housing Preliminary Report; Central Statistical Office, Lusaka, January, 1981.

Chingola, Mufulira and Luanshya, Livingstone to the south and Petauke to the east. Other secondary towns like Kabwe, Mumbwa, Sesheke, Chililabombwe, Chingola, and Isoka are growing rapidly.

About 80 tribal groups make up the population of Zambia. The major tribal groupings are the Bemba speaking people (Lunda, Bemba, and Bisa), the Nyanja speaking people (Chewa, Tumbuka, Nsenga, Ngoni, Kunda, and Chikunda) and the Tonga speaking people (Tempa, Lenje, Soli, Ila, and Toka). In addition to these dominant groups there are also migrants from Zimbabwe, a few white, coloured and Indian people.

The survey covered the capital city Lusaka and the rural area of Keembe in Kabwe rural district in the Central Province. Lusaka, like many other African capital cities, has settlement patterns which portray the rapid growth in urbanisation in the past two decades.

Private housing schemes have been encouraged in such areas as Roma, Kabulonga, and Olympia Park and government initiated housing schemes have thrived in Kabwata, Chawama, John Howard, Garden, Kalingalinga, Chalisa, etc. The rural survey was carried out in Keembe, a rural area of low population density in Kabwe Rural District in the Central Province. Keembe is about 100 kilometres from Lusaka way out of the main motor road from Lusaka to Kabwe. Thirty-three dispersed small villages were covered in the survey. These villages are spread over an area of more than 600 square kilometres.

The main economic activity of the populaton in Keembe is subsistence agriculture. In the absence of large villages, economic and social activities tend to be very parochial.

This survey aimed at measuring fertility and mortality levels in rural and urban communities in Zambia and identifying their interrelations to social and economic factors. This exercise aimed at throwing more light on the determinants and consequences of infant and childhood mortality. It also tries to identify cultural, economic, and nutritional elements that determine the period of lactation and thereby exert influence on child spacing and fertility levels. Information was collected on the most recent closed birth interval for women aged 12 - 50 years and their marriage and pregnancy histories.

The survey involved a combination of retrospective and prospective methodologies to deal with the problem of omissions and seasonality of vital events. The retrospective survey involved collecting data on social and economic characteristics. The prospective survey was conducted among the women over a twelve months period. It collected information on age at menarche, age at first and subsequent marriages, age at first birth, duration of first and subsequent marriages, and breast feeding practices.

Information was collected on societal and household characteristics likely to influence levels of infant and childhood mortality and fertility. Information on household composition and structure, family size, attitudes and preferences, patterns of food distribution, and consumption in households was also collected.

The survey also looked at child feeding patterns, common morbidity problems among children under five and anthropometric measures for children 1 - 4 years old. Information on the availability and use of health services and sources of food and water supply was also included. These are factors which are considered to influence living standards and sanitary conditions in societies. These data should provide greater insight into fertility and mortality interrelationships and differentials in rural and urban communities in Zambia. They should also provide greater information on determinants of infant and childhood mortality and identify possible areas of policy and programme development for reducing current high levels of mortality and fertility.

The survey investigated the extent of the knowledge and practice of birth regulation, attitudes towards acceptance, and rejection of family planning methods. It also investigated how family size norms are sustained through cultural practices, values, and pressures and how these interact with social and economic arrangements to influence fertility behaviour in rural and urban communities in Zambia. Special topics were covered during each of the four rounds made.

First Round Survey: This was undertaken from August to September 1978 and focussed on collecting basic information on household members, demographic, and socio-economic baseline information on females aged 12 - 50 years old. Information on marriage and knowledge and use of birth regulation methods and pregnancy status and history and number of children ever born and surviving as well as deaths in the last 12 months was also collected. In the first round survey, there were five schedules used to collect these different kinds of information. I have used data on children ever born and children surviving to estimate child mortality.

Second Round Survey: It was conducted in December 1978 and focussed on bio-social factors influencing fertility, birth history, and changes in household size since the first round. Information was also collected on adult mortality and orphanhood status. There were eight schedules administered in the second round. I have used information on births and deaths in households recorded since the first round of survey.

Third Round Survey: This was carried out from April to May, 1979, and focussed on changes in household composition and pregnancy status since the second round. Information on socio-economic factors facilitating and constraining

childbrearing, maternal and child care, value of children, family income, socio-economic roles of women, parental concern for children's education, and future socio-economic roles with the household economy was collected. Six schedules were used to collect these different types of data. I used data on births and child deaths that occurred between the second and third rounds.

Fourth Round Survey: The last round of survey was conducted in August 1979, and was aimed at getting information on nutrition; household diet, sources, and regularity of food supply. Water supply and sewerage system and the availability and use of medical services were also dealt with. Anthropometric measurements were obtained for a sample of children 1 - 4 years old and vital events were recorded. I used these data on births and child deaths recorded in the interval. The fourth round had eight schedules to record the relevant information.

Sample Design and Procedures

The total sample size for this survey was 2572 households consisting of approximately 5000 women aged 12 - 50 years. The sample size consisted of 2052 households from Lusaka, and 520 from Keembe.

The sample size was restricted by the limited budget and consideration of logistics and time available for each round.

The total sample was split into rural and urban. However, we abandoned the idea of two sub-samples when it came to selecting a suitable survey area. We selected Keembe area because: it was predominantly agricultural; its inhabitants were principally engaged in subsistance peasant agriculture; it was situated far enough from an urban settlement so it could maintain its rural character; and there were no large commercial farms or mining concerns in the area.

In view of limited resources, an area near Lusaka was located. Keembe was selected as the rural study area. The highly dispersed settlement and the homogeneity of the life style in Keembe made it necessary to reduce the rural sub-sample to 520 households. The urban sub-sample was raised to 2052 households. All households in the selected villages were covered with the exception of fishermen who were out fishing. All households with women aged 12 - 50 years were included in the study, and households without eligible women were excluded on verification by the supervisor.

The urban sub-sample in Lusaka was stratified according to the socio-economic status of resident as follows:

(a) Low density stratum: This was made up of areas of Lusaka inhabited by high income groups.

(b) High density stratum: This was composed of areas of the city inhabited by middle level income groups. Although buildings in these areas were solid, the small sizes of each housing unit made homes relatively overcrowded.

(c) Squatter Stratum: The squatter areas and "compounds" in Lusaka are predominantly the homes of the low income and manual workers. This stratum was further divided into "site and service" areas (initially designed to provide localised employment to inhabitants of the neighbourhood), "up grade" areas (squatter areas under government low income housing improvement schemes), and "other squatter" areas (not falling in the two former categories).

The sample size for each stratum was computed on a "PPS", (probability, proportional to size) where size refers to the estimate of the population size of the stratum provided by the Central Statistical Officer. The survey covered low density (262), high density (645), and squatter (1145) households in the urban stratum. In each stratum, blocks or areas were selected with probability proportional to the population size of the areas, and within selected areas complete coverage of households was made. 2052 households were actually covered in the first round of the survey in the urban subsample.

The survey excluded residences of diplomats, consulars and non-Africans. Institutional residences such as hospitals, prisons, industrial settlement estates, police barracks, etc. were also excluded from the sample. The survey comprised four rounds at intervals of three months between August 1978 and August 1979.

The results of the survey represent the characteristics of the population studied because the survey units were self-weighted and thus sampling estimation method and estimates of the sampling error are not given.

In all the four rounds, the methodology of data collection relied on both prospective and retrospective approaches. In this analysis one technique of indirect method listed earlier has been used to derive estimates of infant and child mortality from data collected in the joint ECA/Zambia study. Similar data are also available from population censuses conducted in the countries of the sub-region and these indirect techniques can also be used without difficulty.

Retrospective data were used for women in age groups 15-19, 20-24 and 25-29. I recorded the number of women in these respective age groups as 217, 586 and 536. These women had their respective number of children everborn as 295 for women aged

15-19, 1327 for those aged 20-24 and 2072 for women in age group 25-29. The number of dead children were recorded as 28,132 and 186 respectively for age groups 15-19, 20-24 and 25-29.

Estimates of infant and childhood probabilities of dying before attainment of age X derived from data on CEB and CS, general mortality level obtained from the number of deaths reported for the period prior to the survey, and infant deaths during the same period are presented in Table 2.

Prospective data pertain to the reports for each round recorded about number of births, deaths by age at death, and the current population size. For the 2nd, 3rd and 4th rounds, I recorded respectively, the number of infant deaths as 24, 14 and 14; I recorded births as 193, 170 and 132 respectively. Estimates of infant mortality rates, general mortality and the implied life expectancy at birth are again presented in Table 2.

Table 2. Estimates of mortality and results of the survey

Indices	Retrospective data	Prospective data		
	first round	second round	third round	fourth round
P_1	1.36	-	-	-
P_2	2.26	-	-	-
P_3	3.86	-	-	-
D_2	0.099	-	-	-
Deaths	74	47	51	32
Births	-	193	170	132
Infant deaths	-	24	14	14
q_2	0.46	-	-	-
IMR	-	124	82	106
CDR	40+	11.8	12.7	10.8
e range	<20	45-55	54-58	49-53

ai, bi and ci are coefficients for estimation of multiplier ki which are used to convert proportion of dead children, di, into probability of child dying before exact age, x q (x).

P1,P2 and P3 are average number of children born to women in the group 15-19, 20-24 and 25-29 respectively.

The evidence presented in Table 2 suggests that estimates of infant and childhood mortality are more plausible if derived from prospective survey data. Indirect methods of mortality estimation however, provided an unreliable estimate even when the

data are available according to data requirements for the technique. Sample fluctuations, misreporting, data displacement and wrong selection of mortality model patterns may influence estimates of infant and child mortality. Normally when the survey aims at studying factors and determinants affecting child mortality in a small area, multiround data collection approaches are most appropriate. A series of multiround surveys being conducted by the Institut de formation et de recherche démographique (IFORD) at Yaounde, may be relevant[1].

Summary and Conclusion

Population census data collection in East Africa goes back to 1948 when the East African Statistical Department conducted the first population census in Kenya, Uganda and Tanzania (Tanganyika and the Island of Zanzibar). The second series was conducted in 1957 for Tanganyika, 1958 in Zanzibar, 1959 in Uganda, and 1962 in Kenya. The third and subsequent round of censuses in these countries have been held regularly at intervals of about every ten years. The latest in the series was held in 1979 in Tanzania, 1979 in Kenya, and 1980 in Uganda. This practice of conducting regular population censuses has improved the data collection methods and estimates of population parameters. Population data are also augmented with demographic data from civil registration systems and ad hoc surveys. Demographic surveys have been conducted regularly in Tanzania and Kenya. The latest important surveys were held in 1973 in Tanzania and 1978 in Kenya as part of the World Fertility Programme.

Other countries in the sub-region started demographic data collection almost at the same time. Zambia and Zimbabwe conducted demographic surveys in early 1950s. Both countries are conducting population census at regular intervals. The latest censuses were conducted in 1980 in Zambia, 1982 in Zimbabwe, and 1976 in Malawi. Demographic surveys have been undertaken in Malawi in 1970/72 and in 1978/79. Kenya is the only country which participated in the World Fertility Survey programme. As in most countries, civil registration systems are not complete.

Data collection has been emphasized in these countries because of the importance of population data in development planning. Analysis of methods that enable maximum integration of population data in socio-economic development planning has been done. This paper has presented data collection methods applied among countries in the sub-region. The countries have developed different data collection systems in order to provide reliable demographic data relevant for development planning. The paper

1. Jacques Vallin et al., Methodologies for the collection and Analysis of Mortality Data. Ordina Editiors, 1984.

also presents methods for data collection and analysis of infant and childhood mortality in the sub-region. These procedures have been illustrated with data collected in a multi-round demographic survey conducted in Zambia. The four round demographic survey used two prospective and retrospective techniques. Analysis of the data show that the prospective technique provides reliable data for the analysis of infant and child mortality. We hope that at the end of this workshop effective methods of data collection and analysis of infant and child mortality in the sub-region would have been realised.

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INFANT MORTALITY IN ZIMBABWE: AN ANALYSIS OF LEVELS AND CAUSE OF DEATH STRUCTURE

by
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Nature of the Problem

The prevalence of a high mortality rate in developing countries and the absence of complete or reliable data continues to be of great concern to demographers. There is a serious gap between the quantitative information about the population that is essential for many purposes and the amount and quality of data actually available. Demographers are continually seeking better techniques and methods for deriving more accurate and plausible estimates of mortality and other demographic aspects (i.e. fertility and migration). Mortality is of great concern to governments and policy-makers who strive to allocate their meagre resources to implement health programmes aimed at the reduction of mortality to acceptable levels. The efforts of developing countries in formulating policies promoting social and economic development is adversely affected by the absence of adequate demographic data.

The main source of data on infant mortality in developing countries is the census but its effectiveness is reduced by the underreporting of deaths. Most people try to avoid talking about death. In our tradition death is associated with evil spirits and bad omens. Recorded deaths in a census are unreliable because of inadequate registration systems and because the data are often outdated by the time the census is published.

Demographers are also concerned about the age-sex pattern of mortality. There are varying factors affecting the pattern. It has been observed that the probabilities of dying for males and females differ, and the magnitude of variance differs from population to population. This depends on the general level of mortality, commonly measured by the life expectancy at birth (e(0)). Countries with reliable statistics have established that the mortality rates are higher for males than females. Some deviations from this pattern have however been observed in Sri Lanka, India, and Pakistan. It has been observed that the lower the general level of mortality, the greater the excess of male over female rates.

Studies have shown that in developing countries, death at infancy accounts for a large proportion of the total deaths in any one year. This suggests that efforts made to reduce deaths in infancy will go a long way to reducing the general level of mortality. In order to achieve this objective we have to

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* The views expressed are those of the author and do not necessarily represent those of the Central Statistical Office.

identify factors contributing to infant mortality and the contribution of each to overall mortality. Among those identified are: demographic, social, environmental, biological, and pathological factors. These factors can be further grouped into: proximate determinants and indirect determinants.

The proximate determinants are those causes of death (disease or injuries) directly resulting in death. The indirect determinants are those "remote" factors which initiated the events leading to the fatal injury or disease. The determinants of infant mortality can be divided into socio-economic and biomedical factors. Death is a biological process, therefore the factors affecting infant mortality are biomedical. On the other hand, the economic, social, and cultural variables are felt indirectly as they operate through the biomedical factors. These factors operate differently at the neonatal and postneonatal states. However, the extent to which these factors affect the mortality levels varies among different sub-groups in a population. This study, therefore, examines the influence of some biological factors on cause of death structure during infancy. The data used for this study were obtained from the Ministry of Health Annual Reports and the 1982 Census of Zimbabwe.

Rationale for the Study

This study shows the period of occurence, the distribution, and the different types of diseases of man and relates them to living conditions. It is felt that little study has been done on the epidemiology of diseases especially among infants in Zimbabwe. What Zimbabwe needs are community based studies as a basis for planning effective preventive measures in different parts of the country.

I believe that this research is going to help the government of Zimbabwe reduce infant mortality, which is high. It would also help international organisations, like the World Bank, World Health Organization, and UNICEF to determine where to channel their assistance in respect to health problems. This does not mean that health problems for adults are of less concern. What must be understood is that indications of high infant mortality in countries like Zimbabwe remain of paramount importance. Planning for healthy infants and controlling biological wastage should therefore have high priority. This study is a multi-disciplinary approach to the study of infant mortality. The inter-relationships between man and his environment are well outlined by Herbert Spencer in his work, "Biology" in which he takes for his keynote the conception of life as having for its chief characteristics:

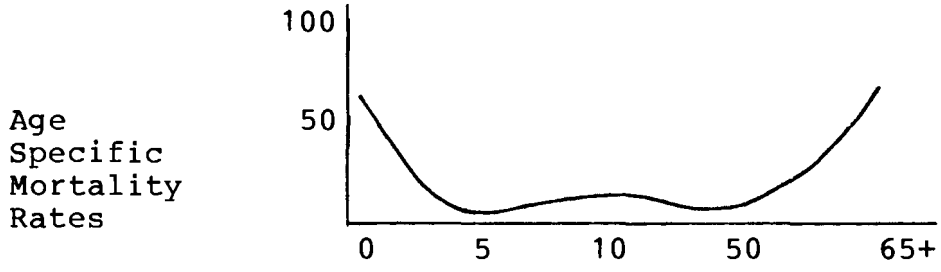
> "a continous adjustment of the organism to its environment, of its internal to its external relations. So structure follows functional need....."

In most developing countries the study of causes of death and the consequences of the level and structure of mortality in the population have either been affected by lack of data on cause of death or have not been done at all. I consider this study an attempt to break through these barriers and a stimulant for further research in that field in Zimbabwe.

To understand the concept of cause of death is a central theme to an appreciation of this study. Death is one possible outcome of an encounter between a specific morbid process and a vulnerable human target. It is clearly a joint function of the potency of an agent and the vitality of the host. The importance of the state of the host is shown by the steeply sloping curve of the mortality schedule and the general age pattern shown in Fig.I.

Fig: I

The Age Pattern of Mortality



The above pattern depends on the prevalence of causes of death in a population. The official and international definition of cause of death was given by the World Health Organisation as:

> "The disease or injury that initiated the train of morbid events leading to death or the accident or violence which produced the fatal injury". (WHO 1955, p. 337)

The definition only caters to the direct cause of death, cutting off the chain of events leading to death.

Estimates of Infant Mortality Based on 1982 Census

Direct Estimates

The results of the Infant Mortality Rates (IMR) using the 1981 and 1982 data are presented in Table 1.

Table 1. Infant Mortality Based on 1982 Census

Sex	1981 IMR/1000	1982 IMR/1000	Average
Male	30	26	28
Female	33	31	32
Total	27	21	24

Source: 1982 Census, Ten percent Sample

The above results are highly implausible considering Zimbabwe's stage of development. The most likely explanation is the underreporting of deaths. To overcome this situation one needs to use indirect estimates of infant mortality.

Indirect Estimates

The indirect techniques require data on children surviving from birth, (and those ever born alive), classified by sex as well as the age group of mother. These techniques have some limitations as they imply that fertility and child mortality have been constant in the recent past. There are however indications that both fertility and mortality have been declining in Zimbabwe although the precise extent of the decline has not been determined. These techniques assume that the risk of a child dying is a function only of the age of the child and ignore factors such as pregnancy complications, and birth order of the child. The reported data of surviving children refer to surviving cohorts of women. It is assumed that members of the cohort who do not survive or who migrate have no effect on the survival of the children. This is not true in real life. The techniques also rely on the quality of data input which are often poor.

Feeney's Method

The method developed by Feeney estimates infant mortality if the parity of women by age P (i), proportion of children dead D (i), and the mean age of the fertility schedule (m) are known. The results of the Zimbabwe 1982 Census are presented in Table 2.

Table 2. Estimates of Infant Mortality Rate Using Feeney's method

Age Group	Reference Date	IMR
15 - 19	1982.6	76
20 - 24	1979.5	83
25 - 29	1977.6	87
30 - 34	1975.5	91

The above table shows that the Infant Mortality Rate has declined from 91% in 1975 to 76% 1982.

Brass's Method (and the Trussel Variant)

The analytic technique used to estimate infant mortality is one originally developed by Brass and later modified by Trussel. The results of the two methods are presented in Table 3.

Table 3. Estimates of Infant Mortality Rate

Source	Age Group of Mother	IMR	Reference Date
TRUSSEL	20-24 & 25-29	83	1982.6
	20-24	89	1979.7
	25-29	94	1977.3
	30-34	98	1975.1
BRASS	20-24 & 25-29	73	1982.6
	20-24	80	1979.9
	25-29	85	1978.0
	30-34	90	1975.8

The Trussel estimates may be taken as representative as the techniques used have found wider applicability to African data. It also takes into account early fertility of the populations.

Causes of Perinatal Mortality

Perinatal mortality includes still births and live born infants who die within 168 hours from birth. The World Health Organisation has recommended that the cause of death in this category be set out as follows:

- Main disease or condition in fetus or infant.
- Main maternal disease or condition affecting fetus or infant.
- Other maternal diseases or conditions affecting fetus or infant.
- Other relevant circumstances.

The 1980 Report of the Zimbabwe Secretary for Health provides a table of the principal causes of 5069 registered infant deaths. These deaths account for about 15% of the total number of infant deaths in the country in that year. Among the registered deaths, 2287 (45.1%) were attributed to certain conditions originating in the perinatal period. The breakdown of the group is presented in table 4.

Table 4. Registered deaths occuring during the perinatal period

Cause of Death	Number	%
1. Hypoxia, birth asphyxia and other respiratory conditions	754	33.0
2. Slow foetal growth, foetal malnutrition and immaturity	731	32.0
3. Obstetric complications affecting foetus or newborn	169	7.4
4. Birth Trauma	106	4.6
5. Maternal conditions affecting foetus or newborn	27	1.2
6. Others	500	21.9

Source: Computed from Ministry of Health (1982).

These statistics are biased towards urban and other centres where the obstetrical services are provided by the government and missions. Provincial Medical Officers interviewed thought that in deliveries outside the formal medical care systems, deaths from birth trauma, obstetric obstructions, and antenatal infections would rank higher than indicated in the tables.

Recent data are available on deaths during the first week of life, and deaths occuring in the one week to one month age group for Harare city. This is presented in Table 5.

Table 5. Distribution of Registered Causes of Death under One Month, Harare 1983 and 1984.

Age Group	Under One Week				One Week to One Month			
Causes of Death	Number		percent		Number		percent	
	1983	'84	'83	'84	1984	'84	'83	'84
1. Prematurity	52	73	23	31	3	7	2	6
2. Intra-partum asphxia	50	55	26	24	2	0	1	0
3. Pneumonia	19	12	9	5	59	38	35	33
4. Septicemia	12	15	5	7	30	21	18	18
5. Congenital anomaly	25	20	11	9	9	6	5	5
6. Respiratory distress/ failure	12	22	5	10	2	4	1	3
7. Meningitis	5	7	2	3	18	13	11	11
8. Gastro-enteritis	5	3	2	1	25	12	15	10
9. Neonatal tetanus	4	4	2	2	6	5	4	4
10. Congenital syphilis	3	2	1	1	1	1	1	1
11. Hypothermia, Misadventure & Others	27	17	12	7	13	9	8	8
Total	223	229	98	100	168	116	101	99

Source: Harare 1985 pp 126 - 127

About half the deaths of infants under one week are due to prematurity and intra-partum asphyxia. This plus respiratory distress, congenital anomaly, septicemia and pneumonia, account for more than 80% of deaths during the first week of birth.

Pneumonia leads in the cause of death in the one-week to one month age group; together with septicemia, meningitis and gastro-enteritis. They constitute 79% of causes of death in 1983 and 72% in 1984. These data, which relate to Harare only, are probably less representative of the country-wide situation than those pertaining to registered deaths over the whole country.

Causes of Infant Mortality

According to clinic/hospital records the three main causes of infant mortality, besides conditions occuring in the perinatal period, in 1979 and 1980 were: pneumonia and other diseases of the respiratory system, gastro-enteritis, diarrhoea, and other intestinal infections, and measles as shown in table 6.

Table 6. Registered Causes of Infant Mortality, 1979 and 1980

Causes of Death	1976		1980	
	Number	Percent	Number	Percent
1. Perinatal period conditions	1568	33.1	2287	45.1
2. Diseases of the Respiratory systems	925	19.5	362	17.0
3. Diarrhoea, enteritis and other intestinal infections	528	11.1	516	10.2
4. Measles	367	7.7	271	5.3
5. Congenital abnormalities	238	5.0	312	6.2
6. Tetanus	307	6.5	66	1.3
7. Other bacterial diseases (other than 3 and 6)	193	4.1	88	1.7
8. Meningitis	112	2.4	137	2.7
9. Others	386	8.1	402	7.9
	4624	97.5	4441	97.4

Source: Ministry of Health 1980
Ministry of Health 1982

NB: As classification of causes of death are different for the two years, the data are not comparable.

The three major causes are followed by congenital abnormalities, tetanus, bacterial diseases other than intestinal infections, meningitis, and malnutrition. Updated statistics on these causes are not available, however, a comment was made that pertussis/whooping cough should be included. Malnutrition is generally ignored as the ultimate cause of death, yet, malnutrition makes children more vulnerable to infections and contributes to the intensity of their diseases.

After reviewing these direct causes of death the previous reservations about the official definition of "cause of death" must be considered. It has been argued:

- that too much emphasis is still being placed on short-term vertically organised public health interventions and modern medical institutions at the expense of social and economic development;

- that the current approach to health care as a means of reducing mortality rates in developing countries is not appropriate to the disease environment (see Gwatkin 1980; Palloni 1981);

- that a greater proportion of deaths is due to water and food borne diseases, and effective prevention therefore calls for improved personal hygiene rather than specific cures, such as availability of rehydration salts;

- that it is not a single episode of diarrhoea that kills but the fact that children weakened by malnutrition continually battle diseases to which they are vulnerable.

It is therefore recommended that:

(1) Maternal and child health centres be established to help reduce infant mortality rates. A study carried out in Western Nigeria proved that the introduction of MCH reduced the infant mortality rate to 76 percent below the original level (see Mosley, 1963).

(2) Education should be emphasised for use in further research and also in planning health programmes.

(3) Education has been established as a factor which can reduce infant mortality rates. In their study in some Latin American States, Puffer and Serrano noted that the proportion of deaths of the under fives were much lower where mothers had some education.

It is also recommended that further research be aimed at:

- Carrying out in rural and urban areas, projects designed to accurately determine infant mortality rates that would be as comparable as possible, taking into account biological, nutritional, sociological, environmental, and economic factors.

- Relating mortality to biological factors.

- Studying the reproductive history of mothers, ascertaining the relationships of variables such as age of the mother, birth order, and birth intervals, to infant mortality.

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A STUDY OF INCIDENCE, AETIOLOGY AND OUTCOME OF LOW BIRTH WEIGHT IN URBAN ZIMBABWEAN WOMEN

by
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Abstract

Low birth weight is a major associated cause of perinatal and infant mortality, and young childhood morbidity (e.g. physical and mental handicap), especially in developing countries such as Zimbabwe. There has been very little research in Zimbabwe into low birth weight: its incidence, breakdown into preterm and intrauterine growth retarded groups and aetiological factors. Recent research in Ethiopia has suggested that maternal nutritional status and physical activity during pregnancy are important factors. Also several different research centres have shown that subclinical chorioamnionitis is a common pathological finding in the placentae and membranes from low birth weight babies.

The aims of this study are to establish in an urban high-density area, and later in a communal area and a commercial farming community, the following:

1) incidence of low birth weight babies (under 2,5kg)
2) proportions of pre-term and small for gestational age
3) importance of various aetiological factors associated with lowbirth weight,
4) the prognosis of low birth weight babies in terms of subsequent neonatal and infant morbidity and mortality and assess growth in this group.

Problem Definition and Identification

Low birth weight is a major associated cause of perinatal and infant mortality especially in developing countries. Low birth weight is conventionally defined as a birth weight of less than 2500 gms. Low birth weight babies fall into two categories, a) 'Pre-term', i.e. delivered before 37 weeks of gestation and b) 'Small for gestational age' (SGA) those that are born with a weight below the 10th centile for the particular gestational age due to intrauterine growth retardation.

There are well defined causes of intrauterine growth retardation (e.g. hypertension, syphillis, congenital abnormality) and similarly there are recognised causes of prematurity (multiple pregnancy, antepartum haemorrhage, urinary tract infection, malaria). However there are many cases in which the precise cause of the intrauterine growth retardation or prematurity is not known.

The association between low birth weight and poor socio-economic status is well described (11,12), although the actual causal factors are not well understood. There has been much controversy about the role of maternal undernutrition in the aetiology of low birth weight (13).

In recent years there has been renewed interest in identifying and defining factors in low birth weight. Maternal undernutrition has been studied by Lechtig (14) and Naeye (15). Some experimental projects where selected undernourished pregnant women have been given dietary supplements have shown some improvements in birth weights (16,17).

Two recent studies, one in Ethiopia (18) and the other in the United States have suggested that excessive maternal physical activity during pregnancy may be one factor in the aetiology of low birth weight particularly where dietary intake is borderline. Also several different research centres have shown that sub-clinical chorioamnionitis is a common pathological finding in the placentae and membranes from lowbirth weight babies (20).

WHO defines low birth weight as including birth weights less than 2500 gms based on multicentre data showing that perinatal and early childhood problems increase significantly below this weight.

In Zimbabwe there has been very little research into low birth weight: its incidence, breakdown into preterm and SGA groups, and its aetiological factors. Clinical impression and comparison with other developing countries would suggest a higher rate (over 10%) than in developed countries. This was also suggested by a World Health Organization (WHO) International investigation which estimated that in Zimbabwe 15% of all live births were of low birth weight as compared to an average of 7% for developed countries (21).

Statistics from the Greater Harare Unit show that low birth weight is a major associated factor in perinatal and infant mortality (22, 23). Cerebral palsy and mental handicap related to birth asphyxia or birth trauma are major problems in Zimbabwe and are often related to low birth weight (24).

Pregnant women in Zimbabwe live in very different kinds of socio-economic settings where family income, the need for heavy physical labour and nutritional intake may vary considerably. Some live in urban areas in high or low density suburbs. Others live in rural farms either as peasant farmers in the communal lands or as labourers on commercial farms. The physical burden of work of women in rural areas is often very great (25). Many women also migrate between rural and urban areas. There has been no research into average birth weights and the incidence of low birth weight in women from these different socio-economic

backgrounds in Zimbabwe, although there is a current research study being conducted by Dr. S. Munjanja in the Department of Obstetrics into normal fetal growth and normal birth weights for an urban population.

The objectives of the study were to establish in an urban high density area (and later in a communal area and a commercial farming area) the following:

1) the incidence of low birth weight babies (i.e. those weighing under 2500 gms)
2) the proportions of preterm and small for gestational age
3) the importance of various aetiological factors associated with low birth weight babies (including the factors of, maternal nutritional status, maternal physical activity, and amniotic fluid infection syndrome.)

It is hoped that the information obtained from the study will help define the extent and distribution of the problem of low birth weight in different sectors, thus enabling a more rational allocation of resources to be made. Also, the elucidation of important aetiological factors in low birth weight may aid in earlier detection of at-risk mothers and suggest prevention measures.

The ultimate aim of the project was to provide information which would contribute towards the reduction of perinatal morbidity and mortality, and thus improve infant health and survival.

Study Design

Descriptive and analytic:

a) The study attempts to define the incidence of low birth weight in a specified urban population group and assess the proportion of preterm and SGA babies.

b) Using a case control study we have tried to assess the importance of various aetiological factors by comparing their occurrence in mothers of low birth weight babies with mothers of normal birth weight babies using a questionnaire.

Data Collection

i) Study Duration: The study was carried out from 21.9.86 to 18.12.86.

ii) Study population: The high density suburbs of Highfields, Glen Norah and Glenview were chosen as the study area because they were considered to be representative of an established urban community. All women resident in these areas who delivered at the 3 low risk maternity units serving these areas or who were referred to the high risk Harare Hospital maternity unit during the study period, had the following data collected from clinic records: birth weight, still birth and early neonatal death. The purpose of this was to establish a birth weight distribution of the study population.

We attempted to distinguish those women normally resident in an urban setting from those living in the rural areas who came to town to deliver by asking whether the mother had spent more than one out of the previous six months in the rural areas.

The study population did not include those mothers who lived in the catchment area but who delivered at home. In Greater Harare it is thought that this constitutes only a small proportion of the total deliveries (5-10%) (26).

iii) Cases and Controls: Cases selected included all those women who delivered babies weighing less than 2500 gms at the three municipal clinics and Harare Central Hospital who were from the study population. Controls comprised the next normal birth weight infant born at the same institution as the index case.

Data were collected from Obstetric notes, from an administered questionnaire and from specified additional investigations obtained on daily visits to the clinics and the hospital maternal health postnatal wards and neonatal unit.

Data obtained from the obstetric notes included standard obstetric history and known obstetric factors contributing to lowbirth weight (see appendix a).

A questionnaire was administered to all cases and controls by a research midwife. The questionnaire sought information on 1) socio-economic status 2) physical activity during pregnancy 3) Diet 4) Social habits 5) literacy and education (see appendix b).

Data obtained from specific investigation included a) the mother's height, weight, VDRL and, b) a gestational assessment using the Dubowitz method was carried out within the first 24 hours of life on all low birth weight babies.

The weights were plotted against gestational age on Lubchenco intrauterine growth charts (28) normally present in the notes and babies were assigned to the categories of preterm, small for gestational age and a combination of the two.

Placentae: Clinic and hospital nursing staff were instructed in the collection of specimens and swabs to be taken from the case and control placentae for microscopy culture and histology to detect evidence of chorioamnionitis, malaria, syphilis and any other pathology.

Reasons for methodology used

Though prospective studies have shown associations between physical activity, diet, and birth weight we chose a case control study using a questionnaire in an attempt to show associations between various aetiological factors and low birth weight in an "urban" population as compared to normal birth weight controls from the same population.

In our community where most women book late in pregnancy and about 10% have no antenatal care before delivery, a prospective study would have been more difficult, required more resources and would have introduced bias if only booked mothers were followed.

Methodological Problems

a) Defining the incidence of low birth weight (LBW). The study could not include home deliveries believed to be in the order of 5-10%which may conceivably influence the LBW incidence.

b) Determining the Preterm/SGA ratio. Use of the Lubchenco chart (27) added a 4th group to the three (Prem, SGA, P/SGA) already mentioned, as the 10th centile is 2175 gm at 37/52 compared to the 2500 gm on the Gairdner-Pearson chart (1971), i.e. term appropriate for dates but LBW. Use of a universal standard is obviously needed to compare results.

c) Determining the study populations resident status. Many women migrate between the cities and the rural communal lands for varying periods of the year for planting, harvesting, etc. Attempting to determine whether the woman was predominantly "urban" or "rural" by a single question proved difficult and made the information found on this issue probably meaningless. For this reason we chose to omit this variable in our analysis.

d) The use of a questionnaire to retrospectively assess diet in pregnancy and physical activity is a less effective and reliable method than would be a dietary survey and a time and action study of physical activity. Assessing the relative levels of activity during the three trimesters was logistically difficult. Using a scoring system to assess physical activity in the various trimesters would have been

more meaningful. Diet; the design of the questionnaire attempted to quantify variety and frequency of food intake but this was difficult to extrapolate to adequacy of caloric intake.

e) Placentae. Given the critical time factor for obtaining bacteriological specimens from placentae and the infrequent and sporadic occurrence of marginally low birth weight infants particularly in the low risk clinics, it proved unrealistic to expect regular clinic staff to remember to identify specific study cases as they occurred.

This aspect of the study would be more suited to a purely hospital based exercise with a full time researcher on hand to identify the study cases.

f) Assessment of low birth weight infants. The Dubowitz gestational assessment is a fairly complex procedure with some criteria difficult to interpret in black babies. A simpler reliable system needs to be identified if the study is to be extended into the rural community.

Results

Total deliveries at the three clinics and after referral to the central hospital was 2056.

Table I. Low birth weight incidence in the study area

	HOSPITAL	CLINICS	TOTAL
Deliveries	955	1101	2056
Low birth weight	173	50	223
Low birth weight %	18.1%	4.5%	10.8%

Table II. The birth weight distribution for the study population

RANGE	NO	%
<1000gm	17	0.8
1000-1499	17	0.8
1500-1999	40	1.9
2000-2499	149	7.2
2500-2999	567	27.6
3000-3499	846	41.1
>3500	420	20.4

Table III. Low birth weight babies studied

	No of babies	SB	ENND
LBW single	114	11	5
Both twins LBW	30 (15pr)	4	4
I twin LBW	6		
TOTAL	150*	15	9

* 135 mothers

Table IV. Breakdown of low birth weight by gestational age using the Lubchenco (1972) standard

CATEGORY	NO	%
Preterm AGA	52	40
Preterm SGA	7	5.4
Term SGA	52	40
Term AGA	19	14.6
TOTAL	130	100

It was found that of the LBW assessed 40% were preterm, 40% small for gestational age and 5.4% a combination of the two, while 14.6% weighed less than 2500 gm but with a gestational age estimated at between 37 and 39.5 weeks.

Aetiological Factors from the case controlled study.

Data from the obstetric notes are currently being analysed by an obstetric colleague. Data from the questionnaire have not been completely analysed to date, but some preliminary results are available.

Maternal activity in pregnancy

On preliminary analysis of the responses, activity in pregnancy was classified as "light" or "heavy". Work was considered "light" if no heavy manual work was stated, no gardening, harvesting, or collecting of water and wood, and if the mother received help with domestic work and children. Work

was considered "heavy" if the mother claimed to have spent time harvesting and ploughing, if she frequently walked significant distances to collect water and wood, and if she had many children and no domestic help.

The assessment of activity as light or heavy was a somewhat subjective interpretation of how mothers responded to the questionnaire.

Table V. Physical activity of the two groups

	"LIGHT WORK"	"HEAVY WORK"
LBW Mothers	75	56
Controls	82	50

no significant difference

Socio Economic status

Social economic status was defined by stated income alone. Family income levels were divided into three groups: $150, $150-400, and, over $400.

Table VI. Comparison of income groups against low birth weight mothers and controls

	$150	$150-400	$400
LBW	52	57	10
CONTROL	40	71	15

$P = > 0.05$, i.e. no statistical significant using X^2

Discussion

The incidence of low birth weight in a high density urban population group was 10.8% of all deliveries. This reflected both clinic and referral hospital cases but did not include home births believed to be about 5-10% in the urban population. This figure is less than the 15% estimated in the WHO report of May 1980 (29). Differentiation of LBW into preterm and SGA showed 40% as SGA, 40% preterm, 5.4% preterm/SGA, and 14.6% as LBW Term AGA.

Table VII. Incidence of low birth weight (LBW) and proportion of term intra-uterine growth retardation (IUGR) (in %). (after Villar and Belizan (1982) (3).

DEVELOPING COUNTRIES	LBW	IUGR
Cuba	10.1	38
Kenya	13.6	34
Colombo	21.8	76
Johannesburg	19.5	73
India (10 states)	30.5	77

Preliminary analysis of the questionnaire has revealed no significant associations between the various factors studied and low birth weight. However the relationship between the prevalence of an influence of low birth weight requires more sophisticated statistical analysis (Rogan and Gladen 1978). It was felt that our questionnaire was not a very objective way of evaluating diet and activity. When the study is extended to the rural phase it is planned to follow up a sub sample of cases and controls with dietary survey and actual observation of physical activity.

Conclusion

The data in our study have not been fully analysed. We are presenting it here as we believe there are methodological problems that need discussion when attempting to study a problem with such a multitude of variables and interrelated aetiologies.

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PERINATAL MORTALITY BY BIRTHWEIGHT AND GESTATION: A ZIMBABWEAN STUDY

by
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Abstract

The Harare population birthweight for gestation standards were constructed using data from 5,872 singleton livebirths. A further 18,091 births were analysed to determine the relationship, if any, between birthweight for gestation centiles and risk of perinatal mortality. The results showed an overall perinatal mortality of 41.1/1000. The least perinatal mortality occurred at a gestation of 39 weeks at a birthweight of 3,500 - 3,750 gms. The least perinatal mortality occurred when the birthweight was between the 50th and 95th centiles at any given gestation. When the perinatal mortality for each week of gestation and birthweight cell of 250g size was calculated, this showed a pattern which could be represented graphically in zones of perinatal risk. Such zones form the basis for a simple method of determining perinatal mortality risk using both birthweight and gestation.

Introduction

In 1970, the World Health Organisation (WHO) identified the relationship of birthweight to known gestational age as one of the factors that would reduce perinatal mortality and morbidity, especially in developing countries(1). It also advised that birthweight-specific and gestation-specific perinatal mortality rates be determined to assist clinical decision making. Ten years later, this information was still unavailable in many countries as indicated by WHO report in 1980:... "data on birthweights are lacking especially from developing countries where the incidence of low-birthweight is highest"(2).

Establishing birthweight for gestation standards does not necessarily lead to a greater understanding of the relationship between birthweight, gestation, and risk of perinatal mortality. Use of percentiles of birthweight for gestation to classify risk of perinatal death has been shown to be inefficient and misleading (3,4).

Similarly, use of the concept of low birthweight has its problems. The WHO defines low birthweight as a birthweight of less than 2,500 gms. This is used throughout the world to indicate a "high risk" neonate(5). However, some populations have acceptable perinatal weights below 2500 gms.

Variations in mean birthweights and perinatal mortality risk between populations indicate the need for each region to derive its own risk criteria. This information was unavailable in Zimbabwe and we thus undertook the study. We wanted to determine the perinatal mortality risk by birthweight and gestation, and then devise a method by which health workers can use the information.

Materials and Methods

Birthweight for Gestation Standard. In Harare we used a nomogram derived from 5872 singleton pregnancies which is described elsewhere.

Perinatal Mortality by Birthweight and Gestation. We recruited into the study patients from the Greater Harare Obstetric Unit comprised of Harare Maternity Hospital and 9 peripheral clinics. We excluded referrals from outside Greater Harare.

We analysed retrospectively case records of all patients delivering in the Greater Harare Obstetric Unit between 1/1/1986 and 31/8/1986. All women delivering at 22 weeks or more, or delivering an infant or stillbirth more than 500 gms were eligible for the study.

Gestation was calculated in completed weeks from the first day of the last menstrual period. When menstrual dates were unavailable we used the gestation determined by palpation or by neurological examination using the Dubowitz score (8).

The definition of perinatal mortality used was that provided by the WHO (1977) (9). The data was analysed on an ICL, Computer VME 2900 using the Statistical Packages for Social Sciences. We analysed the birthweights of infants and stillbirths by grouping them into cells of 250 gm size.

Results

Overall Perinatal Mortality. During the study period there were 925 perinatal deaths out of 22,514 deliveries, resulting in a perinatal mortality of 41.1/1000. Table I gives a breakdown of the results. Of the excluded cases, mainly due to lack of menstrual data, 4 were perinatal deaths. The record-keeping for perinatal deaths is more efficient than that for good outcome pregnancies. The perinatal mortality rates quoted in this paper will therefore be higher than the "true" figures.

Table I Results

Total No. of Deliveries	22,514
Cases entered into study	18,091
Cases not entered	4,423
Male/Female ratio	101/100
Perinatal Deaths: Still births	553
Neonatal Deaths	372
Perinatal Mortality	41.2/1000
Perinatal Mortality Greater Harare (1986)	39.8/1000

Perinatal Mortality by Birthweight. Table II shows the change of perinatal mortality by birthweight. The least perinatal and neonatal mortality is between 3501 and 3750 gms. This birthweight is higher than the mean birthweight at term.

Perinatal Mortality by Gestation. Perinatal mortality decreased with increasing gestation. The least perinatal mortality was at 39 weeks (Table III).

Perinatal Mortality by Birthweight and Gestation. Fig. 1 shows the perinatal mortality rate in each cell of 1 week by 250 gm.

When the gestation is kept constant, the perinatal mortality drops with increasing weight, but tends to rise again after the nadir. The same tendency is noted when the change in perinatal mortality with gestation is determined, while the birthweight is kept constant. The variation in perinatal mortality by gestation (946 to 8) was similar to that by birthweight (983 to 10).

Analysis of the perinatal mortality rates in conjunction with the birthweight centiles shows that the least perinatal mortality in each week of gestation occurs when the birthweight is between the 50th and 95th centiles. This occurs in all the weeks of gestation that have a sufficient number of cells to analyse. In absolute terms, the least perinatal mortality of the total population is at 39 weeks at a birthweight of 350 - 3750 gms.

Cells with a roughly equal perinatal mortality were joined if the perinatal mortality risk corresponded to 1, 5, or 10 times the average risk (taken as 40/1000). The result is shown in Fig. 2. The complete curve includes perinates who are average or low risk. Further from this, the curves describe increasing perinatal risk.

TABLE II

PERINATAL MORTALITY BY BIRTHWEIGHT

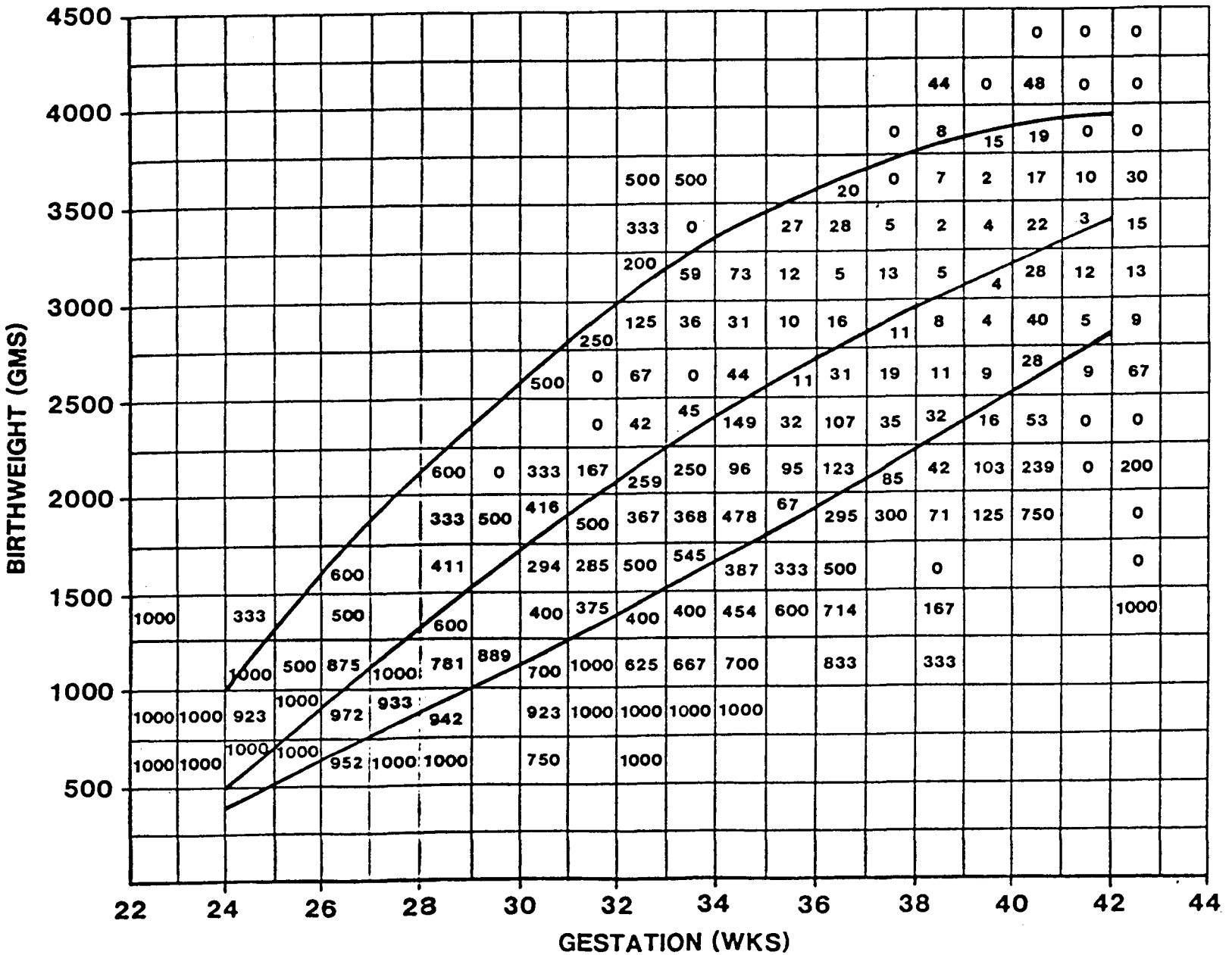
BIRTHWEIGHT	501-750	751-1000	1001-1250	1251-1500	1501-1750	1751-2000	2001-2250	2251-2500	2501-2750	2751-3000	3501-3750	3751-4000
NEONATAL-MORTALITY RATE/1000 LIVEBIRTHS	971	913	614	258	241	156	37	13	4.5	4.5	1.5	4.5
PERINATAL MORTALITY RATE/1000 BIRTHS	983	952	742	475	395	321	127	57	19	16	10	14

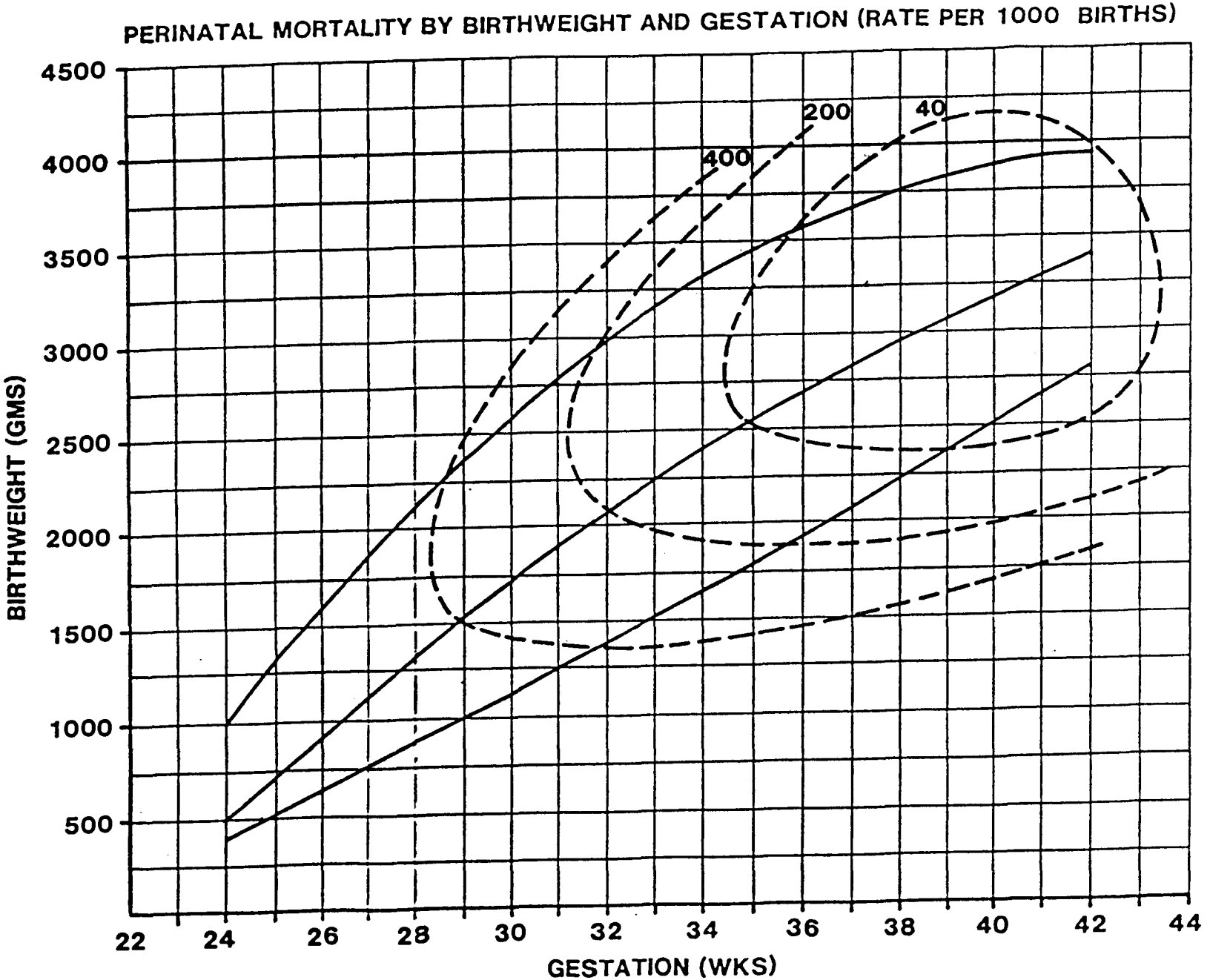
TABLE III

PERINATAL MORTALITY BY GESTATION (RATE / 1000 BIRTHS)

GESTATION	22 - 23	24 - 25	26 - 27	28 - 29	30 - 31	32 - 33	34 - 35	36 - 37	38 - 39	40 - 41	42
PERINATAL MORTALITY	946	905	903	708	454	299	98	38	8	22	21

PERINATAL MORTALITY BY BIRTHWEIGHT AND GESTATION (RATE PER 1000 BIRTHS)




PERINATAL MORTALITY BY BIRTHWEIGHT AND GESTATION (RATE PER 1000 BIRTHS)
BIRTHWEIGHT (GMS)
4500
4000
3500
3000
2500
2000
1500
1000
500
200
40
400
22
24
26
28
30
32
34
36
38
40
42
44
GESTATION (WKS)

Discussion

In our region, the risk of perinatal mortality has been assessed by birthweight alone using the WHO demarcation of 2500 gms to divide perinates into two broad groups. The major advantage of this method is the simplicity. However in many Third World countries this resulted in the influx of small but healthy infants to special care neonatal units causing overcrowding. Maternity staff tended to ignore gestation, which is as important as birthweight.

A simplified system of attaching risk to a pregnancy would be one incorporating only the 40/1000 curves of perinatal mortality in Fig. 2. The closed curve would represent average or low risk. "High risk" would designate those cases falling between 40 and 200/1000 in perinatal mortality and "very high risk" beyond 200/1000. This scheme has the theoretical advantage that it is based on actual perinatal deaths in the population, rather than on foetal growth curves.

An interesting finding related to the "Optimum" birthweight which has been described as that at which the perinatal mortality is least (10). In agreement with other studies (3,10), this was found to be higher than the mean birthweight. In addition, the study has shown that at each week of gestation, the lowest perinatal mortality is found between the 50th and the 95th centiles.

The curves described in this study of the relationship between birthweight and gestation perinatal mortality risk have been published in other populations before(3,4). However, these are not in wide clinical use, perhaps due to the difficulty of determining gestation accurately in many cases. The next step is to use the model to test its efficacy and accuracy in predicting the risk of perinatal death. We hope that during this process its shortcomings if any will be discovered.

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MALNUTRITION AND INFANT MORTALITY AMONG THE SAMIA OF BUSIA DISTRICT, WESTERN KENYA: METHODOLOGICAL AND CONCEPTUAL ISSUES

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Introduction

In Kenya there are demarcated areas of nutrient deficiency. Most of these areas are mainly rural and inhabited by 10 million small holders whose income is about K.shs. 50.00 per annum. Western Kenya where Busia District is situated, claims 32% of this population (Busia District Development Plan 1979-83). It is recorded that malnutrition, especially marasmus and kwashiorkor is rampant among children and partly accounts for their high mortality rate in the district. Of every 1000 children born, 167 die before their first birthday. This is higher than the national average rate of 101 per 1,000. This occurs despite the fact that Busia District is classified as a region of high agricultural potential. It has fertile land, enjoys climatic conditions suitable for agriculture and should therefore be able to meet its nutritional needs. Thus the problem of population pressure on resources, as a central consideration in the ecology of malnutrition (Robson 1972), does not seem to hold for Busia District. This study tries to identify the factors influencing the incidence of malnutrition among the Samia.

Methodology

The material used in this research was collected over a period of one year with breaks in between that were spent at the Nairobi University Library and National Archives gathering secondary information. Informal interviews were held at the District headquarters, Busia, with community development officers, district planning officers, and the nutritionist at the District hospital.

Government officials gave their ideas on development and their conception of the local people's attitudes to such development versus the people's own ideas. This fitted well in the emic-etic approaches to the problems at hand. Chiefs and women's groups formed the major sources of information. An earlier project[1] based in Busia District identified Samia

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[1] District Sociocultural profiles project, Busia District 1985. (The Research was conducted in 1980-81).

location as affected by malnutrition. This observation was further supported by information gathered from the District Nutritionist and also from the National Development Plan (1979-1983).

Luchululo-Bukhulungu sub-location was selected because of the prevalence of malnutrition in the area. This had led to the establishment of a Nutrition Rehabilitation Centre for the area. The researcher obtained detailed information on malnutrition and actual cases for discussion and follow-up from the Centre.

Information on the demographic, social, and economic factors of the population with malnutrition was considered of primary importance. A field survey and identification of all the households in the sub-location was done to determine the sample size. Luchululo-Bukhulungu sub-location had 888 households and a sample size of 171 households was randomly selected, i.e. of every three households one was selected for interview.

Data was collected using various methods. Questions related to what people ate sounded fairly obvious and most respondents wondered why I raised such questions at all. I explained to them that what they ate, how it was prepared, stored, and processed was of interest and where appropriate would be adopted and promoted.

The question of bias in the answers solicited could not be ruled out. Some people anticipating food relief exaggerated their food problems. Frequent visits and observation of the household and their activities however, gave a true picture of the general condition of the homestead vis-a-vis socio-economic status and food consumption. Restricted investigation would have been misleading.

Use of the "24-hour Recall" method was useful only to a limited extent. The mothers were able to recall the food previously consumed but were not able to provide the measures of actual quantities. This was partly due to limited resources at my disposal. Moreover in this community, as in many other non-western societies, food measures are arbitrary, depending more on the food available than the people to be fed. The actual amount of food consumed per meal differed according to availability. When scarce a women cooks whatever quantity is available and that has to suffice. The woman's primary concern is satiety of the family members and she will use the resources available to achieve this end. This research intended therefore to record the various foods consumed and thereby detect some balance and variation which could in turn determine fluctuations and stability in a given period. This formed the basis for the assessment of food use strategies at various points in time in a household. Forces of significant influence on the dietary pattern were clearly brought out as the mother always related their food quest to the problems affecting the household. The

incidence of malnutrition in the study area has already been established, as this research set out to do. Possible solutions were also reached. Types of food and their availability were considered cardinal to the investigation of the incidence of malnutrition.

Data was collected on the various sources of food, whether purchased or home produced. The balance between the two depended on the season. The period immediately after harvest shows a dependence on family produced food, particularly on the staple as is evident through full or half-full granaries. This is also the period of sales which at first gave the impression of a surplus. This was disproved when a few months later during the hunger season-esimocho-in March-April-May, people started to buy the grain at a higher price.

For qualitative data life histories of selected key informants were taken. Through them it was possible to obtain retrospective information that formed an important base for this research. However problems were faced especially with regard to memory lapse. This was, however, overcome by counter checking the information with other informants. This helped to solicit data on the indigenous belief system, food concepts, the traditional economy, the introduction of cash crops, etc. By virtue of their age, the informants gave an account of events pointing out the significant changes that took place in the community.

A structured questionnaire was administered to 171 households and involved questions on structure and composition of household, household facilities, land size, health, particularly of children and mothers, income and education. The research focussed on the economy of the household as described by Dewalt and Pelto (1976). A follow up on 50 households randomly selected from the original 171 households was carried out between January and March 1982. Although details on the households had been solicited through the questionnaire, the follow up ensured investigation on a smaller number of households. Questions with regard to food production, consumption, income, etc., were asked again. This was used to countercheck the answers solicited by the use of the household questionnaire. Details of constraints impinging on the household were gathered in this smaller sample.

Nangina Rehabilitation Centre was used as a base to identify actual malnutrition cases. The mothers, many of whom were malnourished, were also interviewed on their social backgrounds and marital status. Problems relating to general poverty featured prominently. The mothers stayed at the Centre for three weeks. There was therefore ample time to evaluate their cognitive response. It was also possible to establish the mothers' view of western management of malnutrition. It should be noted that the mothers did not bring the children to the

clinic for treatment of malnutrition. It was usually for other diseases such as diarrhoea, vomiting, and malaria, which act synergistically with malnutrition.

The mothers were, therefore, usually sceptical about the treatment of the disease whose causation and treatment were only viewed in social-cultural terms. This will be discussed further in the section on results.

The Relevance of Research Approach

Malnutrition and the beliefs and practices relating to its management are inextricably connected to the cultural, socio-economic and ecological environment. This interrelationship has led some researchers to conclude that the cognitive world of traditional societies tends to be less compartmentalized that the western world (Morley in Morley and Wallis 1978). To comprehend the incidence and management of malnutrition therefore requires unravelling this intricate interconnection.

The holistic approach coupled with the explanatory quality of anthropological research helps this purpose. More crucial in the anthropological approach is the constant awareness of the cultural context as a point of reference for everything that comes under its scrutiny (Lindenbaum in Fitzgerald 1976). The method of participant observation combined with the anthropologists' primary concern with people's ideas generates an awareness of the attitudes and knowledge of the local community. The anthropologist is particularly interested in how these ideas relate to observed behaviour and vice versa.

The approach in this research used participant observation and incorporated quantification, as an adjunct where deemed necessary. The two were combined, quantification being essentially an aid to description. Quantification is useful as it achieves condensation of facts so that the regularities and patterns in them are more easily discernable (Mitchell in Epstein 1967). This approach was found to be useful when analysing the data on socio-economic status of households.

From the onset, I was aware that Samia is encapsulated in a wider community setting. This research attempted to relate Samia conception of malnutrition and its management to their culture, economy, national policies, and programmes.

It has been common in anthropological research, particularly in the structural-functional approach to emphasize normative behaviour with regard to diet (Pelto and Jerome 1978). In this research however it was imperative to pay close attention to variations from the norm. This became necessary because malnutrition only affects some households in any given cultural ecological environment. In accounting for this variation,

intra-and inter-societal variables were identified as influential in the incidence and management of malnutrition. This was possible as a sample of households was extracted for a detailed case study on various household variables to determine what is best described (by Dewalt and Pelto in Fitzgerald 1976) as the household ecology.

Anthropologists are becoming increasingly aware of the contradictions between the stated ideas and observable realities. They are now concerned with situational analysis. One advantage of this is that the observed discrepancies can be seen as normal rational behaviour rather than conflicting (Van Velsen in Epstein 1967). In Samia, although people's ideas tended to be uniform, there was variation in practice. For example, although people are guided by the same principles about food qualities this did not influence or was not reflected in the consumption of the foods in some households. Through participant observation it was possible to discern the process of option in food consumption and malnutrition management which were related to socio-economic contexts rather than adherence to ideal norms stated by the people.

Findings

The results included the Samia notion of malnutrition, the cultural mechanisms that restricted its incidence and their bio-medical relevance. The results also show the impact of social change and the response to the introduction of Western forms of treatment and management.

Samia definition and conception of causes of malnutrition

Malnutrition seems to have existed among the Samia for a considerable time. To explain the incidence of malnutrition, it is imperative to analyse the people's understanding of the condition in terms of causation and treatment. Malnutrition is a condition greatly influenced by cultural beliefs and is subsumed by Samia along with a series of other conditions. For these reasons the cultural perception of the condition cannot be directly equated with the biomedical perception. Marasmus is perceived as an element of a number of other social disharmonies engrained in the notion of ekhira; a pervasive and mystical affliction often related to sexual transgression. The child is considered the victim of the wrath brought upon the offenders. In another instance, if a mother becomes pregnant and continues to breastfeed, the foetus, through jealousy or envy, would pass ekhira to the nursing child through the breast milk. However, the operation of ekhira in the child is not limited to the parents of the child. There are instances in which sexual relations of those who are not parents of the child may still precipitate marasmus (ekhira) in the child. Thus the concern is

not simply with an automatic one-way transmission of ekhira as a result of adultery on the part of the parents, but much more with an area of life which embodies danger for individuals in various social relationships.

Kwashiorkor is recognised as a distinct physical condition and is described by its symptoms, i.e. a swollen stomach and cheeks as "ripe as a pawpaw". Samia refer to it as embowo and go on to ascribe the condition to the "evil eye", ebikhokho/obusura (foreign objects) or eloko (witchcraft). The objects (ebikhokho/obusura) are sometimes believed to have been transmitted into the child's body via the mother's breast while suckling. Breastfeeding children are therefore particularly vulnerable as it is believed that they literally "suckle" in these objects. However, ebikhokho/obusura can also affect older children.

It is important to note that in both cases there is no connection between diet and malnutrition at the cultural level. At most there is a negative link in the case of kwashiorkor where fruits are withheld from the child.

Mechanisms that restricted the incidence of malnutrition

It is true that sometimes there is a discrepancy between the cultural practices and western principles with regard to dietary practices in relation to health. While it is important to recognize this dichotomy in knowledge and practice, one must not loose sight of the existence of some cultural practices that can be rationalised in biomedical terms. Apart from the direct use of traditional medicine for preventive and curative purposes, there are traditional practices which inadvertently reduced the incidence of malnutrition. It is pertinent to go a step further and identify some of these cultural practices that are of sound nutritional value and which are indicative of some cultural and biomedical knowledge. The central of these is breastfeeding. Breast milk is, from the onset, identified as the most ideal food for an infant. A mother was therefore expected to breastfeed for a period of approximately two and a half years before conception. Moral and social consideration brought to bear the enforcement of this societal expectation. A mother who bore children too closely could easily be ostracized by fellow women. Samia believe that if a child is conceived before its preceding sibling has reached the age of weaning the latter is likely to be afflicted by ekhira and will probably die. Infant deaths are closely associated with the violation of postpartum sexual prohibitions resulting in stopping breastfeeding. This in turn causes failure of the child to thrive; a manifestation of the impact of ekhira. The biomedical explanation of the risk of child mortality associated with short birth intervals are in terms of lessened intensity of maternal care and premature weaning (Gray in MacGormack 1982). Although the cultural and scientific explanations start on different premises, the ideas

underlying the health of the child are basically similar. For Samia, a mother who conceives prematurely is "neglectful" of her nursing child as she has to cut down on her maternal care.

Such a mother brings ekhira to her child and may be held responsible for literally killing her child. The high mortality rate of Busia District, is the cause for such a cultural belief based on an observation of mortality patterns. It is also a belief that coincides with the medically recognized complex relationship between breastfeeding, birth spacing, and the survival of children. The problem arises when the rules are "broken" as the Samia see it. It is at this level that the discrepancy between the cultural and biomedical explanations becomes evident. Violation of the rules results in ekhira whose management can only be sought in the cultural matrix even though ekhira in the Samia sense and marasmus in the biomedical sense manifest the same health condition. The discrepancy goes back to the way malnutrition is perceived by the Samia as the following figure shows.

Figure 1: The Biomedical and Cultural Conception of Malnutrition

Definition	Sociocultural	Western/Medical	Congruence+/ Divergence-
Empirical Category	Ekhira Embowo	Marasmus*1 Kwashiorkor PCM	
Causation	Personalistic	Naturalistic	-
Management:			
Preventive	Child spacing and prolonged lactation for ekhira. Prophylactic*2 measures in embowo.	Balanced diet child spacing and prolonged lactation	+ -
Curative	Relational Mystic cure directed to causation.	Attention to appropriate diet.	-

*1The symptoms which Samia associated with the conditions of ekhira i.e. body with the western biomedical diagnosis of the diseases.
*2The prophylactic measures in embowo are ineffective in the prevention of the condition.

The figure shows that although there is divergence at the definitive level of the problem of malnutrition there is nevertheless partial congruence at the management level. This is in relation to the preventive measures that are undertaken by Samia. Divergence again occurs at the critical level of curative with regard to steps taken by Samia once a child shows signs of malnutrition, perceived as ekhira or embowo. The treatment and management advocated has no bearing to the medically recommended form.

In both marasmus, viewed as ekhira and embowo, no connection is made between food and their incidence, and consequently food is not considered as a remedy for such disorders. The curative measures which Samia undertake are based on their cultural recognition and diagnosis of the condition. This is in line with Glick's argument that: treatments are responses to illness reflecting ideas expressed in diagnostic statements about illness (in Landy 1977,62).

Among Samia, treatment of malnutrition involves virtual cleansing by the use of herbs to put right social and moral relations. In marasmus, i.e. ekhira, local herbs (amanyasi kaekhira) are used for treatment. For preventive purposes, the roots of these medicines are boiled and the concoction drunk by the parents of the newborn child. A few drops of the concoction are put in the family's drinking water pots and also in food as it cooks. The newborn is also given a few drops to drink. All these cautionary measures are undertaken to protect the newborn baby from the potential danger of ekhira that may be caused by the sexual activities of any of those family members who are in varying degrees socially related to the child.

Once a child is afflicted by kwashiorkor (embowo), i.e. shows signs of oedema, a medicine-man, omulumikhi whose speciality is the removal of foreign objects from the body is approached. The process by which he removes the objects is okhulumika, using a horn to suck the objects out. Other measures include the withdrawal of pawpaws from the child's diet as the condition is likened to a ripe pawpaw and would be aggravated if the child continued eating these fruits. Besides these curative measures, preventive medicines from plants are used and these include etiang'itiangi, tulatula and omulandira. The roots of these plants are boiled in water and the concoction is given to young children to drink. An amulet, eirisi, is worn around the child's neck as a prophylactic measure against the malignant gaze of the "evil eye".

Socio-economic and environmental factors in the incidence of Malnutrition

In present day Samia, socio-cultural factors in the incidence of malnutrition interact with socio-economic factors. The latter are even more crucial than the former. Through

informal discussions with mothers it was evident that even though the cultural beliefs were strong they were open to adjustments. Most of them had ideas of good nutrition, based on the knowledge they had acquired from health and nutrition education campaigns. However most of them were unable to apply this knowledge due to poor socio-economic conditions.

A questionnaire on income showed that income is fairly low, i.e. 95% of the sample households had an income of below K.shs. 2,000.00. The form of agricultural production also contributed to malnutrition in the community. Cash crop farming in which almost all households participated had a particularly negative impact on the food provisioning of the household. The high labour demands of cotton production meant that the traditional food diversity was lost. The low and irregular renumeration from cotton does not make up for the cost of traditional food diversity. People have then reverted to cassava as the staple which has fewer labour demands but which is low in nutritional value. This is aggravated by the fact that with the advent of social change rules affecting child spacing are no longer strictly adhered to.

Environmental factors also play a major role in the morbidity patterns among the Samia. In the study area it was found that clean and safe water is a major problem. People have to collect water from unprotected ponds and streams. This is compounded by the fact that there is very little use of latrines based on the traditional belief that witches are capable of using human faeces to harm individuals and possibly a whole family. Human waste is therefore disposed of in the bush so as to minimize the risk of being bewitched. This is detrimental to the community particularly during the rainy season when cholera cases are high and children are the most vulnerable group.

Conclusion

The study investigated the socio-economic and cultural factors in the incidence of malnutrition among the Samia. The findings showed that the cultural perception of malnutrition plays an important role in the management of the condition once it occurs. It was also evident that through education some people were beginning to relate the quality of diet to avoid or manage malnutrition. The anthropological or socio-cultural approach was successfully used in eliciting the cultural information on malnutrition. The ecological or holistic approach complemented the explanations which the anthropological approach alone could not solicit. It became increasingly evident that even though the cultural element still exists its impact is accentuated by environmental and socio-economic factors. These are low income, low production of nutritious foods which are outweighed by cash crops, water shortage and poor sanitary conditions.

This implies that to alleviate people's health problems one needs to study the cultural background in terms of perception. This would provide a guide to areas of intervention. Health education has been a major intervention tool to improve health. However, according to the Samia data, it seems that health education alone cannot improve the health condition of the community. There is a need to provide the community with the means to apply the knowledge.

This requires other intervention programmes to go hand in hand with health education; for instance, provision of water, improvements in agricultural production in terms of diversification as well as proper renumeration for the major crops. It is plausible to argue that with improved socio-economic status people are likely to maintain good health particularly for the children.

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MATERNAL AND CHILD MORTALITY AND MORBIDITY IN ILULA VILLAGE, TANZANIA

by
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Summary

This paper presents preliminary results of the first prospective study of community based maternal and infant mortality and morbidity in rural Tanzania. About 700 pregnant women were followed up throughout pregnancy to delivery. Three hundred of them were studied further in relation to their health and nutrition and their infants were followed up to one year. The maternal mortality rate was found to be 5.7/1000 (95% confidence limits of 2.2. to 14.5/1000) the perinatal mortality (PNM) was 7.2% (95% confidence limits of 5.6 to 9.6%) while the Infant Mortality Rate (IMR) was 87/1000 (95% confidence limits of 60/1000 to 124/1000). Factors associated with maternal morbidity were found to be poor protein energy status and anaemia while mortality was associated with known risk groups, primipara and grand multipara, connected with post partum bleeding and ceasearian section. Child mortality and morbidity was associated with malaria, diarrhoea, measles, and poor nutrition.

Introduction

During the last half of the twentieth century, remarkable progress has been made to increase the quality of life of people by controlling mortality and morbidity. Even in the least developed countries where good quality data is difficult to get, life expectancy has been steadily increasing albeit at a slower rate than in the developed countries. For example, the life expectancy in Tanzania has increased from about 35 years at Independence (1961) to an estimated 55 years in 1986. Likewise, the quality of life as measured by the physical quality of life index (PQLI) has risen from 12 in 1961 to an estimated 69 in 1986. The PQLI is a measure of relative development status introduced by the Overseas Development Council of the United States of America (1). To calculate the PQLI, infant mortality, life expectancy at age one year, and adult literacy rate are combined in a formula* to produce a single index score. The

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*PQLI = 0.6484 x LE - 0.0977 x IMR + 0.5278 x ALR where LE is life Expectancy, IMR is Infant Mortality Rate, and ALR is Adult Literacy Rate.

100, which is achieved when infant mortality is 7/1000 live births, life expectancy is 77 years and adult literacy is 100%. Life expectancy at age one rather than at birth is used so as not to give double emphasis to infant mortality. At a PQLI of 97, Norway, Sweden, and Iceland have the highest PQLI scores world wide. The score of 100 is taken arbitrarily as ideal but also in the context that the countries with the highest PQLI in the world as mentioned above, still have a PQLI of under 100. The use of the PQLI is useful in comparing the well being of countries.

In terms of social indicators, the compound indicators of infant mortality rate and life expectancy at birth are widely accepted as reflections of overall well-being and level of development. Adult literacy is meant to reflect level of development and self - sufficiency. The Disparity Reduction Rates (DRP) are the rates at which development indices used in the PQLI are progressing towards the ideal.

The use of PQLI scores in measuring well-being has its limits. None of the factors used in the PQLI for example are direct problem area indicators, except for adult literacy. Therefore, planning of strategy based on PQLI results on a local level is difficult. Moreover, apart from being considered a high figure, there is no medical reason to indicate why a life expectancy of 77 years should be considered ideal. Lastly, the quality of data used to calculate the compound indicators in developing countries is poor and this limits the usefulness of the PQLI.

This paper presents preliminary results of a prospective study in one rural area in Tanzania which examines the factors that determine maternal and childhood mortality and morbidity. The study had the objectives of creating a basic knowledge of factors influencing pregnancy outcome and subsequent infant and child growth in a defined rural area, and the initiation of intervention measures for problems identified within the context of the primary health care system available. Pregnant women and children were studied because they are universally acknowledged as the greatest risk groups in mortality and morbidity.

Materials and Methods

Study Area

Ilula is a ward in Iringa district, Iringa region. It lies about 450 km southwest of Dar es Salaam and 45 km northeast of Iringa town.

The study area covers Ilula and Mwaya villages with a population of 5657 (1978 census). These villages are surrounded by mountain ranges and traversed by the all weather tarmac

Tanzania-Zambia highway. There are daily bus services to Iringa. There is no electricity or telephone services in the villages. The main ethnic groups are the Wahehe and Wa-bena. Others include the Wa-Kinga, Wanji, and Wa-Safwa.

The predominant religions are Christian and Muslim. Maize is the staple food and is grown together with beans, potatoes, and vegetables. These crops are also cash earners. The major cash crops, however, are tomatoes and onions produced on the hillsides mainly for the Dar es Salaam market. The majority of people are subsistence peasants with a few civil servants, craftsmen, businessmen, and livestock herders.

There are two mission dispensaries, one Folk Development Centre (FDC) and two primary schools.

Study Design

The study was prospective in design but with periods of cross-sectional data collection. It was divided into three main parts.

Part I: Obstetric Study

The first part, mainly an obstetric study (2), started in June 1983 and concluded in May 1986. This part concentrated on the factors influencing maternal health and the health delivery system. The main questionnaire was based on that designed by the WHO task force on the study of hypertensive disorders of pregnancy. Within 48 hours after delivery any woman residing in the area was interviewed and measured according to the modified WHO protocol.

Further information from the antenatal cards and relevant hospital records were added. The interviews were carried out by an experienced dispensary midwife. This part covered 703 obstetric events.

Part II: Maternal and Child Health and Nutrition Study

The second part of the study started in May 1984 and covered 300 pregnant women recruited as early in pregnancy as possible. This study was preceded by a baseline health and nutrition survey in February 1984, using TFNC survey procedure (3). This part of the study was an expansion of the first part and included the nutritional status of the mothers as well as follow up of the children up to one year of age.

It was aimed at collecting information on the risk factors influencing maternal, neonatal, perinatal, and infant mortality and morbidity and how they relate to various environmental socio-economic and cultural factors. Mothers were recruited into

the second part of the study as soon as pregnancy was certain. In cases of doubt a pregnancy test was done. After recruitment, a basic information questionnaire including biological and socio-economic data was filled in by a field nutritionist recruited for the study. Factors elicited included income, wealth, obstetric history, household work patterns, and at the same time, haemoglobin, and malaria were investigated. Routine urinalysis was also done. Venous blood specimen was collected for analysis for serum disease indicators and nutrient levels including trace elements. MCH services were also offered at the same time which included weight, height, fundal height, foetal health, presentation blood pressure recordings, and urine for albumin. All this information was filled in special questionnaires designed for the study.

Follow-up for individual mothers was done once during weeks 12-16, weeks 22-24, and weeks 32-36. During these follow-ups, the mothers were examined by the midwife for fundal height, weight, urine for albumin, and haemoglobin. Information on maternal and paternal practices in respect to reproductive behaviour was also elicited.

A routine obstetric clinical examination of a group of 30 mothers was done by a specialist obstetrician on every Saturday - this was called the Saturday Examination. The mothers were also interviewed for the 24 hours dietary recall and the workload for the previous 24 hours.

Most mothers were expected to deliver at the dispensary. During delivery, type, length of gestation, birth weight, height, and head circumferences of the baby were recorded, cord blood serum was collected from all cases and was stored for analysis. Home deliveries were recorded and the mothers were followed up within 24 hours. All complicated cases were referred to Iringa Regional Hospital.

From 2-6 weeks of delivery, a home visit was made by the midwife to examine both the mother and the child. Thereafter the child was followed-up at the age of 3, 6, 9 and 12 months respectively. During the follow-up the child's weight and height were taken and recorded. A questionnaire on feeding habits and 24 hours dietary recall was recorded. Capilary blood samples for analysis were also collected.

Part III: The Maternal Indepth Study

Out of the 300 mothers 50 were selected in a subsample for more detailed investigations. These investigations included family food supplies, dietary intake, workload, and nutritional status of the mother.

(a) Food Supply: During each trimester the household stocks in the house were weighed and recorded for three consecutive days. Also new purchases of food items were recorded.

(b) Dietary Intake: A field nutritionist with two field assistants trained on how to conduct dietary intake, spent three consecutive days during each trimester in recording the total amount of food prepared and the actual amount of food consumed by the mother. The energy and nutrient content were calculated from food tables. Those foods which were not included in the tables were analysed for their nutrient content at the TFNC laboratory.

(c) Work Load: At the same time the field assistants recorded all the activities of the mother from the time she wakes up in the morning until the evening when she goes to sleep. The energy expenditure was calculated both in qualitative and quantitative terms by using the Durnin-Passmore tables.

(d) Nutritional status of the mother: The energy status of the mother was assessed by using pre-pregnancy weight in relation to height and pregnancy weight gain, serum levels of prealbumin, transferring, and retinol-binding protein was used in assessing the protein energy status.

Results

All the data collected from this study have been analysed at TFNC and at the Paediatric Department, Uppsala University, Sweden. Much of the data are still being analysed. Only those preliminary results directly relating to mortality and morbidity will now be presented.

Maternal Morbidity and Mortality

At baseline, only morbidity data was collected from the mothers. The common clinical problems found on examination were anaemia (22.5% and iodine deficiency manifesting as goitre (50.1%). As many as 29.5% of 429 women had an undesirable Body Mass Index (BMI) of less than 20 indicating poor nutritional status. The BMI is an index which measures the protein-energy status (nutritional status of adults) and is measured on the basis of a weight-height index by dividing the weight in kilograms by the square of the height in metres (W/h2). The W/h2 index also called the Quetalet index is used in place of "ideal" weight because the value of the index is the same for people of normal weight regardless of how tall they are.

This is based on the observation that the weight/height index varies with the power of the height as shown in figure I. The W/h2 seems to standardise the index so that people of different heights can be compared directly. As a numerical index BMI does not relate to any reference. The interpretation of the value of the BMI is based on the relationship between the BMI and

FIGURE 1 WEIGHT VARYING WITH POWER OF HEIGHT

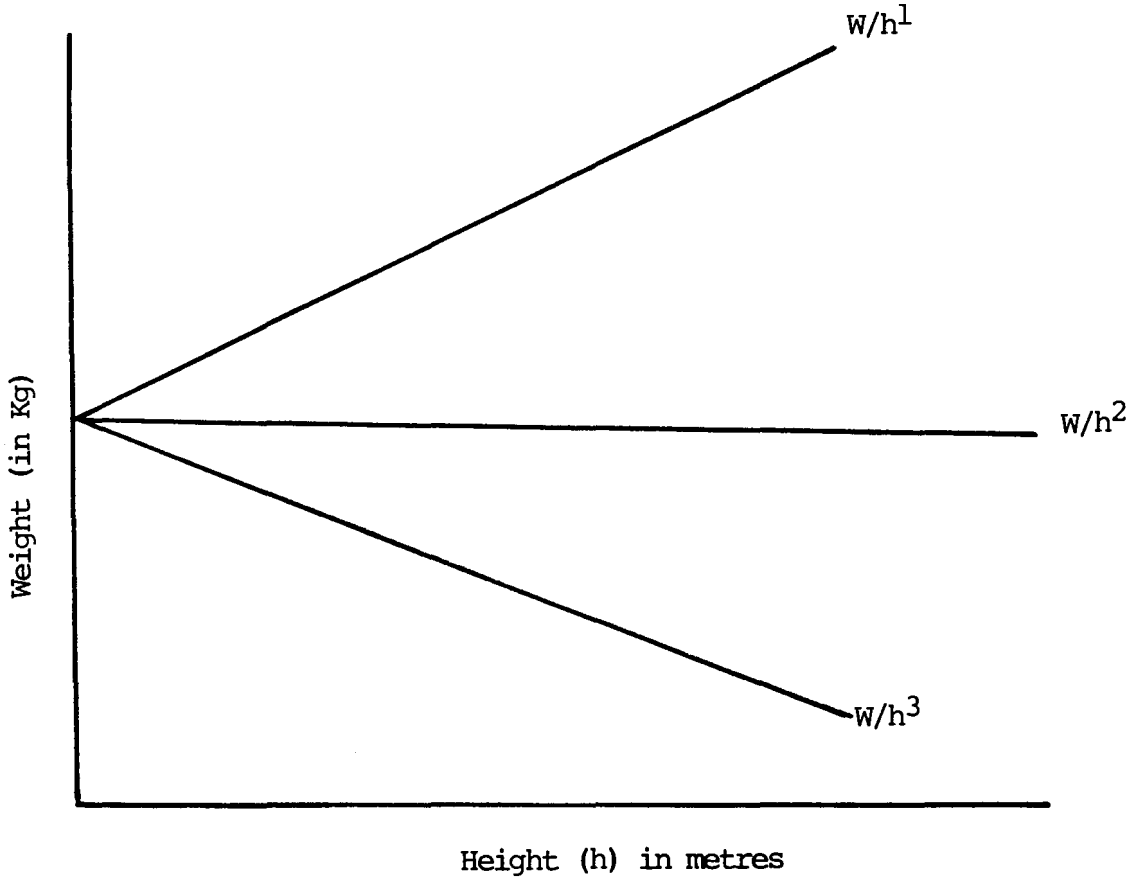
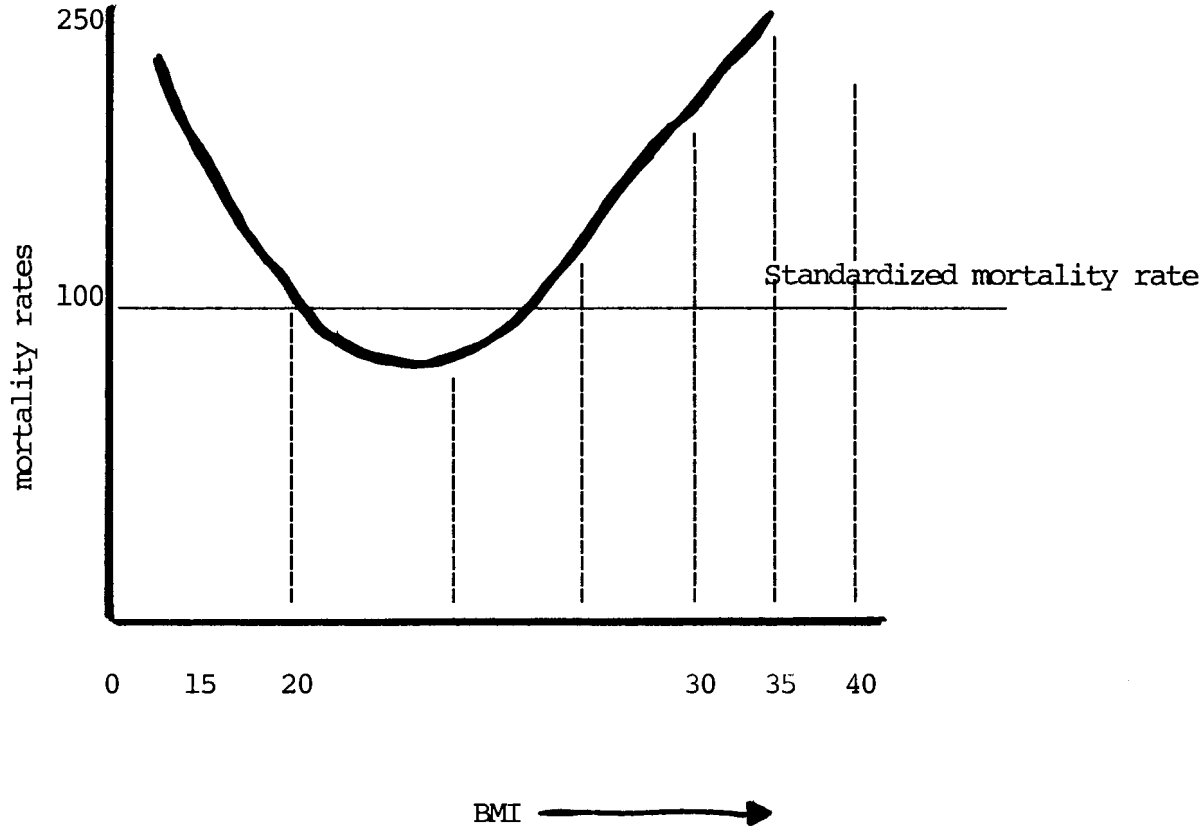


FIGURE 2 RELATIONSHIP BETWEEN BODY MASS INDEX AND MORTALITY



mortality as shown in figure 2 and table 4(4,5). For a well nourished population, the BMI should be between 20-26 kg/m2 and any lower or higher BMI is associated with a higher than normal risk of mortality. Although it has seldom been done it would be possible to compare the thinness or fatness of different populations by comparing the distribution of BMI. The representative average value of BMI in industrialised countries is 25 + 2.5 kg/m2.

The obstetric part recorded 703 events of which 12 were abortions. Three of the abortions were twin pregnancies. Twin deliveries were 23. Singleton pregnancies 28 weeks and above were 667. There were four maternal deaths (5.7/1000) (95% confidence limits of 2.2 to 14.5/1000). Table 1 summarises their case histories. Apart from an underage mother (18 years) who died of post partum haemmorrhage, the rest had a very clear risk factor of high parity. At baseline 222 women questioned about contraceptive use showed only 19 (8.6%) were using any form of contraceptive.

Perinatal, Infant and Child Mortality

At baseline, the causes of death of 279 children from mothers history was analyzed by age, as indicated in table 2. Fever, probably malaria, was the first cause of death at all ages; followed by diarrhoea and vomiting, measles, and then unknown causes. Most deaths (41.25) occured during the first year of life decreasing as age increased reaching the lowest level of 8.2% during the fifth year of life.

In the obstetric material of 703 obstetric events, perinatal mortality (PNM) was 6.0% (40/667) in singletons and in twin pregnancies 24.0% (11/46). The respective 95% confidence limits are 4.6 to 8.0% for singletons and 4.0 to 38% for twins. The total PNM was 7.2% (51/713) the 95% confidence limits being 5.6 to 9.6%. Twins accounted for 21.1% of all PNM. In the low birth weight group 1000-1999g, PNM was 56% but at six weeks follow up 78% of the children had died, leaving only 6. In the 2000 to 2499g birth weight group the PNM was 11% (5/46). Perinatal mortality in the birth weight group of 2500g and over, was 4.5% (29/641). There were 59 singleton pregnancies which passed 42 weeks of gestation and there were 3 (5%), perinatal deaths in this group as compared to 4% in the 38 to 42 weeks group. Table 3 shows the perinatal mortality according to state of birth and weight.

Note from table 3 that low birth weight is associated with high perinatal mortality. Table 4 shows the relationship between some selected factors influencing nutritional status of children at the baseline survey. It is again noted here that low birth weight is associated with future poor nutritional status. Other morbidity factors associated with poor nutritional status were history of measles, fever, and diarrhoea. The frequency of feeding, birth place, and breast feeding also had a significant effect on the nutritional status of the child.

Table 1. Maternal Mortality: Case Summaries

Case No.	Age (years)	Parity	No. of Antenal Visits	Place of Delivery	Gestation at Delivery	Remarks
65	18	Prim	8	Dispensary	44/40	Post Partum Haemorrhage
71	34	7	9	Undelivered	37/40	Uterine rupture, previous C/S
87	34	5	8	Regional Hospital	39/40	Breech Presentation prolonged labour, C/S. Post.op/ sepsis
255	40	9	8	Home	40/40	Post Partal Haemorrhage

Table 2. Child Mortality by cause and age in 279 deaths (from mother's history)

Age at death	0-12	13-24	25-36	37-48	49-60	Total	% of all (Deaths)
Cause of death							
1. Unknown	29	3	3	0	3	38	13.6
2. Fever	38	23	16	14	9	100	35.8
3. Diarrhea & Vomiting	17	11	8	5	1	42	15.1
4. Measles	8	17	7	5	3	40	14.3
5. Kwashiorkor	1	4	11	6	5	27	9.7
6. Respiratory infections	7	1	4	2	1	15	5.4
7. Prematurity	10	-	-	-	-	10	3.6
8. Others	5	-	3	-	8	-	2.5
Total	115	59	52	32	30	272	100.0

Table 3. Percent perinatal mortality according to birth state and weight

	Total	Birth Weight (in g) 1000-1999	2000-2499	2500-4500	Unknown
Singleton	6.0	60.0	7.5	3.0	30.0
Twins	24.0	50.0	15.7	0.0	66.0
Total	7.2	56.0	11.0	4.5	32.0

Table 4. The relationship between some selected factors and nutritional status

	Nutritional Status		
	Well nourished	Under nourished	Remarks
1. Birth Weight (X + SD) -	3.0+0.45	2.54 + 0.64 -	t = 0.08 p < 0.001
2. Birth Place: Home Health Unit	59 313	92 215	X2 = 19.3 df = 1 p < 0.001
3. Feeding On demand On schedule	146 25	124 110	X2 = 46.52 df = 1 p < 0.001
4. History of Measles past one year YES NO	28 320	40 250	X2 = 5.48 df = 1 p < 0.01
5. History of fever within past two weeks YES NO	169 192	170 136	X2 = 5.05 df = 1 p < 0.02
6. History of diarrhoea within preceding month Yes No	125 230	145 152	X2 = 12.32 df = 1 p < 0.00
7. Breast feeding Yes No	178 196	105 202	X2 = 12.43 df = 1 p < 0.00

Table 5. Interpretation of Body Mass Index (BMI)

BMI (Score)	Intrepretation
Less than 20	Undesirable
20 to less than 25	Desirable
25 to less than 30	Overweight
30 to less than 40	Obesity
40 or more	Extreme obesity

Discussion

The presented results form a small part of the data generated from the Ilula study. In developing countries there are problems associated with the analysis of biological samples and data analysis as well as organisational and managerial ones associated with doing prospective studies in rural areas.

A research committee composed of the authors, and its frequent visits to the study area, solved the organisation and management problems. The enlisting of expertise based near the study areas, and the WHO/UNICEF supported Joint Nutrition Support Programme (JNSP) launched in the region at the same time that the study started also helped.

Biological samples and most of the data had to be analysed outside the country and this to some extent delayed the whole process. However, efforts are being made to finish data analysis and collation.

For the group of 300 women of the second part of the study there were 10 or 3.3% abortions and 26 infant deaths. This gives an infant mortality incidence of about 87/1000 with the 95% confidence limits of 60-124/1000. A detailed analysis of these deaths would have given us an insight into the reasons for the deaths and the precedent risk factors.

The estimated national Infant Mortality Rate (IMR) according to the 1978 census is 137/1000 with Kilimanjaro region having 76/1000, the lowest IMR in the country. For Iringa region where the present study was done the IMR was estimated to be 152/1000, which is higher than the 87/1000 calculated for Ilula in this study. This may be because Ilula is well served with hospitals; there are two missionary hospitals in the two villages and the regional hospital can easily be reached. Moreover, the Tanzania-Zambia highway and the cultivation of tomatoes and onions for the Dar es Salaam market has led to rather rapid urbanisation.

However, maternal mortality at about 6/1000 is higher than that estimated for health institutions in Tanzania which is about 4/1000. The deaths came from known risk groups primipara and grand multipara and compare with figures given from other developing countries like India and Nigeria (7) and of European figures of about 50 or more years ago.

Maternal mortality reflects the standard of antenatal intrapartal and post-partal care that is given. Given the fact that for Tanzania the level of maternal mortality is almost a hundred fold that of countries like the U.K. and Sweden; for a Tanzanian mother, pregnancy is a definite risk.

Since twin pregnancies constitute as high as 3.6% of this study and 7.4% of the offspring, and are associated with low birth weights and high perinatal mortality (PNM), their early detection and appropriate programme for their care and delivery is of high priority if PNM is to be reduced.

The limitations of this study in terms of projecting the results to the national level should be realised. Both the maternal and infant mortalities resulted under conditions of intervention above what is normally done in Tanzania. Moreover, the number of observations were few thus giving a very wide range of the parameters as shown by the wide 95% confidence limits.

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A SUMMARY OF FINDINGS ON BIRTHWEIGHT DISTRIBUTION IN TANZANIA

by
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Introduction

Birthweight is an important determinant of infant health and development. Levels of morbidity and mortality are known to be higher among cases of low birthweight (below 2500 g) (Bergner & Susser 1970; Lechtig et al. 1978).

In a village sample in Rufiji district, the indicators of nutritional status of under-5 children were found to be strongly associated with birthweight (Table 1).

Table 1. Example of the relationship between birthweight and nutritional status of under 5 children (Ikwiriri village)

BW	% below 80% SWA	% below 90% H/A	% below 90% W/H
over 3500	15.7	13.3	13.0
3000 - 3499	24.4	18.5	15.6
2500 - 2999	40.7	38.0	28.3
below 2500	54.5	57.7	25.0

Source: Bantje, 1981, Table 9

SWA = Standard weight for age
H/A = Height for age
W/H = Weight for height

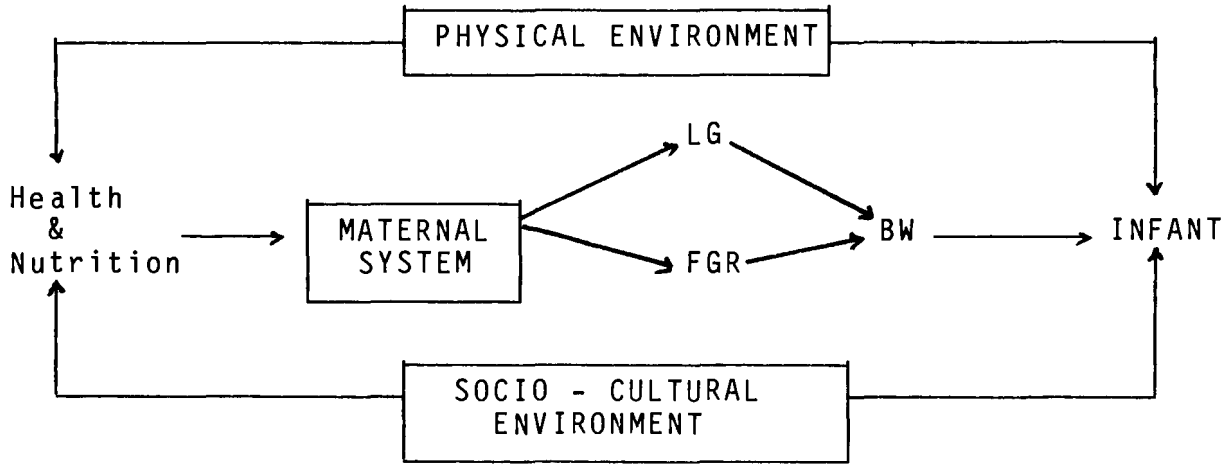
The incidence of low birthweight (LBW) is much higher in third world countries than in the West, ranging from less than 5 percent in Western Europe to 30 percent in India (WHO 1984). A reduction of this incidence would be an important contribution to the control of perinatal problems.

The two determinants of birthweight are gestational duration and fetal growth rate. Low birthweight therefore may be due to short gestation (premature delivery) or fetal growth retardation. Routine delivery records do not distinguish between the two phenomena. Therefore no distinction between the two will be made in this paper, except in one case where length of gestation could be retrieved from ante-natal records.

Birthweight has been proposed as a powerful indicator of socio-economic change as it is sensitive to a wide range of influences (Mahner 1978). This paper discusses a number of efforts at monitoring birthweight in Tanzania and understanding the causes of its variations. While it may be true that birthweight distribution corresponds with broad socio-economic change, its sensitivity to so many interrelated factors restricts its usefulness as an indicator. Very detailed research trials would be needed to separate the various factors.

In general the factors influencing birthweight may be classified into three sub-systems: physical environment, socio-cultural environment, and the maternal system. Both physical and social environment incorporate elements related to health and nutrition that influence fetal and early childhood development. Some of these factors show variations over time which are reflected in seasonal and longterm changes in birthweight distribution. Birthweight is only an indicator of the developmental link between the maternal and fetal systems. But it is the easiest to record and analyse and its relevance has been amply shown. From birth the infant is independently exposed to environmental and social influences.

Figure 1. Factors influencing birthweight



The physical environment

While altitude and temperature may influence birthweights, rainfall is the overriding determinant in tropical countries. It influences the presence or absence of certain diseases. Malaria and anaemia are among the most important determinants of birthweight and are more common in the hotter and wetter parts of the country. Rainfall also determines food production and the timing of agricultural routines, hence the alternation of periods with heavy labour and little food and those with little labour and plenty of food. The generally healthier conditions in drier areas contrast with the frequent occurrence of food shortages in those areas.

The socio-economic environment

This comprises many different but often related factors such as: the level of income (hence access to higher standards of living, including better health care and food supply); the quality of housing; the level of awareness of health problems and their remedies; the type of household economy (resulting in different levels of labour demands on women); the quality of domestic life (hence the amount of support from husbands or relatives); and the frequency of childbirth, occurrence of veneral diseases and related health factors.

The maternal system

The interaction between the maternal and fetal systems is extremely complicated in terms of health and nutrient supply. It is however obvious that healthier and better fed women give birth to heavier and healthier babies. Maternal height, weight, weight gain during pregnancy, reproductive history, and health all have a bearing on the birthweight of the offspring. Some of these factors may have their basis in the mother's own childhood conditions, e.g., due to a history of malnutrition (Drillien 1954; Ounsted 1973).

Confirmed causes of short gestation are infections (malaria, VD, certain viral infections), toxidity (due to heavy smoking, alcohol, or indigenous herbs), and trauma due to heavy labour or sexual intercourse at a late state of pregnancy (Tafari 1978; Naeye 1980).

Fetal growth is influenced by maternal nutrition. The effect of serious undernutrition on birthweight is confirmed, as is the beneficial effect of supplementation in cases of serious undernourishment. However, in less serious cases the capacity of the maternal system to store and use energy reserves acts as a buffer against fetal deprivation, thus making supplementation unnecessary (Bergner and Susser 1970; Lechtig et al 1975; Aebi and Whitehead 1979).

Methodology

Objectives

The objective of this study undertaken in the past 7 years, was to investigate patterns of birthweight distribution in Tanzania. The focus was on maternal factors, but later this was broadened to distributional patterns in relation to geographical and environmental factors. Particular attention was paid to evidence of long term and seasonal changes in birthweight distribution. An additional objective was to test the validity of routine delivery records for monitoring purposes. A few suggestions for effective monitoring of birthweights are presented at the end of this paper.

Data sources

Most research on factors influencing birthweight is based on carefully controlled hospital based samples. While these serve to study the principles at work, they tend to be unrepresentative for the wider population. Moreover they cannot be replicated on a large enough scale for monitoring purposes.

The work presented here is based on routine delivery records in rural hospitals. Of the 11 hospitals visited, 10 were non-governmental hospitals of various denominations, and one was a government hospital. Questions may be raised about the reliability of such data, but the remaining impression is that they are much better than assumed at first. While individual weights may not always be accurate, group averages reveal regularities and patterns that cannot be due to chance. Many hospitals have kept such records over a number of years (some going back more than 10 years). They constitute an important and hitherto neglected source of data on a variable that is basic to infant health and development.

All analyses discussed here are based on live, single births only, i.e., still births and multiple births have been excluded. Although there is a difference between mean birthweights of male and female children, the sexes have been combined on the assumption that their proportions are roughly constant. The analytical tools used are mean birthweight and percentage low birthweight, lagged regression analysis and running means.

Other data sources used include field studies, antenatal records used to retrieve maternal variables in Ikwiriri, and rainfall data from the Department of Meteorology in Dar es Salaam as an indicator of environmental conditions.

Advantages and disadvantages

The advantages of this approach are that it involves no extra costs beyond those for travelling to the hospitals concerned. One has access to a large body of data over an extended period of time. The number of deliveries covered by this study is about 11,000 per year, corresponding to a theoretical population of about 250,000, i.e., one percent of the Tanzania mainland population.

A disadvantage is that the approach is retrospective, so that one has no control over the quality of the data. Moreover a wide margin of observer error must be assumed. Only parity and sex are regularly recorded in addition to birthweight.

The hospitals were very cooperative in making their records available, usually expressing enthusiasm that someone was interested in using them.

Birthweight variance and data needs

Birthweights range from about 1000 to 4500 g. This wide range is due to the effect of the variables discussed, and to the wide range of individual variance within the same category. In other words, women with otherwise similar characteristics display widely diverging birthweights.

To understand the impact of the various influences on birthweight it is necessary to differentiate between subgroups. The range of individual variation within any subgroup creates a need for large samples. To study seasonal variations in an otherwise undifferentiated data base (i.e. with birthweights from women who differ by height, weight, parity, and socio-economic status) several hundred cases are needed for each time unit, or at least some 1000 births per year. This means that only data from larger health units can be meaningfully studied. Combining data from smaller units is a problem even where they exist, because weighing scales are usually not calibrated.

Even in larger units the number of cases per year is too small to differentiate by more than one variable at a time. Thus, in order to differentiate, e.g. by parity, one has to aggregate by time, that is, to combine a series of years, and vice versa. One possible compromise is to compile data on a bi-monthly basis. It should be possible to get better results with the use of slightly improved delivery records and computerised processing.

It should be noted that mean birthweight is always an estimate based on an accidental sample (the institutional deliveries) that is bounded in space and time. One fact revealed by this study is that mean birthweight has limited significance, because it is subject to constant change. It can only be interpreted on a longitudinal and geographically dispersed basis.

An important question was what exactly happens when mean birthweight changes. Is it due to a broad shift of birthweight in the whole population, or is it due to an increase in very low birthweights? In other words: are some people affected a lot, or is everybody affected a little? Analysis of distribution curves suggests that changes in birthweight are mainly due to broad shifts of the whole distribution, therefore probably due to factors that affect most people in the same way, most likely nutrition.

Results

Influences of the maternal system

With the exception of parity, the data in this section are derived from a sample of 2640 cases from Ikwiriri village (Bantje 1982 and 1986).

Parity. The impact of parity on birthweight is well documented. All stations studied show very similar curves. The occurrence of LBW is especially high among first births, resulting in a very low mean birthweight for that group. Figure 2 shows an average curve compiled from a number of stations. Mean birthweight continues to increase until the eighth birth, while the number of women per category decreases steadily. There are indications that it declines with higher birth order, but the number of cases is then very small.

Weight and weight gain. The impact of maternal weight is shown in figure 3. No independent influence of weight gain could be demonstrated from the data, while data on maternal height were missing. There is some debate whether weight or height is the more useful discriminatory variable.

Antenatal care (ANC). The frequency of attendance at the ANC clinic is strongly associated with mean birthweight (Table 2) and this was originally accepted as proof of the beneficial effect of antenatal care. While this is still a real possibility, statistical analysis later showed that the variance due to ANC attendance is completely subsumed in that due to variations in length of gestation. It was not possible to attribute the variance decisively to either variable.

Table 2. ANC attendance, birthweight and length of gestation

ANC attendance	Mean BW	% LBW	Mean gestation
1	2833	20.5	35.6 weeks
2	2907	13.5	36.7
3	3012	11.0	37.3
4	3046	8.1	37.6
5	3049	7.3	38.1
6	3125	4.1	38.5
7	3013	8.0	38.6
8	3093	6.1	38.9
9	3162	2.5	39.5
10	3050	8.5	39.5
over 10	3186	1.9	39.7

Source: Bantje 1982, Table 4

Length of gestation. The most important predictor of birthweight is gestational age. As seen in Fig. 4, each week of gestation adds an average 80 g to the birthweight. Attempts to raise birthweight should therefore focus on the prediction and control of short gestation, with good antenatal care, malaria prophylaxis, and rest during the last months of pregnancy.

Regression analysis. A multiple regression of birthweight with length of gestation, parity, sex, and maternal weight yielded an R-square of 0.29, showing that almost one third of the variance could be explained by these four variables.

Environmental factors

Rainfall data are more easily available than data on maternal variables. They are a broad indicator of environmental conditions and have been useful to the understanding of seasonal birthweight fluctuations. In almost all stations studied, mean birthweight showed more or less regular seasonal variations. Birthweight always falls at the beginning of the rainy season, reaching its lowest value during or just after the rains, and rises during the dry season. The fluctuations are strongest and most regular in the drier areas, with averages fluctuating by about 100g. While average curves over a number of years give the best visual representation (Fig.5), the standard deviation of monthly (or bi-monthly) means is a more accurate measure of seasonality (Table 3). Due to the unreliability of the rainfall pattern, seasonal peaks may shift from year to year and suppress each other on an average curve. The standard deviation takes into account the actual variations between date points and expresses them in a single figure.

The timing of the seasonal variation is best measured by regression with the lagged rainfall curve. The R-square obtained is a measure of the regularity of the variations, while the length of the lag is indicative of the mechanisms at work. In the dry areas the lag is short while seasonality is strong. This indicates a rapid response of mean birthweight to periodic food shortages and heavy labour at the beginning of the agricultural season. In high rainfall areas the lower R-squares suggest smaller and less regular variations, while the long lag suggests that variations are due to health related factors, especially malaria infection, in the course of the rainy season (Table 3).

Table 3. Rainfall and birthweight variations

Station	Annual Rainfall	Mean Birth-weight	Magnitude of seaso-nality (1)	Regularity of seasonal Pattern (2)	No. of Months lagged(3)
Mvumi	530	2938	101	0.18	2
Kilimatinde	568	2994	98	0.11	0
Igunga	565	3138	72	0.35	2
Makiungu	670	2970	66	0.18	2
Nkinga	811	2970	61	0.11	2
Ndala	836	3049	71	0.55	0
Ilembula	607	3009	41	0.09	4
Ikwiriri	1000	2992	52	0.11	4
Bagamoyo	1044	2942	36	0.18	4
Ifakara	1400	2899	55	0.06	4
Mbozi	1278	2979	36	0.02	0

Source: Bantje 1987, Table 3
(1) standard deviation of bi-monthly means
(2) prediction of birthweight variation with lagged rainfall (r^2 values)
(3) lag period giving the best prediction.

The occurrence of seasonal variations in energy balance is confirmed by corresponding variations in maternal weight and weight gain, as were observed in Ikwiriri (Bantje, 1983).

Table 4 summarizes the conclusions from the analysis by classifying the 11 stations according to rainfall and altitude. The classification is crude and tentative, based on a limited number of series of unequal length. But the relationships are curiously coherent.

Table 4. Relation between environment, mean birthweight, and seasonal variations.

	Mean Birthweight	Birthweight seasonality
Low rainfall area	high (3010)	strong
Wet lowland area	low (2944)	medium
Wet highland area	medium (2979)	weak

Source: Bantje 1987, Table 5

Socio-economic factors

A relation between socio-economic level and birthweight was found in several studies. In Ikwiriri, birthweight ranged from 2960 g in the lowest to 3137 g in the highest income group (Bantje 1981). In Dar es Salaam, the range was from 3061 g to 3288 g (Yambi and Bantje 1979). In both cases the sample was small, and the findings merely indicative.

A more interesting picture emerges when one looks at all available data on birthweight in a longitudinal perspective. There are a few records from the 1940's and 1950's and increasingly more as one moves into the 1970's and 1980's (Bantje 1985). A nationwide investigation would no doubt reveal more data, especially from the older mission hospitals. It is hard to ascertain whether data from different time periods are based on comparable samples. Nevertheless, the data suggest that, on the whole, there has been a slow rise of birthweight from a gross average of 2940 g in the 1950's to about 2990 g in the late seventies. This can broadly be attributed to improved standards of living, especially better health care, in the course of time.

An exciting question was whether the economic crisis of the early 1980's would reflect itself in the level of birthweight. Figure 6 shows 12 months running means of birthweight for a number of places. In some of the more remote stations (Mvumi, Ndala, Nkinga, Makiungu) there is no evidence of a decline. Environmental conditions and the resulting food supply situation apparently were the decisive factors. In places closer to Dar es Salaam and the main road, therefore presumably more closely

linked to the national economy, birthweight has declined rapidly between 1979 and 1984. In Ikwiriri, Ilembula, Ifakara and Bagamoyo the subsequent improvement of the economy appears to be reflected in a hesitant return to the rising trend. The sudden rise in Moozi between 1983 and 1985 may be attributed to the expansion of the coffee industry and the fast increase of producer prices for coffee.

Although sketchy, such findings suggest that close monitoring of birthweight in a network of carefully selected centres over the country may be a powerful tool to demonstrate changes in general well being.

Discussion

The relevance of birthweight studies is perhaps most obvious from the close correspondence between mean birthweight and the incidence of low birthweight. While the overall incidence of about 14 percent low birthweight in Tanzania is not unusually high for tropical countries, it rises to over 40 percent for particular categories of women and time periods. Where such variables concur, one must assume that the survival chance of first and second births to poor women in the wrong season is very low indeed.

A serious limitation of birthweight as an indicator is that it can only be analysed in retrospect, at the population level. The procedures of antenatal care (such as malaria prophylaxis, checking blood pressure, HB level and weight) serve to identify individual at risk cases, but one wonders if the screening could be improved.

In nature of things, any intervention at the individual level should take place several months before delivery. Starting with the observation that length of gestation is the most important determinant of birthweight, an analysis was done on the Ikwiriri data to determine which other variables could be used to screen for the likelihood of short gestation to occur. It was found that primiparous birth, a maternal weight below 45 kg, and weight gain below 100 g/week are strongly associated with short gestation. However, while 73% of low birthweight cases are associated with one or more of these characteristics in addition to short gestation, 50% of all women display one or more of them. Therefore it would be necessary to give special care to 50% of all pregnant women in order to cover 73% of the low birthweight cases. This would entail very high costs for a low level of prediction. However, at the level of the population close monitoring of birthweight would still have its value. Given its dense network of primary health care units, Tanzania has an excellent opportunity to undertake this. A number of suggestions to put it into practice made on the basis of the experience gained, follow.

- A country wide network should be established, with several observation points in each region. These should be as rural as possible and have a minimum of about 1000 deliveries per year.

- These units should have proper weighing scales, which should be calibrated and periodically checked.

- These units should be provided with standard, preprinted delivery record books.

- In addition to the usual sex and parity data, an effort should be made to also record maternal height, postpartum weight, and gestational age at birth.

- Standard forms should be designed for the compilation of the weights in the hospital. These should then be sent to the central monitoring unit every month so as to reduce the amount of travelling involved.

- The monitoring effort should also include the number of still-births.

Once a more complete picture of the variations in birthweight distribution is formed, deviations from the usual value could be an indication that health and/or nutrition interventions in the particular area are called for.

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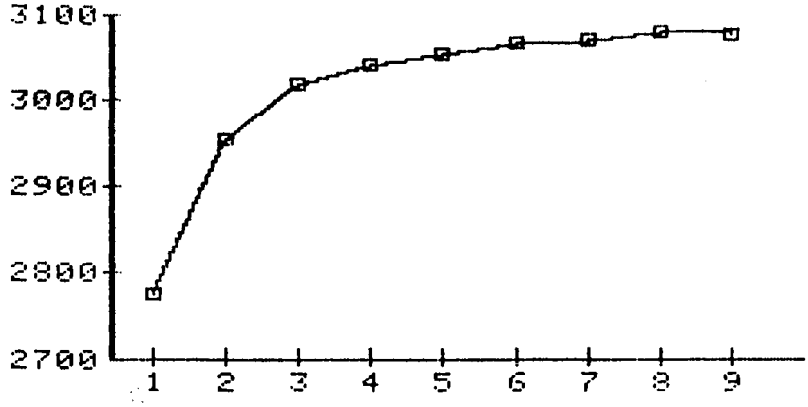


FIG 2 - MEAN BW BY PARITY

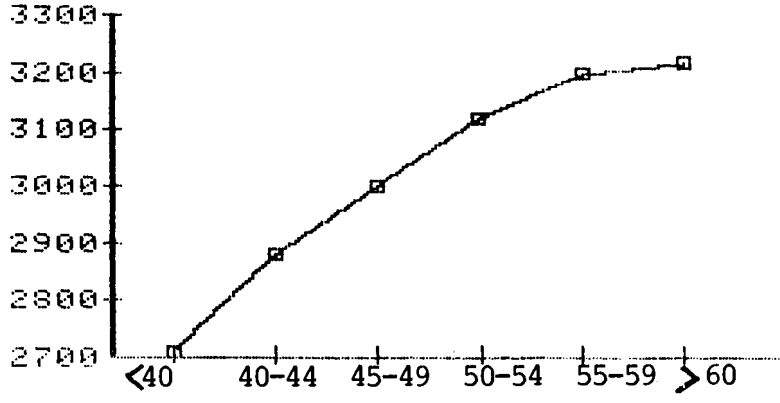


FIG 3 - MEAN BW BY MATERNAL WEIGHT

FIG 4A - MEAN BW BY GESTATIONAL AGE

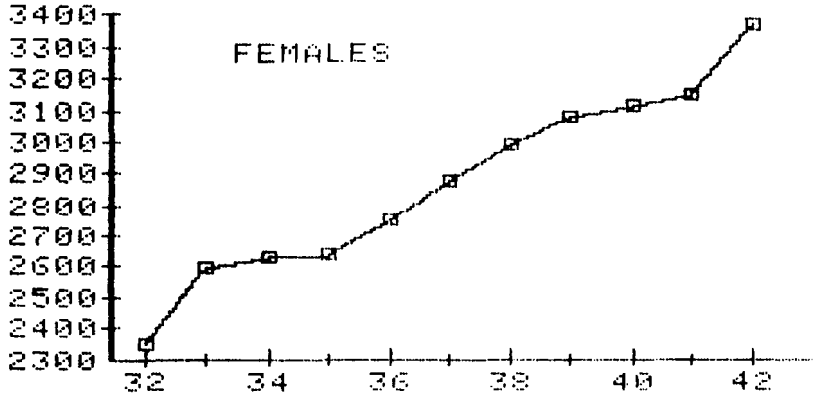
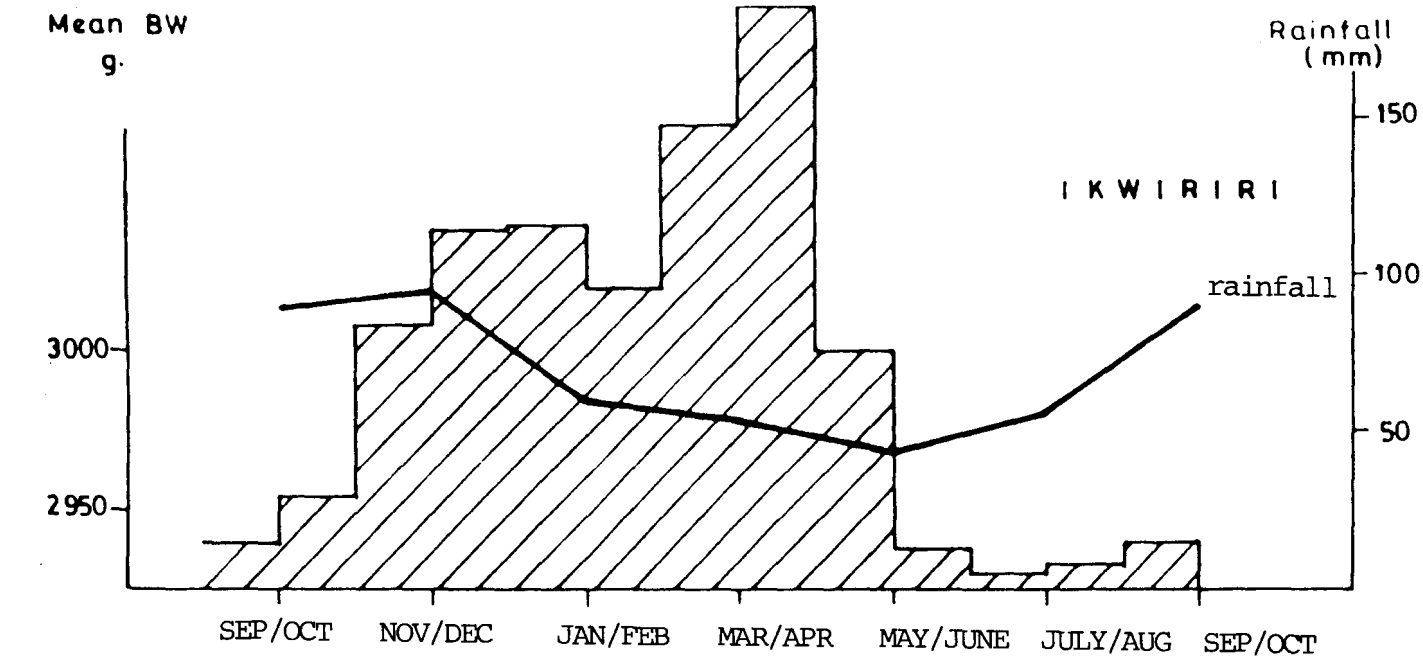


FIG 4B - MEAN BW BY GESTATIONAL AGE



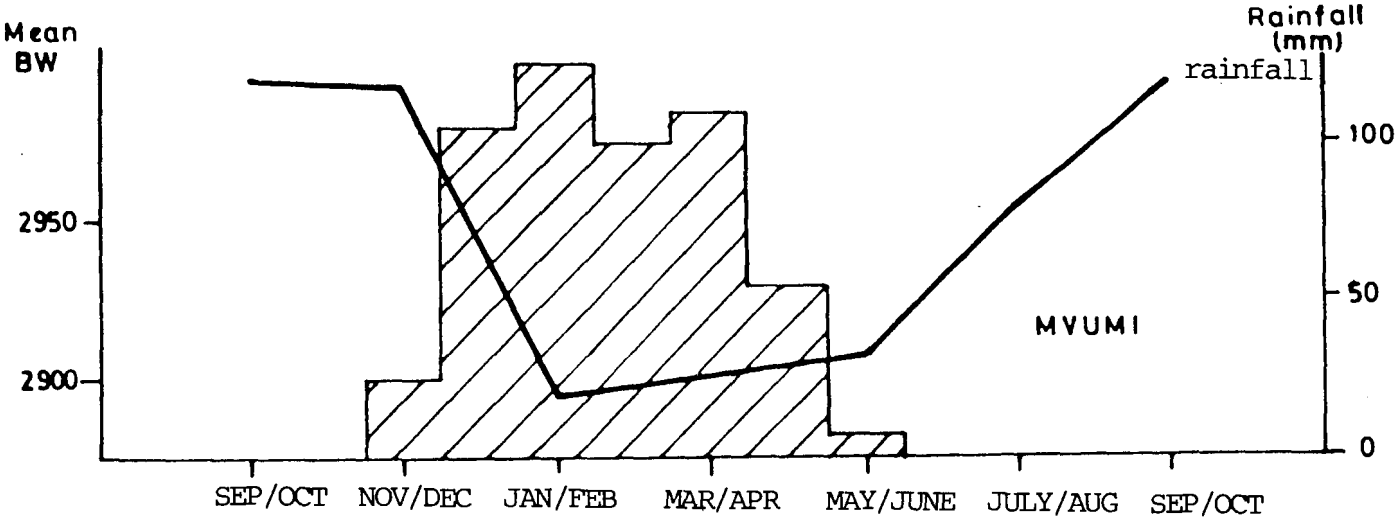
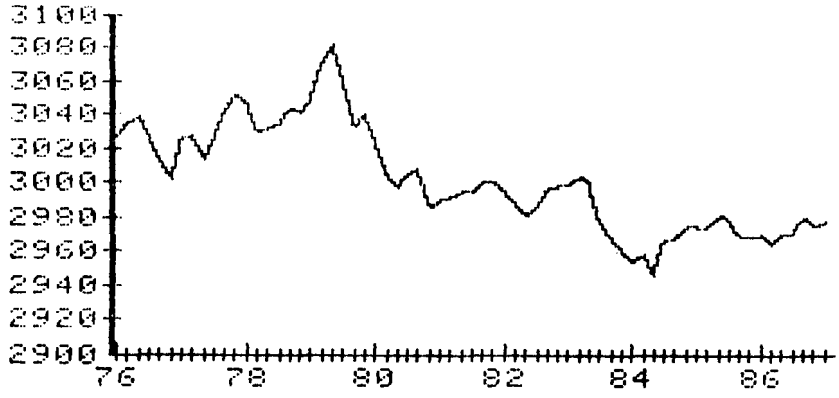
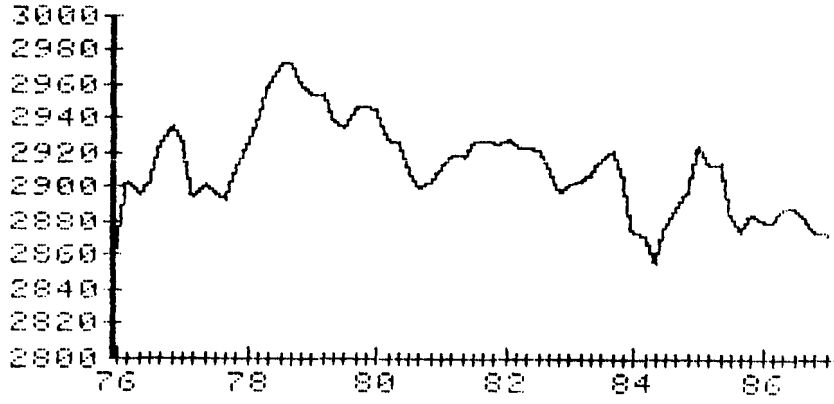


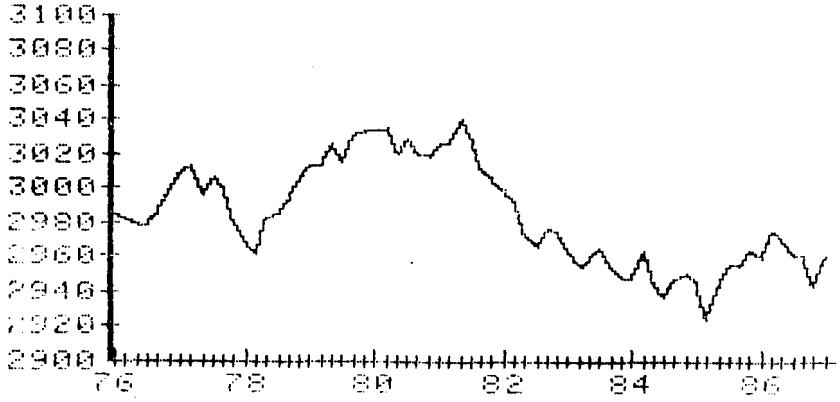
FIG 5 - MEAN BW AND RAINFALL CURVES



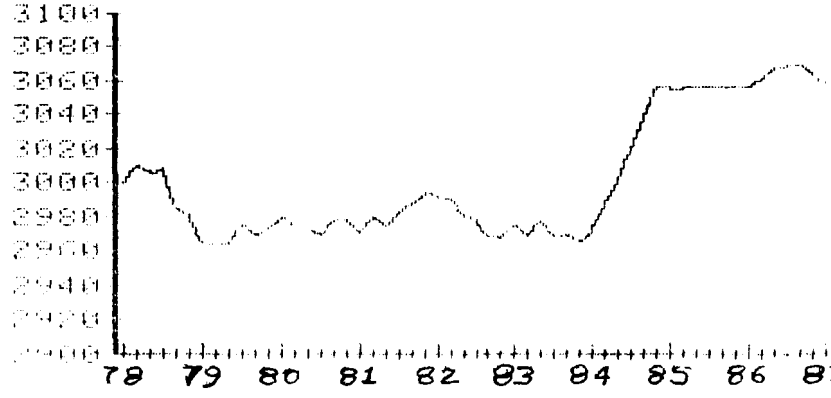
ILEMBULA 12 MONTHS RUNNING MEANS OF BIRTHWEIGHT



IFAKARA 12 MONTHS RUNNING MEANS OF BIRTHWEIGHT



TKWTRIRI 12 MONTHS RUNNING MEANS OF BIRTHWEIGHT



MBOZI 12 MONTHS RUNNING MEANS OF BIRTHWEIGHT

FIG 6 - LONG TERM TRENDS OF BIRTHWEIGHT

THE RELATIONSHIP BETWEEN MOTHER'S AVAILABILITY AND INFANT AND CHILD HEALTH

by
Esther Sempebwa / Aga Khan Health Services, Kisumu, Kenya

Summary

The mother plays an important role in the survival of her children. She more than anybody else meets their demands. It is therefore difficult to find an adequate substitute in her absence.

With the global economic recession and accelerating cost of living, men are increasingly migrating to the urban areas. Despite this there has been rapid increase in population pressure on the land thus reducing its productivity and ability to support those depending on it. Traditional forms of division of labour between men and women in rural areas are rapidly vanishing.

The women are finding themselves in a situation where they have to act as head of the family. As such they have to look for alternative ways to supplement their meagre resources so as to be able to take care of their families. This additional effort takes them away from home. The time they spend away is costly to their childrens' health. They become too busy to take the children to clinics for treatment, or to treat them at home themselves. In the rural areas, as it is difficult to get someone outside the family to take care of young children when the mother is away, the younger ones are often left with siblings who are mostly below 10 years of age (the older ones go to school).

The women therefore need to do extra work to make ends meet. At the same time, however, children suffer due to the long periods of absence of the mothers from home. Many mothers are away for 6 - 8 hours a day. Mothers therefore, have to find adequate substitutes in their absence for the benefit of their children.

Mother's Availability and Infant and Child Health

Child health status reflects the general well being of a population. Populations with high infant and child mortality rates (as in the case of Nyanza Province, where an under two years mortality rate of 209/1000 was estimated from the 1979 census) also suffer many other disadvantages which perpetuate the high mortality rates. These include poor environmental sanitation, unsafe and inadequate water supplies, poor nutrition, inadequate health services, frequent births, low educational attainment especially for women, and inadequate food supplies, among others.

It was with these problems in mind that the Aga Khan Health Service, Kenya, with the co-operation of the Government and Municipal Council of Kisumu, undertook the implementation of a Primary Health Care (PHC) programme in 3 locations of Kisumu District. These areas are near Kisumu town where the need was felt to be greatest. The 3 locations are North Nyakach, Central Nyakach and Kajulu. They have a total population of just over 56,000 people. The population distribution in all 3 locations is about the same with 19% of the population aged under five years, while 48% in Kajulu, 50% in North Nyakachi, and 52% in Central Nyakach are aged under fifteen years. The sex distribution varies. There are more females than males especially beyond age 20. This is felt more in the Nyakachs than in Kajulu. Most of the households are composed of the nucleus family. The project carried out a baseline survey in 1984 and the infant mortality rate was estimated at 166/1000 for Kajulu and 182/1000 for Nyakach (combined). The project therefore intends to improve the health and nutritional status of children under five years and women of child bearing ages with the hope that in the long run this shall also have an impact on mortality levels.

Some of the project interventions are immunisations, nutrition education, growth monitoring, family planning, and parental education in simple treatments like oral rehydration therapy in cases of diarrhoea, and the prevention of home accidents, among others.

The Population and Household Count

We carried out a population and household count for over seven months. Each household was numbered and mapped. The identification number enables us to visit any household without difficulty.

The survey revealed that:

- 50% of the households were headed by females;
- 45% of the household heads were illiterate (This was 63% among the female household heads);
- Only 8% of the household heads had received education beyond the primary level (8 or more years);
- Majority of people (75%) were engaged in farming. (This being low potential agricultural land, farming is largely subsistance);
- 20% of the households heads were engaged in self-employment. (This is 33% for female households);
- Salaried employment was available to 11% of households heads; (19% Kajulu, 7% North Nyakach, 8% Central Nyakach).
- Fertility is high. Total fertility rate was estimated at 7.8 for all areas combined but was 7.6 for Nyakach and 8.3 for Kajulu.
- Child mortality experience was higher among the self employed mothers followed by farmers;
- Most of the self employed mothers had between 5 - 7 years of education.

Rationale for the Study

The mortality experience of the self employed mothers was not what would be expected for the following reasons:

- Most of them have higher education than average for females.
- Women engaged in petty business earn more than the farmers and possibly have control over this money.
- Most of those in petty business combined it with farming. It was therefore assumed that they did not have to spend much money on food.

However, the fact that these mothers had the highest mortality experience (retrospectively) raised our curiosity. We therefore paid particular attention to this category of women.

Methodology

Data in this paper have been randomly gathered from different sources. These data sources are summarised below.

Population Updates

As a follow up to the population count, each household is visited once yearly to monitor population change. Information gathered includes births by age of mother, deaths by age and cause, and migrations. Each form used carried the identification number of the household where the event occurred. This is the identification number given during the population and household count.

Sample Surveys

Two surveys were carried out.

Survey 1: This was carried out on a small sample of 46 women, 21 in Gem Rae and 25 in Kadero (Gem Rae is a sublocation in North Nyakach, Kadero in Kajulu). A structured questionnaire with lots of open ended questions and demanding a lot of observation was used. We selected 3 clusters in each sub-location using the maps of the area. In each cluster, we interviewed 10 women with a child under 5 years of age. Two interviewers were trained over a period of one week to carry out the survey under close supervision.

Survey 2: This survey was designed after the analysis of the first update data. There were two sub-locations which showed very high infant and child mortality, i.e., Gem Rae where the Infant Mortality Rate (IMR) was 76/1000 and Child Mortality Rate

(CMR) was 26/1000, and Kadero where the IMR was 193/1000 and the CMR was 31/1000. The objective of this survey was to compare those families which suffered an infant or child death to those which did not in an effort to identify factors contributing to high mortality. A random sample (using the household identify number) was picked. 50 households were picked in each sub-location (i.e. Gem Rae and Kadero) giving a total of 100 families which suffered mortality. These we called Group A. After interviewing a family in Group A, the interviewer was supposed to look for a comparable family in the neighbourhood. That is, families with a living child of about the same age, the same socio-economic status, and the same family size, and interview this mother as well. This was called Group B.

A structured questionnaire was designed for each group. Questions concerning characteristics of the mother and child care practices were the same on both questionnaires. However, the questionnaire for Group A had a section about the dead child, i.e., cause and symptoms leading to death, person consulted, and the treatment sought.

Support Measures for Women in Health and Development Survey

This study was conducted in Kenya and Swaziland. It aimed at identifying what support measures, both formal and informal such as parental, conjugal, occupational, kinship and social, are available to women in their different roles.

This was an in-depth study looking at the mother and other people she interacts with on a daily basis, e.g., husband, mother-in-law, neighbours, and community leaders. Data were gathered through observation, discussion, and direct interviewing. Some of the observations from this study for Western Kenya which have a bearing on this topic will be included in the discussion.

The Findings

Results of the population count and 1st update enabled us to identify areas where the problem of infant and child mortality was highest. The findings from each survey will be presented separately but will be considered together during discussion.

Women, Work, and Child Care

This survey was carried out in January when there is little agricultural activity going on. The target was to interview 60 women, 30 from each area. 50% of the women were supposed to be in self employment. 46 women were interviewed and 18 or 39% were self employed. Only some of these were interviewed because it was very difficult to find them at home even in the evenings. All the women interviewed were between 19 and 39 years old. Each had at least one child under the age of five years.

Work

The women listed the major activities they would be involved in during a normal day, how long each takes and where it is done. Since the interviewers and supervisors also spent a lot of time in the field with the women, they were able to confirm this information through observation. The following table summarises the findings.

Activity	Kadero		Gem Rae		Average	
	Hrs	Min	Hrs	Min	Hrs	Min
Cleaning the house	-	15	-	15	-	15
Fetching Water x 2*	-	45	1	30	1	07
Washing Clothes	1	00	1	00	1	00
Cooking x 3**	1	00	1	00	1	00
Fetching Firewood	1	30	2	00	1	45
Going to the Market	2	00	3	00	2	30
Digging*+	4	00	3	00	3	30
Business ++	4	00	5	00	4	30
Total	14	30	16	45	16	02

(Time given here includes travel time).

* Women fetch water twice on average. Kadero women do not go as far as Gem Rae women.

** Women cook 3 times on average. In the morning they cook tea or porridge, afternoon they cook lunch, and evening they cook supper.

\+ Most women reported that they go the shamba from 6.00 a.m. to 11.00 a.m. or 12 noon when they go for the first trip of water. Women in Kadero tend to have shambas further away from their home so they have to travel longer distances.

++ Applies only to those women in self employment.

The list excludes child care, tending to domestic animals, leisure, work done for in-laws (who live close by), among others. Fetching water, washing clothes, and fetching firewood are normally combined. From the list of activities and time spent on them it is deduced that women spend most of the time away from home.

In order to achieve a realistic time distribution, the activities are divided into those compatible and those incompatible with child care, while considering average time spent on both. Self-employed women are dealt with separately below.

Self Employed women						
Activity	Compatible		Incompatible		In between	
	Hrs	Min	Hrs	Min	Hrs	Min
Cleaning house	-	15	-	-	-	-
Fetching water	-	-	1	07	-	-
Washing clothes	-	-	-	-	1	-
Cooking	1	-	-	-	-	-
Firewood	-	-	-	-	1	45
Market	-	-	2	30	-	-
Digging	-	-	-	-	3	30
Business	-	-	4	30	-	-
TOTAL	1	15	8	07	6	15

Washing clothes and digging would be compatible with child care depending on the distance of place of activity from home. We noted that most of the washing is done at the water source and that most mothers no longer take children to the shambas.

When rural mothers go for business which in many cases is trade, the children are often left at home. In most cases the children are also left at home when mothers go to the market which is almost daily routine. Of the total 15 hours and 37 minutes, women in self employment are for slightly over 50% of the time (8 hrs 07 minutes) engaged in activities incompatible with child care. For farmers the hours in the day which are clearly incompatible with child care are only 3 hours and 23 minutes, but they have another 6 hours and 15 minutes, just like their self employed counterparts, which falls in between.

Women engaged in self employment in this survey are also farmers. They are also involved in small scale trade in food-stuffs, e.g., fish and grain. They have to visit the marketplace daily. Other activities include mat-making and retail in small shops and kiosks.

All these women work on their shambas and do all the other activities at home before they move on to their trading places. In order to make a profit they have to acquire their stock cheaply. This involves, at times, travelling to the neighbouring districts. This takes them away from home for a number of days (as in the case of Gem Rae where grain traders go away for 2 - 3 days at a time and each time they leave the children behind). The fish traders who transport dried fish to Nairobi on night buses also find it inconvenient to travel with their babies. A comparison of the health status of the children of these women yielded interesting results but due to the small sample only tentative conclusions can be made.

Child Health Status

The health status of the children was generally poor in the population. Children of self employed women were not well cared for e.g., only 16% were fully immunised and only 11% had been weighed in the past three months. The results show that both categories of children need more care but those of self employed women need even more care. The fact that 50% of them had diarrhoea and vomiting in the past two weeks and the majority did not receive appropriate treatment implies higher risk to mortality and morbidity and hence agrees with the finding in the population count.

Child Health Status	Self Employed		Other	
	Number	%	Number	%
Fully immunised	3	16	14	50
Weight above 80th percentile	9	50	19	68
Weighed in past 3 months	2	11	9	32
Has no scabies	10	55	19	68
Had D & V in past 2 weeks	9	50	9	32
Received appropriate treatment for D & V	3	16	7	25
Total Number (N)	18		28	

Factors contributing to Child and Infant Mortality in the Past Year

This information was obtained from a survey among families which had suffered mortality (using comparable families which did not suffer as a control). We could not interview the 100 women per sub-location as it was difficult to find them at home. 70 interviews were done in Kadero, 37 in group A and 33 in group B. In Gem Rae 80 interviews were done, 40 in each group.

Preliminary Results

In Gem Rae, 69% of the households in group A were headed by women while in group B it was only 48%. In Kadero women headed 52% of the households in group A. The following table summarises the health status information about the children in the survey.

Health Status of Children	Group A Kadero n	%	(dead) Gem Rae n	%	Group B Kadero n	%	(alive) Gem Rae n	%
a Child had an MCH Clinic Card	14	38	13	33	23	70	26	65
b* Child was fully immunised	2	5	5	13	10	31	11	28
c Not immunised at all	19	51	21	53	10	31	13	33
d Had been to MCH clinic in the last 3 months	2	5	3	7	14	42	14	35
e Had been weighed in the last 3 months	0	0	0	0	16	48	8	20
f Had received measles vaccine	4	11	4	10	13	40	13	33
Total Number	41		46		86		85	

*Only children over 9 months old were included.

Half of the dead children had not been immunised at all as compared to one third of the comparison group. The dead children had not attended child welfare clinics nor had they been weighed in the 3 months preceeding their death while this is not the case among the comparison group B. Immunisation against measles was also very low among the dead children. Thus we can conclude that children in group B are receiving better care than those in group A.

The mothers in both groups were asked whether the child under discussion fell sick frequently. The answer was 70% positive for group A and 50% for group B. The most common problems are listed below.

Common health problems among the children	Group A n	%	Group B n	%
High temperature	16	30	16	43
Diarrhoea and vomiting	21	39	8	21
Difficulty in breathing	8	15	5	14
Skin problems	8	15	4	12
Malaria	8	15	10	28
Cough	7	13	7	19
Total number (N)	68		50	

*For some children more than one problem was mentioned.

The above table implies that there is not much difference in the disease problems among the 2 groups although more children in group A were reported as having fallen sick more frequently.

Causes or symptoms leading to death

The following were reported as causes of death or symptoms leading to death.

Cause or symptom leading to death*	Number	Percentage
** Skin rash/red mouth (measles)	32	41.5
High temperature	20	26
Diarrhoea and vomiting	27	35
+ Wasting	4	5
+ Swollen body	2	2.6
. Difficulty in breathing	21	27
Convulsions	8	10
No appetite	8	10
Unknown	3	4
Total number (N)	115	

* for some children more than one symptom was mentioned
\+ wasting and swollen body is interpreted as malnutrition
** skin rash/red mouth is interpreted as measles.
. difficulty in breathing is interpreted as acute respiratory tract infection. (ARI)

It is obvious that some of these symptoms are interrelated. Measles was the leading killer and of course only 10% of the children in this group had been protected against it. Diarrhoea and vomiting came next and it was followed by difficulty in breathing and high temperature. All these leading killers can be brought under control and children do not need to die from them. 70% of the children died at home. For most of them treatment had been sought as follows:

Government hospital/dispensary	62%
Private practitioner	38%
Traditional healer	11%

There were only 6 children for whom no treatment was sought. Although most of the dead children were reported as having been sick for between 3 to 14 days, in most cases treatment was not sought until 2 to 5 days before death, implying that it was sought too late. (In 4 cases we found the drugs prescribed for the child untouched, nobody gave it to them).

Thus far the survey had not yielded any new information until we looked at the characteristics of the mothers of the children.

Education of the mother: 46% of the mothers in group A and 35% in group B had received no formal education at all.

Major Occupation: All women reported themselves as farmers but 39% in group A and 21% in group B added small scale trade on to this.

Time spent at home: Women in group A spent on average six and a half hours ($6\frac{1}{2}$) away from home as compared to four and a quarter hours (4 1/4) in group B.

Child minder

While the mothers were away, the young ones were often left in the care of an older sibling under 10 years of age. This was the same for both groups. Grandparents also helped out occasionally. Co-wives were not often mentioned as people who assisted with child care. While the causes of death listed are what was expected, the care the children received left alot to be desired. For example, five of the dead children passed away while their mothers were away from home while for 6 children no treatment was sought. All of the six mothers were busy and were planning to take the children to hospital when they found the time. For 4 of the children mentioned earlier, treatment was not complied with, the drugs prescribed were not used. Finally, treatment was not sought early enough. We think that death could have been avoided by the mothers who were at home long enough to assess the situation and take appropriate measures.

Findings of "Support Measures for Women in Health and Development"

This study intends to identify both formal and non-formal support measures to enable women to fulfill their roles better. Let me mention the apparent conflict between the parental and occupational roles of the women as shown by this study. We covered 150 women in Nyanza Province from around Ahero Irrigation Scheme, and 130 women in Rift Valley Province around Kericho Tea Plantations. All these women worked as casual labourers either at the tea or rice farms. They also had their own farms on which they grow food.

69% of these women spent 8 hours or more a day at work. As they lived far from the farms most of them left home between 6:30 a.m. and 8:00 to walk an average of 3 km to the farms. While the mothers were away, 40% of the children under five were left with older siblings. 27% were left under casual care of a relative or a neighbour. Child feeding poses a big problem for these women, 70% reported that the children ate either 1 or 2 cooked meals a day. The mother cooked the food in the evening which the children ate the following day, the dangers of which are well documented. 61% of these mothers were able to be present at only one meal a day with their children, i.e., the evening one.

When asked whether they could leave the job to take sick children to the hospital, they agreed but said they would miss the day's pay as they were casual workers. The tendency therefore was to delay going to clinics or dispensaries until it was too late for both themselves and their children.

Discussion

None of the studies mentioned here intended to look at mothers' time in relation to child health but the relationship was observed and therefore looked at more deeply. The findings presented here therefore cannot be conclusive because (i) the sample sizes are not large enough; and (ii) where the sample size was large enough we did not examine child health status.

Despite this there is evidence to support the fact that the longer (number of hours) the mother is away from home or is involved in activities which are incompatible with child care, the higher the mortality and morbidity risk to her children.

In this paper we have seen the difference between the immunisation status of children in group A and B in the section on "Factors contributing to mortality". Children of women who spend over 6 hours away from home had less chances of being taken to the child welfare clinics. There is also a tendency to delay taking them for treatment when they are sick to such an extent that although they are eventually taken, it is often too late. Moreover when medication is obtained, there is nobody at home old enough or competent enough to administer it.

The mother is also unable to oversee the feeding of her children, particularly those unable to feed themselves, either because of age or sickness. This affects their nutritional status. For convenience the mothers cook the food the evening before and leave it for the children to eat the following day. Chances of contamination are high leading to high rates of infections. The repeated infections deplete the health of the children making them so vulnerable that when attacked by measles or malaria they are too weak to fight.

In a situation where the women has to work so hard to support her family it is unfair to blame her for being away from home for so long. What is happening to the children is not a result of negligence as such but a result of circumstances which have so overburdened the women. It has been noted that over 50% of the households in the rural areas of Kadero and Gem Rae are headed by women. This percentage will continue to grow as the man goes out of these low opportunity areas. The woman therefore finds herself playing two roles, that of her husband and her own. On top of this she has the burden of pregnancy. In the Kisumu PHC project areas, the land is so poor that the woman has to work extra hard to get enough food to feed the family, meet school requirements, medical, and other expenses.

What are the possible alternatives to ensure that when women have to be away from home for long periods the children do not suffer?

One alternative is to encourage the women to organise themselves into small groups and provide child day care centres for those who have to be away for long stretches at a time. These do not have to be run on elaborate lines, they could easily be in one of the homes of the members. The women could make rules, e.g., all children coming to the centre must be immunised and treatment must be sought early for any sick child. In such groups, feeding of the children could also be organised in such a way that the children are fed frequently enough and food hygiene is observed. One of the problems perpetuating poor health is the fact that the children are not fed frequently enough as they may have to wait for the mother to come back home. These centres have been tried elsewhere in the world but more so in urban areas with varying degrees of success.

The second alternative is to improve employment opportunities and income generating opportunities for the self employed by bringing them nearer to the people and enabling the mothers to gain enough income without endangering the lives of the children. UNICEF is trying this out in their Child Survival Package in Kisumu but it has not been evaluated for impact yet.

Neither of these alternatives is easy to implement. They have been tried elsewhere with varying degrees of success but this is an area for further research.

A CRITICAL LOOK AT THE ROOTS OF INFANT MORBIDITY AND MORTALITY IN TANZANIA: A CONCEPTUAL AND METHODOLOGICAL APPROACH

by
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Abstract

This paper describes an ongoing study on Child Feeding and Rearing Practices being carried out in the city of Dar es Salaam and in villages involved in the Joint Nutrition Support Programme (JSNP) in Iringa Region in Tanzania. An overall rationale of the study and the methodology used is discussed. It is urged that the question of perinatal morbidity and mortality can be adequately dealt with by examining a host of bio-medical, social, economic and cultural factors likely to influence the health of infants and young children under five years of age. Although most health problems affecting the underfives appear a year or so after birth, some may be caused by the overall care of the mother during pregnancy and after delivery. The study thus examines some of the factors likely to influence the care of mothers during pregnancy and after delivery together with the overall infant feeding and rearing practices. It is envisaged that the information obtained from this study will contribute to the ongoing programmes geared towards child survival and development.

Introduction

Historically, famine is man's greatest enemy. Dreaded as it is, famine has been and continues to haunt mankind. Fortunately when it strikes it immediately captures the community's attention. It is therefore an emergency requiring prompt action. Today, the greatest emergency facing mankind is the "silent emergency" of frequent infections and widespread malnutrition affecting millions of the world's children. These kill about 28,000 children a week worldwide (11). An estimated total of 3,450,000 deaths are currently known to take place in the world from all vaccine preventable childhood diseases. 50% of these are caused by measles followed by tetanus (23%) and pertussis (18%), while the rest claim about 1%. Out of this 1%, diarrhoea claims about 40,000 lives per year in the developing countries.

Most of the annual deaths in the developing countries occur among the underfives. In Tanzania, for example, severe protein energy malnutrition (PEM) causes about 10,000 deaths among this group annually, and it is the underlying cause for

another 50,000 deaths (5). Available data at Muhimbili Medical Centre (MMC) in Dar es Salaam show low birthweight as the prime cause for infant admissions and constituted about 43% of all the infant deaths in 1985/86. This was followed by anaemia (30%), gastroenteritis (19%), measles (17%), and protein energy malnutrition (10%)(8). Child blindness associated with measles occurs in some areas of Tanzania. So far the problem and its causes are not well known. However, 14% of the children admitted at MMC for measles showed some form of corneal destructive lesions. The prime suspect for this problem appears to be malnutrition in general and lack of vitamin A in particular (9). Endemic goiter, avitaminosis, fluorosis and possibly calcium deficiency are other forms of malnutrition found among children in Tanzania (3).

These health problems and their associated infant morbidity and mortality could be reduced through a multiple health programmes approach. These programmes include child spacing, breastfeeding, infant nutrition and growth monitoring along with immunisation, oral rehydration therapy (ORT), and female education. The programmes deal with the health needs of infants and children, and their mothers. Very little information seems to be available on the factors that may influence the provision of such services. The study therefore sets out to examine some of the factors likely to influence care of mothers during pregnancy and after delivery, and infant feeding and rearing practices in Dar es Salaam and Iringa Regions.

Rationale

Concern about child survival is worldwide. Efforts to ensure child survival resulted in a number of programmes including child spacing, breastfeeding, infant nutrition, growth monitoring, oral rehydration therapy, immunization and female education. These programmes deal with major causes of infant morbidity and mortality and are all carried out within the maternal and child health (MCH)framework.

When talking about infant morbidity and mortality a number of causes such as malnutrition, diarrhoea, respiratory infection, malaria and a long list of childhood immunisable diseases have to be taken into account. These problems however, are caused by more than one factor and do not come singly. They cannot therefore be adequately solved through a single programme approach. This has been acknowledged by many health professionals and hence the development of a multiple programme strategy already mentioned for child survival and development. However, the success of these intervention programmes require adequate data on the causes of the disease in question and the factors that may influence such programmes.

Researches have often tended to single out one health problem (i.e. malnutrition) and look into its contributing factors with the intention of developing some interventions. The available data on the causes of malnutrition for example, tend to centre on food shortage as an immediate cause forgetting other contributing factors such as poverty, ignorance and diseases which act either singly or in combination (1). While such explanation may hold in some situations, it may not necessarily be so in others. A survey of nutritional status of 420 mothers in Iringa Region is an example. Among these mothers 124 (30%) were found to have a Body Mass Index (BMI) of less than 20 where 15 (33%) of the 124 mothers were neither pregnant nor lactating. Only 10 (13%) and 99 (44%) were pregnant and lactating respectively, which shows the presence of malnutrition among these mothers before pregnancy, during and after delivery (4). How adequate then would the food shortage factors explain this situation in a region like Iringa which happens to be one of the richest in agricultural food products?

The case of Dar es Salaam is even more disturbing. A recent survey showed that the immunisation programme (6) has a very low coverge for most childhood immunisable diseases. What explanations are there for such findings particularly for a region which has quite a reasonable number of health facilities providing such services? Malnutrition or any other health problem affecting mothers and infants are a product of a complex process in society. It thus requires a critical examination of both food supply together with the overall care for mother and child within the social structure of the society in question. In most societies, care for both mothers and children is determined by the group's social, economic and cultural factors. These factors range from household income, maternal time allocation and child care, household composition, health beliefs and infant feeding practices, characteristics of the infant, pre-lacteal feeding, and weaning practices to disease management. An examination of all these factors will provide comprehensive information on the health problems facing mother and child and will provide answers to some of the questions currently facing child survival and development programme. For example, how does adequate food production together with other family income contribute to the nutritional status of mother and child? What role does the interaction between the children and their parents and other care takers have on their health and development? How does the family manage certain childhood diseases?

These questions and others focus on the complex factors believed to influence mother and child care with consequent morbidity and mortality among infants and children. The information obtained from this study will contribute greatly both to the current research theories in familiar studies, and in the development of national policies for intervention programmes for child survival and development.

Methodology

The study involves two communities: an urban community represented by Dar es Salaam and a rural one represented by Iringa Region. With the introduction of the Joint Nutrition Support Programme (JNSP) in Iringa, the villages involved have been undergoing a variety of changes due to the nature of the activities in the programme. These villages have been exposed to a number of health activities directed at improving the health of mothers and children. Dar es Salaam on the other hand has been experiencing rapid population increase, and a growing number of employed mothers. The changes taking place in the two communities probably have some impact on the health care of mother and child and indeed on the infant morbidity and mortality. We therefore strongly believe that a study of this nature needs to be carried out in both communities.

The study will be done in two phases. Phase I is intended to be cross-sectional and community based. Phase II will be longitudinal or an indepth follow up on specific variables of interest which emerge out of phase I findings. Data in Phase I will be collected through interviews using a structured questionnaire. Since no study of this nature has been done before in the country, a "fishing net" approach is vital, as we cannot at this stage determine the kind of variables that need to be included in the indepth study. The study will also focus on a number of key areas each of which will have several variables.

Unlike in developed countries, data collection techniques in the African countries are limited. Data collection through the mail or telephone calls is not feasible due to limited facilities. For phase I therefore, interviews using a structured questionnaire is the best technique. A self-administered questionnaire can only be used when all the respondents can read and write. To get correct answers some of the questions may need elaboration and probing. This exercise again can only be done through the interviewing technique. Phase II will involve the use of anthropological methods consisting of observations and informal interviews. It is envisaged that phase I of the study will reveal key variables vital in the health care of mother and child. This will be subjected to an indepth study. To elicit the necessary information we consider the combination of informal interviews and observations the best approach based on the accumulated experiences of nutritional studies in the JNSP areas in particular (2). Talking to the mother while observing her perform different health activities (i.e. food preparations, breastfeeding and child feeding), produces more reliable data since the researcher can confirm what is observed by asking questions when necessary.

The data collection techniques described here have their own drawbacks. Researchers have always been concerned about the problems of validity, reliability and replicability of data collection techniques. In interview techniques, there is always

the problem of "interviewer bias" and the tendency of the respondent to provide what is called "socially desirable" answers. Our study may not be free from these problems considering the nature of research assistants we will use. Most of them are undergraduate medical or nursing students with no experience in interviewing except the short training we provide before the actual data collection. We believe that the indepth study will solve some of these problems and make the data more reliable and applicable.

The observation methods to be used in the indepth study have their own drawbacks as well. Many mothers, may act completely differently when preparing food or feeding their children in the presence of the researcher while they in fact do things differently in their daily routine. Although this problem is less obvious for the Iringa study as mothers in JNSP areas are used to similar visits by the programme workers, it is expected to be more obvious for the Dar es Salaam mothers. However, since there is no easy solution to these kind of problems, the study can only try to limit their magnitude.

Study Samples

What we have now is a tentative sampling framework which may need some adjustments after we analyse our pre-testing data. The sampling framework differs from the urban to the rural sample simply because of the varying organizational structures involved.

The target population for phase I of the study consists of mothers in the child bearing age (i.e. 15 - 45 years) who have had at least one child. The JNSP activities in Iringa covers seven divisions each with a number of villages. According to the programme officers who are co-investigators in this study, there are divisions that have high and low performance with regard to programme activities. A random selection of two villages from each of the high and low performance divisions will be made and the households in these villages will constitute our rural sample. A list of all the ten cell household leaders (balozis) for each village will be obtained, and in the company of each balozis all his/her ten cell households will be visited by the research assistants where the mothers will be interviewed.

In the urban population, a multi-stage stratified procedure will be used. The city of Dar es Salaam has three major districts (i.e. Ilala, Temeke, and Kinondoni). Two districts will be randomly selected using a "ballot technique". Each district has 3-4 divisions and again using a "ballot technique" one division will be selected. Normally, a division has a number of wards each with 3-5 CCM branches representing various geographical sections of the ward. Two wards from each division and one CCM branch from each ward will be randomly selected using a "ballot technique". Since each CCM branch has more than 50 ten cell leaders (balozis) a table of random numbers

will be used to select 50% of the balozis from each CCM branch hence from each ward. It is therefore envisaged that at least 1600 households will be visited in the two study areas.

Methodological Problems

So far, two major problems have been identified concerning sample selection and data collection process.

Originally, our intention was to divide our city population into socio-economic status groups i.e. upper, middle or lower classes. This has however not been possible owing to social and economic changes that have taken place in Tanzania. In many cities in Africa these classes could distinctly be identified according to the neighbourhood the individuals live in. This cannot however apply to Dar es Salaam. One for example, may find a good number of people who have no formal education or known "decent job" but are extremely wealthy owning a number of posh houses and cars. These very people command respect from the elite and professionals of all disciplines, and are part and parcel of the "upper class social network".

Some researchers have circumvented this problem by asking questions directly related to socio-economic indicators (i.e. education level, occupation, property ownership etc.), and then forming the class distinctions later based on the data. However, many studies have shown that questions related to one's income are not adequately answered. Many people are not willing to disclose their income or property, others do not know just how much they earn! In our pre-testing, for example, we tried to ask mothers to tell us what part of their family income they thought is spent on food but none could give us such an estimate.

Others have applied observation techniques on some of the indicators mentioned above. Observations are made on the type of house the respondent is living in, the furniture in it and any luxurious items (i.e. television, video, electric or gas cooker, refridgerator, music system, etc). Also, the number of personal cars one has or the presence of government vehicles for his official use have been used as indicators of one's social and economic status.

These approaches may produce some data, however caution needs to be taken in both the interpretation and the use of this data as they can be unreliable and there are issues which the data cannot explain as shown in the following two cases. A messenger with a minimal salary in a Ministry or parastatal organisation in Tanzania may be renting a room from a landlord in town while he/she may have two or more houses renting for six to eight thousand shillings a month. On the other hand, an executive living in a government mansion with a government vehicle at his disposal may fail to provide a decent meal to his pregnant wife and his six children if he relies solely on his monthly salary.

The other methodological problem has to do with the process of data collection particularly among the urban working mothers. Since the study is done during the day, the research team visits the households when some of working mothers are at work. It is not possible to arrange night visits for the research team as this could pose problems from the community. One therefore, has to work late in the evenings and during the weekends to be able to interview working mothers. This limitation affects the data collection process as at times two or more visits may need to be made before any interview can take place. Moreover when interviews are done on the weekends, it becomes an imposition on the respondents' only time to rest from the strains of the week.

Child Care and Mother's Responsibilities

There is alot of data linking mother's economic and family responsibilities with the health and survival of the child. Among traditional societies, breastfeeding used to be regarded as one of those child care activities that was universal and essential and only influenced by maternal health. This is no longer simply the case as the multiplicity of woman's roles and her economic responsibilities have had a great impact on child care. Among the Keneba in Gambia (5), it was observed that the length of time an infant can expect to receive the mother's close and undivided attention and the duration of breastfeeding depends highly on the birth in relation to the farming season. During the dry season, the young infant is always with the mother and nursed on demand since maternal work activities appear to be compatible with this pattern of care and feeding. On the other hand, during the wet season woman's work patterns change with the pressure of agricultural work, therefore she breastfeeds for a shorter period. The implication of this behaviour to family planning constitute yet another area for investigation.

In the urban areas where mothers are likely to be involved in commercial activities throughout the year the situation is different and so is the impact on child's health, morbidity and mortality. In a study done in the Phillipines, Popkin (7) found that with mother's labour force participation, the total household welfare benefitted, but young child welfare suffered. Children from lower income families appear to have been more affected than were upper-income children. Various other studies have also identified a number of problems experienced by working mothers in their efforts to breastfeed their children.

Nursemaids ("ayahs" in Tanzania) are common in many societies. Mgaza's (4) study on infant feeding in Dar es Salaam in Tanzania revealed that 26% of the low income and 15% of the high income employed mothers took time off from their work to take care of their infants. The rest left their children with relatives, grandparents and "ayahs", the latter taking

responsibility of about 40% of the children of low income and 76% of high income employed mothers. The nature of responsibilities delegated to nursemaids include preparations of food and child feeding, house cleaning, washing of family clothes, and other household chores besides taking care of the child. Light as they may tend to be regarded by a working family, these responsibilities are pretty heavy for one nursemaid and in the fear of being reprimanded for not doing the most visible households chores such as house cleaning and the washing of clothes she may ignore the less visible chores which include taking care of the child.

Normally, when child care is delegated to others, especially older children or young nursemaids, the quality and quantity of food given to the infant may suffer. Woolfe's study (12) in Ghana revealed a wide difference in dietary intake between two groups of children, a village group and another group from the orphanage. The difference was attributed to the behaviour of the adults concerned with child feeding. The orphanage staff was reported to play an active role in feeding the children. Meals were supervised, smaller children were assisted in eating and encouraged to eat and were offered a second portion. The village mothers on the other hand, adopted a more indifferent attitude. Smaller children were not offered second portions, and the children were frequently left to feed themselves from a plate left beside them on the ground.

Whether the mother is taking full time responsibility of the child or sharing it with nursemaids, the impact of their involvement in the course of child care can never be seen more than during the infant's transition from breastmilk to mixed foods to full diet. The transition from breastmilk to a mixed diet is critical to the child's health. In some cases, the immune system of the child may not be well developed and new foods can increase risks of contamination and infection. The methods used to feed supplementary foods to the infant may also affect both the quantity of food consumed as well as expose the child to potential pathogens.

The introduction of solid foods is accompanied by a severance process. The period during which the infant is taken from the breast can represent a natural extension of growth and new needs or socially imposed behaviour that is not "anticipated" by the child. From both the psycho-emotional and nutritional point of view, the process of severance can be harmful and traumatic. It thus needs to be done gradually. However, not all weaning is gradual. A sudden realisation by the mother that she is pregnant again does often lead to abrupt weaning. In some cases this may also be caused by inadequate breastmilk (1).

Finally, the key and most vital role the mother plays besides the ones mentioned earlier is that of a family nurse. Her role includes minor diagnosis of the health problems, the treatment of those she can manage, and the referral of the

difficult ones to the health workers at a nearby health centre or dispensary. Thus, her ability to assess the state of her child's health as well as her understanding of her child's special needs during illness influence both the care of the child and the management of the disease in question. While malnutrition among infants and young children is often caused by inadequate food supply, poor intake or poor quality of food, it can also be caused by infection and resulting debilitation. Frequent diarrhoea disease for young infants and children if not appropriately treated can effectively produce malnutrition. The manner in which the sick infant is treated or a healthy one is provided with the necessary health care (i.e. growth monitoring, vaccination etc), depends a great deal on the mother's overall knowledge and the attitudes and beliefs of the family, local health care practices, and health system. Apparently, these also vary from rural to urban communities.

Data Source

We have seen how child's care may vary both with mother's responsibilities and the environmental situation. Whether in the rural or urban context, the mother appears to be the central source of care although others (i.e. relatives, nursemaids, etc), may occassionally assist. Indeed, in our African communities, as much as the father is the key breadwinner for the family, his responsibility tends to stop at that and he plays a small role in the day to day care of the child. Vital health matters like clinic visits for the child's immunisation and evaluation are left to the mother. Any reliable information pertaining to child care should therefore come from the mother and not the father. We strongly believe that only the mother can provide information on both the care she gets during pregnancy and after delivery, as well as the nature of the activities she is involved in, and the type of assistance she gets from other people.

It is envisaged that such care, her daily activities both in and outside the household (e.g. farm, public or private employment), and the type of assistance she gets will have a great impact on her health and that of the child. We have acknowledged that mother's responsibilities vary between rural and urban environments. Such variations are also likely to affect the child's care and consequently its survival and development. There is thus a need to study both communities.

Pre-test findings

A hundred mothers were selected randomly and interviewed in Ilala District in Dar es Salaam and in two villages in Iringa Region respectively. Interviews were carried out using four types of research instruments. The first one focussed on general

information about the family of the respondent, her domestic and economic responsibilities, and on food availability and distribution. The second instrument looked at the care of the mother and the nature of her workload during pregnancy. This was followed by the third instrument which concentrated on labour, delivery, and neonatal care including child feeding and weaning practices. Lastly, the fourth instrument dealt with the child's health and family planning. I have to admit that we were a bit ambitious in our research instrument design and wanted too much detailed information. This resulted in a longer questionnaire than expected. The pretesting however, cleared some misconceptions that we had in the whole approach to data collection.

In most studies, for example, researchers prefer to ask some indirect questions before they move into more direct ones. This is the approach we took in our pre-testing. Unfortunately, the responses we got from both the indirect and direct questions were far from our expectations. Take for example the following questions: Where do pregnant mothers go for care? Who do you think an expectant mother should see for health counselling? In both questions the answers were to the clinic or a doctor at the clinic. Our interest in both questions was to elicit information on the alternative sources of health care (i.e. TBAs, traditional healers, etc.), which may be used by these mothers besides the clinic. Indeed, when these questions were followed by a direct question such as who did you see for health care when you were pregnant, the answers were more or less the same (i.e. doctor or nurse at the clinic).

However, these observations do not in any way discourage the use of this approach in other studies. What they simply do is show us that the approach may not be as effective in this particular study. It alerts us further on the kind of caution we need to take not only in conducting interviews but also in the interpretation of the information obtained. Furthermore, the introduction of MCH services in both urban and rural areas and the recent campaigns on child nutrition, vaccinations, and many other related programs aimed at child survival and development have undoubtedly made mothers more aware of the kind of services they and their children need. Such awareness is likely to influence respondents to provide some "socially desirable" responses to the interviewers particularly when the latter happen to be working in the health field. Thus, for questions eliciting health behaviour that is being promoted by MCH services, the chances are that mothers would most likely give responses relevant to the expected behaviour.

Data on mother's household chores and responsibilities also need a careful approach both in terms of collection and interpretation particularly when time spent on such chores is used as a measure of mother's workload. Water fetching, for example, is a social activity for many mothers in both urban and

rural areas in the African culture. This activity plays an important role in many aspects of woman's life and her family. While at the water source, mothers gossip about a lot of things including the health problems of their children, breastfeeding, infant feeding, family planning, and many others.

Through these encounters, mothers acquire new information that may influence behaviour related to both their own care and that of their children. Thus, the time quoted as spent on fetching water may include that spent on such gossips.

A familiar problem was observed on the hours spent on firewood collection for mothers in the rural areas. Quite often, mothers would combine the firewood collection with other farmwork, hence the time spent on the actual firewood collection may not be well estimated.

Care of the child in the mother's absence is another area which needs attention. Our expectations were that the mother would leave the child behind when she leaves the house for her domestic or economic activities. Surprisingly, with the exception of employed mothers, almost all mothers carry their children along when they leave the house to fetch water, collect firewood, or go to the farm. Related to this positive behaviour is the issue of breastfeeding. Breastfeeding for many mothers in our culture takes place mostly on demand as opposed to a specified schedule since the mother is with the child most of the time.

Although the study instruments were able to elicit relevant, and reliable information on the mother's responsibilities, workload, and overall care during pregnancy and after delivery, they may not be as adequate in getting information on the day to day care of the child. It is therefore envisaged that the findings of the main study will be supplemented by an indepth study using anthropological methods such as participant observation on a small sample of mothers from the communities involved. This approach will more likely obtain information of what is actually taking place in the day to day care of the child. It will, for example, provide data on how the mother prepares the child's food and feeds the child, what hygiene conditions the child is kept in, and above all, the nature of mother/child interaction which is vital for the child's psychological development.

Implications of the study findings

So far, only a pretesting of the study instruments has been done. The actual data collection is to start soon since the study instruments have already been adjusted based on the pretesting data.

The study findings will have at least four major implications. First, its implication on social structural theory. The study is one of its kind to look at a cross section of factors influencing the care of mother and child. The findings are going to show the kind of influence such factors have upon the care of mother and child and how they actually work together or separately to do so. The study therefore takes a keen interest in the role of social structure in determining the best source of data in light of the existing social organizational structure. For example, we have already seen that mothers, as opposed to fathers in the African social organizational structure seem to be the best source of data since they are the ones responsible for the care of children, consequently more likely to provide information relevant to such an exercise.

Secondly, the information obtained from this study will constitute a data source for researchers interested in some specific variable assumed to influence mother and child care. Furthermore, the methodological approach used will also contribute alot to both current and future studies. The combination of interviews with the observation techniques to be used in phase II of the study for example, will probably solve the problem of "social desirable" responses which many studies using interviewing techniques alone are facing.

A sound social or health policy requires adequate and relevant information. Such information is mainly obtained through empirical studies. We are currently seeing great contributions from social sciences towards this objective. The third implication of the study finding can therefore be seen in relation to health policy matters. Based on the findings, the Ministry of Health may have to review some of its old policies or develop some new ones to address the needs of the mother and child. In the case of breastfeeding, for example, the study findings may appear to support the need for a policy that will provide longer maternity leave for working mothers or the provision of creches in the work place to enable mothers to breastfeed their infants while at work. This will contribute both to infant nutrition and towards family planning. The findings may also call for a National Family Planning Policy aimed at providing better guidance and support for the existing social organs (i.e. UMATI) currently delivering such services should it be felt that such a move would improve child survival and development. Similar policies may also be developed to address other problems pertaining to mother and child should the data support such action.

Lastly, data obtained from this study will also contribute to ongoing intervention programmes on child survival and development.

Conclusion

Child survival and development is influenced by a number of factors which are embedded in the social milieu of the community. Thus, the effective planning and implementation of health intervention programmes geared towards this goal needs to address the underlying bio-social, cultural, economic and environmental factors likely to influence the health of mother and child. Unfortunately very little data are available on how these factors interact and influence the health of mother and child. This study aims at doing that. It is hoped that through these kind of studies we will be able to understand why our children are suffering and dying from malnutrition, diarrhoea, and the childhood immunisable diseases despite the existence of adequate food supply and health care facilities. We strongly believe that an understanding of the causes of infant morbidity and mortality should not focus on the child alone but on the kind of care the mother gets right from the child's conception through delivery, and the kind of care the mother and child get after delivery since such care has a great bearing on the child's survival and development.

It is hoped that data obtained from this study will contribute to some of the ongoing child survival and development programmes. In the same vein, the success of these programmes will have high implications for the problem of infant morbidity and mortality.

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FOCUS GROUP DISCUSSION METHOD (FGD) AS A SUPPLEMENTARY TOOL FOR THE STUDY OF SOCIO-CULTURAL DETERMINANTS OF INFANT MORTALITY: A CASE STUDY OF KENYA

by
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Introduction

Analysing mortality in a given population is a complex issue since it relates to interrelated biological, social, economic, and cultural factors of the individuals, their families and the whole community. (Newland 1980, Fleg 1982, WHO 1981).

Newland argues that the effects of the physical environment on a child's chance of survival depends heavily on its parent's economic and personal resources. Their ability to cope with the challenges of seeing an infant through the first year is determined by their income, knowledge of the resources available and their skills in using them.

It has further been argued that solutions to the reduction of infant child mortality in the developing world can be found in the multiple approach which considers socio-economic factors, cultural and environmental factors and their interrelationships as determinants of mortality in a given society.

This line of reasoning was underscored at the Bucharest Conference by the World Health Organization and the Conference on the Socio-Economic determinants of mortality in Mexico City (W.H.O. 1974, IUSSP 1979).

In reaffirming the role of social and economic progress as a condition of the continuation of mortality decline, the World Health Organization observed that:

> The view that declining mortality in less developed countries can be attributed entirely to public health has proved to be an over-simplification of a rather complicated set of interrelated facts, and by no means a straight forward cause-effect relationship. It appears plausable to assume that a certain take off into development is a pre-requisite for entering into a phase of rapid falling mortality. Efficient government, progress in education and road communications play an important role in the initial stage. Once the decline is on the way, public health measures supported and co-ordinated in many cases at an international level, become increasingly operative.

> Accessibility of an efficient health service infrastructure and a vigorous health policy together with overall progress in the socio-economic field then determine the extent and pace of further gains.

Indeed, while not underestimating the potential of public health measures in further mortality improvements, the WHO concludes that:

> ...actual progress will be determined by a multiplicity of problems whose solution is, generally speaking, not yet readily in sight. Mortality prospect cannot be assessed in a mechanical way isolated from prospective changes in the societal milieu, nor can the experience of other countries be borrowed where their initial experience may have been radically different. A thorough review of the economic and social situation, both current and projected, should be an indispensable prerequisite for a realistic assessment of future trends.

Most studies have focused on the analysis of selected socio-economic factors which are not adequately related to each other nor to other remaining factors (environmental, cultural, and physical). This is because a lot of emphasis has been put on surveys and population censuses as methods of data collection.

Thus, while it has been possible to collect information relating to the various socio-economic factors such as education, income, place of residence, age of mother, number of children, etc., it has not been possible to include information on the socio-cultural behaviour, attitudes and practices of communities as this relates to diseases and nutrition. Collecting such data requires more focused methods of data collection. Hence the need for applying the more qualitative anthropological community-based methods.

This paper outlines how the focus group discussion method (FGD) will be applied to two communities in Kenya in an effort to collect more detailed socio-cultural as well as environmental data that will help supplement the data already collected through the sample surveys and censuses in the country.

The paper justifies the need for such a study by pointing out the gaps in the current collection of mortality data which emphasizes surveys and censuses, and then outlines the methodology to be followed. This includes the scope of the study, i.e. the study area, the study sample selection, kind of data to be collected, how the method operates, data analysis, and some of the advantages and disadvantages of the method. The need for small scale, more focused studies is emphasized in the conclusion.

Justification for the study

Many studies done in Kenya have shown that infant mortality conditions in the country are closely related to a number of socio-economic factors such as education, income, housing, social class, etc. It has also been shown that these mortality conditions differ from region to region, this being reinforced by physical and socio-cultural factors. The role of demographic factors, especially the age of the mother, the number of children she has had, and the birth frequency in determining infant mortality has also been emphasized. (Mott 1980, Muganzi 1984, Anker and Knowles, 1978). In some cases, the environmental factors have been found to play an important part.

These studies, however, have been based on data collected through sample surveys and population censuses. Indeed some surveys in the country have provided rich enough data for estimating mortality at the micro-level, especially using demographic factors. But as we have pointed out, these data are not detailed enough to provide explanations for the observed mortality differentials. Detailed data on the socio-cultural behaviour of the individuals and their practices and attitudes regarding their feeding habits, disease treatment, nutrition, etc., is lacking. Information on maternal time allocation and child care, household compositions, health beliefs, infant feeding habits, weaning practices etc., is needed.

All this information cannot be collected in the surveys or population censuses because of the limitation of the questionnaire and time constraints. Thus, the need to collect this data through the more appropriate focus group discussion method.

Moreover, most of the surveys done in the country have been at the national level. There are very few if any, regionally based surveys focussing on particular problems. For example it has been shown that the high infant mortality conditions in some regions in the country (Nyanza, Western, and Coast) are generally due to low socio-economic development, but mainly also due to the high incidence of malaria caused by climate and physical factors. Socio-cultural factors may also be acting directly to reinforce these mortality conditions. But there has been no surveys focussing specifically on these areas to collect detailed information that could elaborate those findings.

This study is therefore an attempt to fill this gap by applying the focus group discussion method in the study area (South Nyanza and Taita Taveta Districts). The aim is to collect more detailed information specific to the region at the community level to explain why infant mortality remains persistently high in the region.

Methodology

(a) Study Area

The study will be done in South Nyanza District in Nyanza Province of Western Kenya and Taita-Taveta District in Coast Province. The choice of these two districts was due to a number of factors:

(i) South Nyanza has the highest infant and child mortality in the country compared to Taita-Taveta, i.e., 216 per 1000 and 116 per 1000 respectively.
(ii) The inhabitants of the two districts are culturally and economically different. In general terms Taita-Taveta is considered more economically well off than South Nyanza.
(iii) Geographically South Nyanza is located in the Lake basin while Taita-Taveta is inland on the plateau. Malaria is also very high, especially in South Nyanza.

Thus, from these contrasting factors (and many others), we hope that enough detailed data will be collected both at the macro and the micro level which will explain the large mortality differentials observed. It is also hoped that detailed information which will explain the persistent high variation in mortality both between and within the districts will be collected.

(b) Study Samples

We hope that in the two Districts, random stratified sampling will be used in the selection of the study population. In South Nyanza, two locations will randomly be selected from both the high and the low regions which portray completely different mortality patterns. The regions are also different in economic activities; the low one is very dry while the highland is agriculturally rich. Random sampling will then be applied further in the two locations to select two sublocations where the study will be carried out. The same procedures will be applied in Taita-Taveta District.

(c) Data to be collected

Additional data giving more information on mortality determinants will be sought. To achieve this, various kinds of data will be collected.

(i) General:

Information giving a general socio-economic overview of the district will be collected. Such information

will include the number and distribution of health services in the district by various administrative units, economic activities carried out in the different regions of the district, e.g. agriculture, fishing, etc., communication networks, transport facilities, major sources of water, etc.

(ii) Detailed Data:

Using trained community workers, detailed information on the following issues will be collected from groups of villagers:

- -kinds of diseases common in the area, how they are treated, when and where, by whom, and why that person.
- -perception about the various diseases in the community
- -food types in the community, who does what in the distribution and provision of food at household level; eating patterns, food customs and practices, eating habits, etc.
- -maternal care of infants; time spent on child, breastfeeding periods, weaning practices, etc.
- -antenatal care as dictated by traditional vis à vis the modern clinic. Where do they go for care and why.
- -the role of family planning among the community.
- -the status of sanitation, water sources, transportation system, housing quality, etc.

Apart from collecting the above data through focus group discussions, we hope to conduct a follow up of a sample of women to find the practical aspects of the information as given in the various group sessions. A detailed questionnaire will be administered to these women to collect both demographic as well as socio-economic data.

(iii) Hospital Data:

We hope to collect some data from the district hospital in an effort to ascertain the kinds of diseases in the area. This will also verify the other causes of deaths as may be recorded only in the hospital. This information will only be supplementary to the primary data we hope to collect through the group discussion sessions and the questionnaire interviews.

(d) The Use of Focus Group Discussion (FGD)

In order to carry out the FGD, a number of things will have to be done:

(i) After identifying our study sample population, we shall explain to the local leaders including the assistant chiefs, the purpose and aims of our study so as to involve them in the whole project.

(ii) We shall then identify various women community workers whom we shall train to execute the FGD's technique/method. One woman will be chosen as the Field Project Coordinator to help in day to day activities of the project. This will probably be a mature, retired health worker who knows more about the communities to be covered.

(iii) We shall then select the groups of 10 - 15 people to be interviewed in each village.

(iv) The interview will involve:
(a) the two principal researchers as general moderators
(b) the women co-ordinator as assistant
(c) tape recording of all the discussions
(d) three research assistants will take notes of the proceedings
(e) the trained women workers to carry out the interview, i.e. the communication of the themes and responses.

(v) In addition, the research team has the advantage of having as one of the Research Associates a University Professor who comes from the same area and who has used the method many times in collecting data on fertility in the area.

(e) Data Analysis

In the data analysis we will apply both quantitative and qualitative techniques. For demographic estimates, we will use a number of techniques to derive such measures as infant motality rates, child mortality, crude death rates, etc.

For the group discussion data, the two to three trained research assistants who are versed in the local language and data extraction will transcribe the tape recorded points expressed by the participants. The transcripts will be compared with those put down by the clerks during the interview as well as those taken down by the principal researchers. All information will then be analysed.

At another level, the interrelationships between the various socio-economic variables and mortality will be analysed through multivariate analysis. We hope that the focus group analysis will account for the observed mortality estimates.

Methodological Problems

We pointed out earlier that the aim of applying the focus group discussion method is to go beyond the known factors and get to the root of the community's perception about the issues and practices that affect their daily lives. This in essence forms the guide to policy makers and implementers when deciding on what intervention measures will be taken for which community and when.

When well conducted, the FGD method reveals those inner feelings of the people which could not be easily extracted during a snap shot formal interview. It allows individuals to argue on given issues, correcting each other in the process of trying to remember certain events or names of practices, or even cultural norms that are rare.

However, such data, rich as they may be, requires careful collection procedures and analysis. They take time to analyse but if done well, tell a lot about a given society as to why and how events happen the way they do.

One of the problems is the possibility of having an influencial person in the group whose presence may not allow the rest to freely say what they want to say. This calls for the careful selection of the group.

The other factor relates to extracting the data from the tapes. This requires an experienced person who understands the various concepts used during the discussion. This is because some concepts may have several meanings and misinterpretations may mean wrong implications for policy formulation.

There should also be little interference from the authorities from all levels so that people can express themselves freely.

On the whole, we hope that these and other issues relating to the collection, analysis and dissemination of data will be given due consideration throughout the duration of the project. Such measures will include close field supervision, field observation of the events in the local settings, limited but adequate follow up interviews of selected couples, and above all, thorough training of the personnel to be involved in the project.

Conclusion

We have seen that various socio-economic, geographic, as well as environmental factors do interact to influence infant and child survival at the tender ages. The above interrelationships have been shown to exist by the analysis of data collected through censuses and surveys.

However, even at the societal level, interrelationships are further reinforced by numerous cultural customs, practices, and norms which in most cases helps to sustain the differentials as seen in various communities and regions. Adequate data on these socio-cultural factors and practices have not been put together to afford any reasonable analysis, and therefore explanation.

This study is therefore an attempt to go beyond the census and surveys and listen to the people themselves converse freely about what they feel are the problems in their community. We hope that this information will be a useful guide to the appropiate formulation of measures in the regions in question and in other regions in the country.

The need for a small scale intensive probing research design at the regional level is well in line with the current government development strategy of District Focus for Rural Development. The aim of this strategy is to focus on each region, i.e. the district, and depending on the existing resources and social structure, formulate strategies that will effectively use them for the benefit of all the region.

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MONITORING AND EVALUATION OF HEALTH INTERVENTIONS: AGE- AND CAUSE-SPECIFIC MORTALITY AND MORBIDITY IN CHILDHOOD

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Introduction

Monitoring and evaluation of health (and nutrition) interventions are essential elements in strategies aimed at improving the health status of populations (e.g. WHO, 1981a). Sound monitoring and evaluation has direct benefits for programme implementation, especially in reaching underprivileged groups, and long-term effects on the development of more (cost)effective strategies. A number of reviewers have reported the scarcity of good evaluations of health and nutrition interventions (e.g. Gwatkin et al., 1980). It is, however, imperative to monitor the effects of relatively new approaches in health care such as the Child Survival and Development Revolution, advocated by UNICEF, which focuses on low-cost simple measures and Primary Health Care as a strategy toward Health for All by the year 2000.

We use several indicators in evaluating the effects of health and nutrition interventions. The common ones are infant mortality, crude death rate, nutritional status of under-fives, and sometimes disease-specific mortality and morbidity rates. Hitherto, age-specific and disease-specific data have hardly been used in combination to monitor and evaluate the impact of interventions, even though patterns of death and disease tend to vary greatly with the age of the child. This paper will argue that the understanding of childhood mortality and morbidity can be increased and the quality of health planning and of evaluations improved by analysing age-specific mortality and morbidity data.

Age and cause-specific data have not been used much in evaluations of health and nutrition interventions, because it requires an integration of knowledge of the social and medical sciences, and particularly of epidemiology and demography. Such integration has been limited in the past (Mosley and Chen, 1984). Recently, a number of authors have attempted to develop analytical frameworks for the study of child survival and development. These frameworks incorporated both socio- and biological covariates of child health and integrate methods employed by social and medical scientists.

The use of causes of death in mortality studies has many problems. Classifications of causes of death have been based on the assumption that there is an underlying cause of death defined as the disease or injury that initiates the train of morbid events leading directly to death. Little attention is usually

given to the contributory causes, classified in a complex coding system, that does not improve the accuracy of the causes of death (Gray, 1985). However, the majority of childhood deaths in developing countries have multiple causes. Death often results from the cumulative effects of recurrent illness in combination with impaired nutrition (Mosley and Chen, 1984). Hence, evaluations need to take into account synergistic relationships between the target diseases and other diseases or causes of death (Ewbank, 1984).

In addition, there are difficulties in data collection as diagnoses of the causes of death are frequently inaccurate due to misdiagnosis, misclassification and preferences for certain diagnoses. To improve cause of death reporting using lay or paramedical personnel, simple classification of causes of death including only the most relevant diseases are required (Gray, 1985).

Breakdowns of mortality and morbidity data by age require larger sample sizes and accurate information on the child's age. On the other hand, a detailed description of expected benefits of the programme by age and cause can greatly reduce the sample size required to demonstrate programme impact. For example, in the evaluation of the impact of a programme to eliminate neonatal tetanus the required sample size can be reduced by a factor of almost two by focusing on the neonatal mortality rate rather than the infant mortality rate (Ewbank, 1984).

General patterns of mortality and morbidity by age

Physiological considerations

Large differentials in risks of mortality and, to a lesser extent, morbidity have been observed by the age of the child. The general pattern is a rapid decrease of mortality with the ageing of the child. This should be associated with changing morbidity patterns by age (incidence) and the changing relationship between morbidity and mortality by age (case fatality).

Case fatality from gastrointestinal infections is high in childhood as the biological risk of dehydration is very high, but decrease with the ageing of the child (Lowley, 1979). The risk of contracting lower respiratory tract infections is much higher in infants because of a number of physiological differences with older children and adults. The resistance against infections is strongly impaired during the first two years of life which affects both incidence and case fatality. Shortly after birth maternal antibodies provide temporary protection against certain diseases.

Mortality by age

Data from the World Fertility Survey (Rutstein, 1984) show that about 30-33% of all under-five deaths take place in the neonatal period and a similar percentage during post neonatal period. If mortality declines significantly neonatal mortality becomes more than 40% of all under-five deaths (Figure 1). Toddler Mortality (1 year) causes 12-18% and child mortality (2-4 years) 15-20%, with the exception of very high mortality countries in which child deaths account for a quarter of all under-five deaths. At lower levels of mortality toddler and child mortality account for approximately 10% each of under-five mortality.

Data from studies in which infant mortality rates were higher than 50 per 1,000 in Latin America (selected from Puffer and Serrano, 1973) present a similar pattern, although postneonatal mortality is more important (45%) and child mortality less important (less than 10%).

The daily mortality risk declines rapidly during the neonatal period. Reviewing data from Latin America (Puffer and Serrano, 1973), Kenya (Omondi-Odhiambo et al. 1984), Brazil (Victora et al., 1985) and Mauritius (WHO, 1981b), it can be concluded that of all neonatal deaths at levels of neonatal mortality of 20 per 1,000 live births and over, approximately 35% die during the first 24 hours after birth, 35% during the second to sixth day and 30% during the second to fourth week.

After the neonatal period mortality risks decrease gradually although a number of studies report a stagnation or increase at ages 6-24 months. Bourgeois-Pichat (1951) introduced a simple biometric method to depict mortality after the neonatal period. The cumulative number of deaths by the age of the child in days(n) on the scale $\log^3 (n+1)$ results in a straight line. In African countries a sudden increase of the slope of the line can be observed during the second half of infancy. This phase of excess mortality disappears between 24 and 36 months of age (Cantrelle, 1980) (see Figure 2). The increase in monthly mortality risk at ages 6 to 18-24 months appears to be more pronounced in West African countries (Blacker et al., 1985, Duboz, 1984).

Mortality by cause

Table 1 presents the percentages of deaths attributable to specific causes in specific age intervals in four studies. During infancy perinatal causes are the leading underlying cause, but in the Bangladesh study, neonatal tetanus comes out first. Gastrointestinal and respiratory causes are related to approximately one-fifth of all infant deaths each.

A separate study of neonatal and post-neonatal deaths provides more insight. Perinatal problems which include anoxic, hypoxic conditions, maternal conditions, conditions of placenta and cord, and immaturity are most prominent during the first month causing two-thirds of all neonatal deaths. The PAHO study showed that immaturity (birth weight less than 2.501 grams) was very important as an associated cause. Death rates from immaturity as an underlying or associated cause exceeded 20 per 1000 live births in many projects (Puffer and Serrano, 1973).

During the postneonatal period diarrhoeal disorders are the leading cause, followed by respiratory causes. They both account for two-thirds of all postneonatal deaths. Measles is associated with 4-14%, whereas pertussis, malaria (fever), and other infections cause about 5% of the deaths each. Nutritional deficiencies are rarely an underlying cause of death, but, as reported in the PAHO study, very frequently an associated cause in areas of Latin America. The infant death rate for nutritional deficiency as an underlying or associated cause varied from 6-37 per 1000 live births. 61% of the deaths from infectious diseases had nutritional deficiencies as an associated cause, as compared with only 33% of deaths from other causes. This indicates the importance of the nutritional state of the host in the development of infection (Puffer, 1984).

During the second year of life, diarrhoeal disorders are still an important cause, but not as prominent as during the postneonatal period. Measles is now very important and may account for almost half of the deaths, such as in the Kenyan study. Respiratory diseases account for slightly less than 20% and rank third while nutritional deficiencies are an underlying cause for about 10%. In addition, nutritional deficiencies are an associated cause in 25% of all toddler deaths. It is remarkable that measles is hardly ever mentioned as an associated cause, suggesting that there is a preference for recording measles as a primary cause of death.

At ages 2-4 years, measles is still the leading cause of deaths (about 20-25%), with gastrointestinal infections, respiratory diseases, other infections, nutritional deficiencies, and external causes leading to 10 - 20% each. In the Bangladesh study (1-4 years) diarrhoea causes almost half of all deaths. As associated causes,nutritional deficiencies and also respiratory diseases are important (23% each). The mean percentages of 7 studies in West Africa show that measles and gastroenteritis were the leading causes at ages 1-4 years (23% each) followed by acute respiratory infections including pertussis (10%) and malaria/fever (10%) (Cantrelle, 1980).

Morbidity and Growth

The general age pattern of morbidity is not as well described as for mortality. A few studies indicate that the general burden of morbidity is highest during the second year of

life, followed by the first and third years of life (Mata, 1978, McAuliffe et al., 1985). For individual diseases age-specific data are available and will be discussed in the next section.

In a review of growth studies Martorell and Habicht (1986) conclude that there is wide variation found in studies of growth among poor children in developing countries. This is in regard to when children begin to fall significantly behind in growth and in the degree to which they do it. However, the "patterns" of growth retardation are similar. The growth of infants in tropical countries is often adequate for the first 3-6 months. Faltering starts between 3-9 months and continues into the second year of life. Mortality risks are substantially increased for severely malnourished children, particularly at ages 6-11 months (Kielmann and McCord, 1978) and 13-23 months (Chen et al., 1980).

Studies in developed and developing countries have demonstrated the importance of birthweight as a determinant of survival and development chances of a child (e.g. Ashworth and Feachem, 1985, WHO, 1984). The differential risk of mortality between low birth weight and normal birth weight children decreases rapidly with the ageing of the child.

Less evidence is available on increased morbidity or growth faltering among low birthweight infants. In a longitudinal study in Guatemala, Mata (1978) found that low birth weight infants have higher diarrhoea morbidity. On the other hand, it was observed in rural Kenya that the velocity of growth of low birth weight (LBW) children did not differ from normal birthweight children (Jansen et al., 1984). They however, remained persistently smaller.

Framework including age

Figure 3 displays a framework of infant and child mortality and morbidity that incorporates the age of the child. The basic relationship is the calculation of mortality rates as a product of morbidity (referring to disease incidence) and case fatality. The inner part of the framework consists entirely of biological processes, which can be measured.

- Arrow 1 indicates the relationship between age of the child and the case fatality rate. To a certain extent curative services may influence this relationship.

- 2 is the association between nutritional status of the child and case fatality. Curative services may affect this association.

- 3 shows the variation of morbidity patterns by age, although much less marked than mortality by age. It operates through variation in exposure to infectious agents by age. This is

influenced by many socio-economic and other variables, such as immunisation or immunity transferred by breastmilk or maternal antibodies (susceptibility).

- 4 indicates the well-established impact of infections/morbid conditions on nutritional status. Duration, severity and type of disease determine the magnitude of the nutritional impact. Factors, such as curative services, breastfeeding or level of child care, may influence this relationship. Nutritional status itself affects duration and severity of infections and thus the nutritional consequences of infection. The nutritional intake is the other important factor influencing nutritional status.

- 5 male children are included as they are known to have higher mortality early in life, entirely for biological reasons.

Diseases

This section deals with the age-specific mortality and morbidity patterns of measles, pertussis, diarrhoea or gastroenteritis, acute respiratory infections, tetanus and malaria.

Measles

Measles morbidity has a typical age distribution in populations that are not protected by immunisation. During the first few months of life, infants are protected against measles infection by antibodies acquired from their mothers. Consequently, measles is rarely seen under the age of 6 months and not frequently at ages 6-8 months. The attack rate increases rapidly at ages 9-11 months and the proportion susceptible reaches a maximum during the second year of life (Cvjetanovic et al., 1982). The eventual age-specific incidence of measles depends on several factors: population density, morbidity of children (Leeuwenburg et al., 1984), child rearing practices (Foster, 1984), birth rate (Remme et al., 1984) and immunisation coverage. The infectivity of measles virus is so high that virtually all persons in a given population will be infected some time during their childhood. Most studies in the developing countries report a median age of infection of 2 - 2 1/2 years with a maximum at age 1 (Leeuwenburg et al., 1984, Chin and Thaung, 1984, Remme et al., 1984).

Case fatality rates vary from 1 to more than 6%. Recent longitudinal studies report 1-2% in Burma (Chin and Thaung, 1984), 3.7% in Bangladesh (Koster et al., 1983), a 4.8% in the Gambia (Hull et al., 1983), 6.1% in Zaire (Kasongo Project Team, 1981), and 2.4% in Kenya (Leeuwenburg et al., 1984). Aaby et al. (1984) reported even 24% in Guinea-Bissao. The risk of measles mortality depends upon age of infection, nutritional

status, type and severity of complications, availability of medical care (Foster, 1984), and cultural practices. Studies in Guinea-Bissau (Aaby et al., 1984) and historical England (Aaby et al., 1986) showed that the measles case fatality rate was higher in houses with several cases than in homes with one case. There is variation of case fatality rates (CFRs) by age. In the studies summarized in Table 2 case fatality rate is maximum at age 1, followed by the second half of infancy and the third year of life.

Pertussis

Little research has been done on pertussis or whooping cough as compared to measles. Population-based studies are rare. The majority of children get whooping cough sometime in their childhood if not immunised. In a study in rural Kenya (Muller et al., 1984) the median age of attack was 3-5 years. The incidence did not vary markedly under the age of 5 years, but was slightly higher in infancy with an annual incidence of 35 per 1000 children.

The epidemiologic pattern of pertussis also depends strongly on population-density. In urban areas pertussis is endemic and most children are infected in the first year of life. In rural areas epidemics occur at infrequent intervals.

Pertussis mortality is influenced by age of infection and complications. In the Kenyan study the case fatality rate was 1.0% and highest in children under 1 (2.6%). The case fatality rates (CFR) did not vary much between 1 and 4.

Diarrhoea

In a review of data from 24 longitudinal studies, marked variation in diarrhoeal morbidity rates were found. (Snyder and Merson, 1982). All studies reported the highest incidence in children under 2 years old. Median morbidity rates were highest at ages 6-11 months (3.0 episodes per year), followed by 12-23 months (2.7) and 0-5 months (2.3). At age 2 years, a median of 1.4 episodes per year occurred, declining to 1.1 and 0.5 episodes at ages 3 and 4 years respectively. The age pattern of diarrhoea morbidity varies by causative agent. For example, incidence of diarrhoea caused by rotavirus reaches a peak at ages 6-23 months (de Zoysa and Feachem, 1985).

In all studies reviewed by Snyder and Merson (1982) the highest mortality rates were in children under 2 years of age (about 20/1000 population), with almost no difference between children aged 0-11 and 12-23 months. At ages 2-4 years a 3-fold reduction in the mortality was observed. Studies in Kenya, India, Guatamala and Costa Rica considered smaller age groups and showed that mortality rates are highest at ages 6-11 months and much lower at age 0-5 months (Leeuwenburg et al., 1978, Scrimshaw

et al., 1968, Mata, 1985). Mortality is also higher at age 12-17 months than 18-23 months (Scrimshaw et al., 1968). It is unclear whether mortality differentials by age are attributable to incidence or case-fatality differences. Case-fatality rates are likely to vary by causative agent.

Acute respiratory infections (ARI)

There is a significant decline of incidence of both upper and lower respiratory tract infections by age (e.g. Riley, 1985). In a longitudinal study in Guatemala, Mata (1978) detected averages of 5.9, 7.0 and 6.3 respiratory disease episodes per child during the first, second, and third years of life. About 40% were attributed to lower respiratory tract infections. Mata also reported a longer duration of symptoms of upper respiratory tract infections in children 0-5 months (8.6 days) and a decrease to 6.9 days at the end of the third year. In another longitudinal study in Brazil, respiratory diseases were found to be the most common disorders in children under five years, with approximately 8 episodes per year per child in infancy, 9 during the second year of life and 7.5 at ages 2-4 years (McAuliffe et al., 1985). Under age 1 there is a predominance of specific etiological agents (PAHO, 1983).

Differentials by level of ARI mortality between populations are larger than for morbidity. The case-fatality rate of lower respiratory infections in infancy is very high: 4.1% of severe cases dies in infancy, and at ages 1-4 years a case fatality rate of 2.4% has been found for severe cases (Foster, 1984). The younger the child the higher the risk.

Neonatal tetanus

Neonatal tetanus (NNT) has been overlooked in the past as an important cause of neonatal death. An extensive review by Stanfield and Galazka (1985) indicated that neonatal tetanus rates, vary from 5 to 60 per 1000 live births. The case fatality rate of neonatal tetanus is as high as 70-90%, without treatment and even with expert medical care is seldom less than 50% (Foster, 1984).

The age-specific mortality pattern of NNT is very characteristic. During the first two days when mortality due to perinatal causes and low birthweight is very high, NNT mortality is virtually zero. This is due to the incubation period and time between sickness and death. The number of deaths rapidly rises from day 3-4 to reach a peak on day 7 or 8 and then declines more slowly up to the end of the neonatal period. More than 90% of tetanus deaths identified in several community surveys occurred in the first weeks of life.

Malaria

In Africa malaria is a major problem in childhood and thereafter. According to Bradley and Keymer (1984) in the holoendemic areas of West and East Africa prevalence of malaria may reach over 90% by the end of the first year of life. Studies in Uganda and Tanzania showed that already a large proportion were infected between ages 2 weeks - 2 months (more than a quarter) and more than three quarters between 3-5 months (P. falciparum positive). Gardiner(1984) reported high infection rates among infants in Ghana while studies in the West Savanna (Bekessey, 1976) and Liberia (Collier Jackson, 1985) reported the same. Tests show that the levels of maternal antibodies decrease early in life, both in protected and unprotected populations and are low at age 4-5 months (Molineaux, 1978). It has been suggested that passive immunity may merge into active immunity in such a way that the risk of dying remains low throughout (Molineaux, 1985).

The mortality level due to malaria in infancy and childhood is unknown. A study in rural Kenya reported that more than half of the infants had parasites in their blood prior to death, which implied a malaria mortality during infancy of 85 per 1000 live births (95% confidence interval 61-109). It is known that on first inoculation with P. falciparum, a non-immune person is at high risk (5-10%) of early death (Molineaux, 1985). If he survives he acquires some partial and reversible immunity and decreased risk of death upon infection.

Examples

Demographers or other social scientists have carried out most studies of factors affecting mortality and morbidity in childhood. Consequently, limited attention has been paid to causes of death and specific diseases and how these related to age differentials of mortality.

Breastfeeding and socio-economic status of the household are important factors affecting child survival and development. In this section we will shortly review the evidence of age- and cause-specific effects of these factors as an example.

Breastfeeding

Breastfeeding affects the incidence of infection, outcome or severity of infection and nutrient intake. The reduction of incidence of infection, particularly gastro-intestinal diseases (Feachem and Koblinsky, 1984, Jason et al., 1982) and perhaps respiratory infections (Forman et al., 1984), are mostly limited to the period of exclusive breastfeeding (0 to 4-6 months). Breastfeeding is also known to reduce severity of infections, due to immunological properties of breastmilk (Jelliffe and Jelliffe,

1985). This effect persists throughout the first year of life, but is less important than the incidence reduction effect. Finally, breastmilk is an important source of nutrients during the first and perhaps also second year of life, depending on the quality and quantity of supplementary feedings (Brown et al., 1982). It is difficult to separate the nutritional effect of breastmilk from the infection reduction effects but its nutritional benefits are probably largest in the period of exclusive breastfeeding.

Socio-economic status

Mortality differentials by socio-economic status of the household have been observed in many studies. Neonatal mortality varies with socio-economic status and low birthweight appears to play a key role, as it is more common among lower socio-economic classes (Brooks, 1980 Davanzo et al., 1984 Sargent et al., 1986).

The social class gap is much larger during the postneonatal period (Antonovsky and Bernstein, 1973, Adamchak, 1979, Hobcraft et al., 1984). A Chilean study showed that postneonatal mortality among children of 'blue collar' parents was 3.2 times higher than among children of 'white collar' parents. The excess mortality was associated with higher mortality due to malnutrition (5.6 times higher), respiratory diseases (3.6), infectious diseases especially diarrhoea (3.2) and accidents (2.0) (Behm, 1979). At ages 1-4 years mortality differentials by socioeconomic status may increase even more, as was indicated by analysis by occupation of father in the World Fertility Survey (Hobcraft et al., 1984).

Poor socio-economic characteristics are associated with retarded growth and development. Socio-economic factors influence growth by affecting dietary intakes and/or the incidence or severity of infections (Martorell and Habicht, 1986, Pebley, 1984, Victora et al., 1986).

The mortality effects of increasing female education increase with age. There is almost no effect in the first six months of life, but mother's education has a marked effect in the second half of infancy (Butz et al., 1984, Martin et al., 1983). Analysis of USA data gave similar results after controlling for birthweight (Bross and Shapiro, 1982). At ages 1-4 years mortality differentials by education are even larger (Palloni, 1981, Hobcraft et al, 1984). There are relatively few studies on morbidity differentials by education. Palloni (1981) suggested that excess child mortality among illiterate families is associated with a disproportionate contribution of the water-food borne diseases. Data from Narangwal India show that nutritional status is associated with a family's economic resources and one suggested reason is reduced caloric intake (Pebley, 1984). In Brazil father's education was shown to be strongly associated with the nutritional status of children (Victora et al., 1986).

Conclusions

The majority of health interventions programmes have not been evaluated adequately (Gwatkin et al., 1980, Chen et al., 1983, Vaughan et al., 1984). With the present emphasis on primary health care, however, the need for sound evaluations is even more demanding in order to convince policy makers of the effectiveness of primary, community-based or community-oriented, approaches as opposed to facility-oriented care.

Multiple methodological problems complicate evaluations of health programmes. Most interventions are introduced gradually, simultaneously socio-economic, cultural and environmental changes occur and may affect health. The analysis of age and cause-specific data will improve the quality of evaluations.

A useful classification of age intervals would be:

- neonatal period; preferably sub-divided into first day, first week and second to fourth week.
- postneonatal period; should be divided into 1-5 and 6-11 months. Smaller age groups such as 1-2, 3-5, 6-11 months are probably even more useful.
- toddler period; 12-23 months or 12-17 and 18-23 months
- child period; 24-59 months, or 2 and 3-4 years.

Morbidity patterns in childhood show a peak incidence at ages 6-23 months, particularly of diarrhoeal diseases, followed by high incidences at ages 0-5 months and 2 years as well. The pattern of growth faltering is similar to the morbidity pattern with highest levels of malnutrition at ages 6-23 months.

Case fatality rates decrease with the ageing of the child, but the trend is not very clear and well documented under the age of two years. Mortality decreases very rapidly in the neonatal period, and more gradually in the postneonatal period, but the decline stagnates in many studies between ages 6-23 months. This is associated with higher disease incidence and perhaps relatively increased case fatality due to impaired nutritional status and end of the period of protection by maternal antibodies.

Low birthweight and perinatal causes are predominant in the first week of life. In a number of areas neonatal tetanus mortality becomes significant later in the first week, and in the second and third weeks of life. Respiratory causes are most likely the leading causes at ages 1-5 months in most countries, but evidence is limited as postneonatal mortality is generally studied as a whole. From 6 months onward, diarrhoea in combination with malnutrition becomes very prominent and remains a leading cause up to 2 to 3 years of age. Measles joins diarrhoea as a leading cause during the second year of life, and

continues to be important up to 4-5 years. Malaria may be important as a cause of postneonatal or toddler mortality but its role is unclear.

Most of the studies of the determinants of child health in developing countries have focused on mortality. For most of the variables age-specific mortality patterns can be identified, although evidence is not always convincing and some age groups are too large to draw conclusions.

Currently, the potential of primary health care and of low-cost intervention packages such as advocated by UNICEF is much debated (Mosley, 1985, Halstead et al., 1985, Walsh and Warren, 1979). Some emphasize the social dimension of health problems in childhood, others the great potential of simple interventions such as oral rehydration therapy and immunisation (UNICEF, 1986). The need for sound monitoring and evaluation of interventions and strategies to improve child survival and development is compelling. Integrated efforts of medical and social science, and especially of epidemiologists and demographers, can make a significant contribution in this field. The development of models concerning child survival and development will lead to an improved understanding of the causes and determinants of mortality and morbidity in childhood. This will improve planning, implementation, monitoring and evaluation of health interventions.

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Table 1. Causes of Death in Childhood (Percentages)

BRAZIL (1974-78)		BANGLADESH (1975-77)		KENYA (1974-79)	
INFANTS (0-11 Months)		0-11 Months		0-11 Months	
Perinatal causes	27	Tetanus	26	Perinatal causes	35
Respiratory diseases	20	Diarrhoea	16	Pneumonia	23
Intestinal infections	16	Respiratory diseases	7	Gastroenteritis	23
Other infections	9	Fever	5	Measles	8
Congenital anomalies	6	Measles	2	Malaria	2
Nutritional deficiencies	6	Other	44	Malnutrition	2
Other	16			Pertussis	2
				Other	5
	100		100		100

PAHO, 17 STUDIES		KENYA (1974-1978)	
NEONATAL		NEONATAL	
Perinatal causes	65	Perinatal causes	77
Respiratory causes	10	Pneumonia	18
Diarrhoeal diseases	10	Gastroenteritis	3
Congenital anomalies	4	Other	2
Other infectious diseases	4		
Other	4		
	97		100

PAHO, 17 STUDIES		KENYA (1974-78)	
POSTNEONATAL		POSTNEONATAL	
Diarrhoeal diseases	47	Gastroenteritis	40
Respiratory causes	25	Pneumonia	23
Other infections	6	Measles	14
Measles	4	Malaria	4
Congenital anomalies	4	Pertussis	3
Nutritional deficiencies	4	Malnutrition	2
Other	10	Other	14
	100		100

Table 1 (cont'd.)

PAHO.11 STUDIES [TODDLER 1 YEAR]			KENYA (1974-78) [TODDLER 1 YEAR]		BANGLADESH (75-77) [1 - 4 YEARS	
	UNDER-LYING	ASSO-CIATED				
Diarrhoeal diseases	29	10	Measles	41	Diarrhoea	45
Respiratory diseases	18	11	Gastroen-teritis	16	Fever	8
Measles	22	0	Pneumonia	16	Measles	13
Nutritional deficiences	10	25	Malnutri-tion	12	Respiratory diseases	5
Other infections	9	25	Malaria	6	Other	29
External causes	4	1	Pertussis	4		
Other	8	27	Other	5		
	100	99		100		100

PAHO 11 STUDIES (CHILD 2-4 YEARS)			KENYA 1974-78 (CHILD 2-4 YEARS)		WEST AFRICA STUDIES 1960a (1 - 4 YEARS)	
Measles	20	1	Measles	24	Measles	23
Other infection	16	15	Malnutrition	20	Gastroenteritis	23
Diarrhoea diseases	14	10	Malaria	13	ARI/Pertussis	10
Respiratory diseases	12	23	Gastroen-teritis	11	Malaria/Fever	10
External causes	12	1	Pneumonia	9	Other	34
Nutritional deficiences	7	23	Accidents	4		
Other	19	26	Pertussis	2		
			Other	17		
	100	99		100		100

Table 2. Measles Case Fatality Rates (CFR) by Age
(in parenthesis number of deaths)

Age (months)	Kenya		Zaire	
	CFR		CFR	
0-5	-	-	0	(31)
6-11	6.4	(4)	6.2	(194)
12-23	11.8	(14)	9.8	(366)
24-35	6.4	(4)	4.3	(232)
36-47	4.2	(21)	2.8	(246)
48-59	7.3	(21)	-	-
60 +	1.1	(1)	-	-
All	1.1	(27)	6.1	(1069)

(Kenya from Voorhoeve et al, 1977; Zaire, Kasongo 1981).

FIGURE 1. MORTALITY DISTRIBUTION UNDER THE AGE OF 5 YEARS IN WORLD FERTILITY SURVEY AND PAHO STUDY FOR DIFFERENT LEVELS OF MORTALITY.

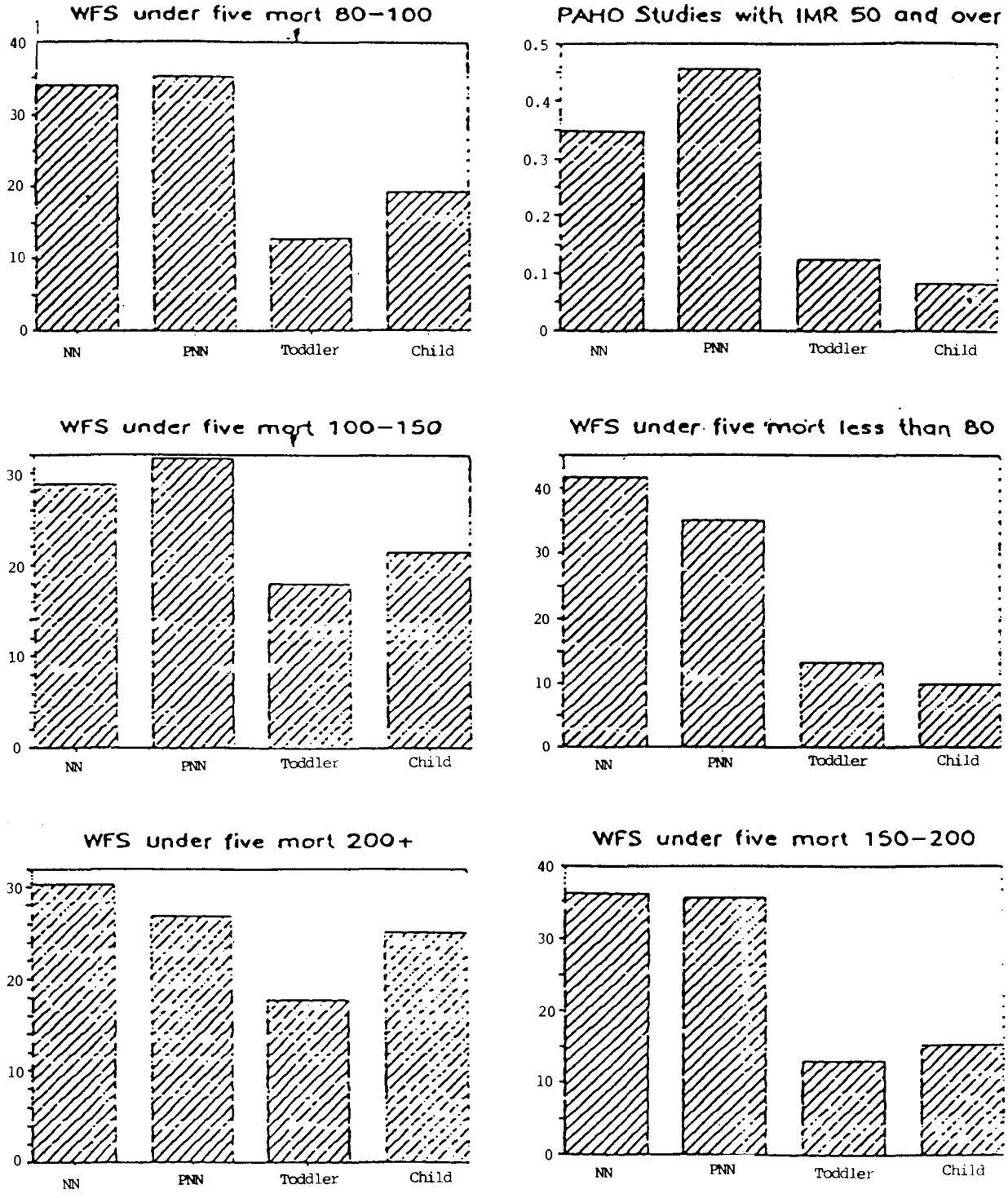


FIGURE 2 - BIOMETRIC ANALYSIS OF POSTNEONATAL AND CHILD MORTALITY (AGE SCALE $\log^3(n+1)$

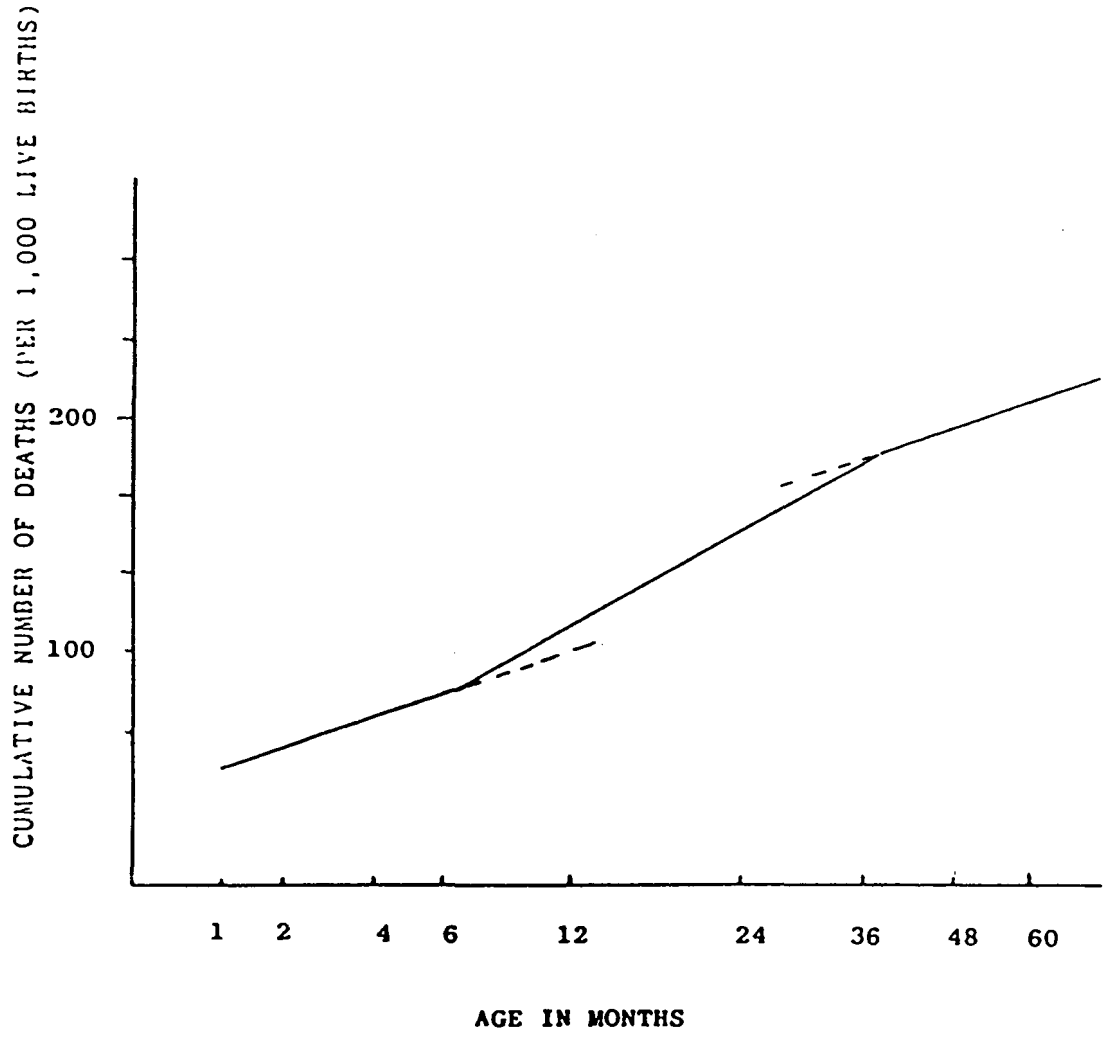
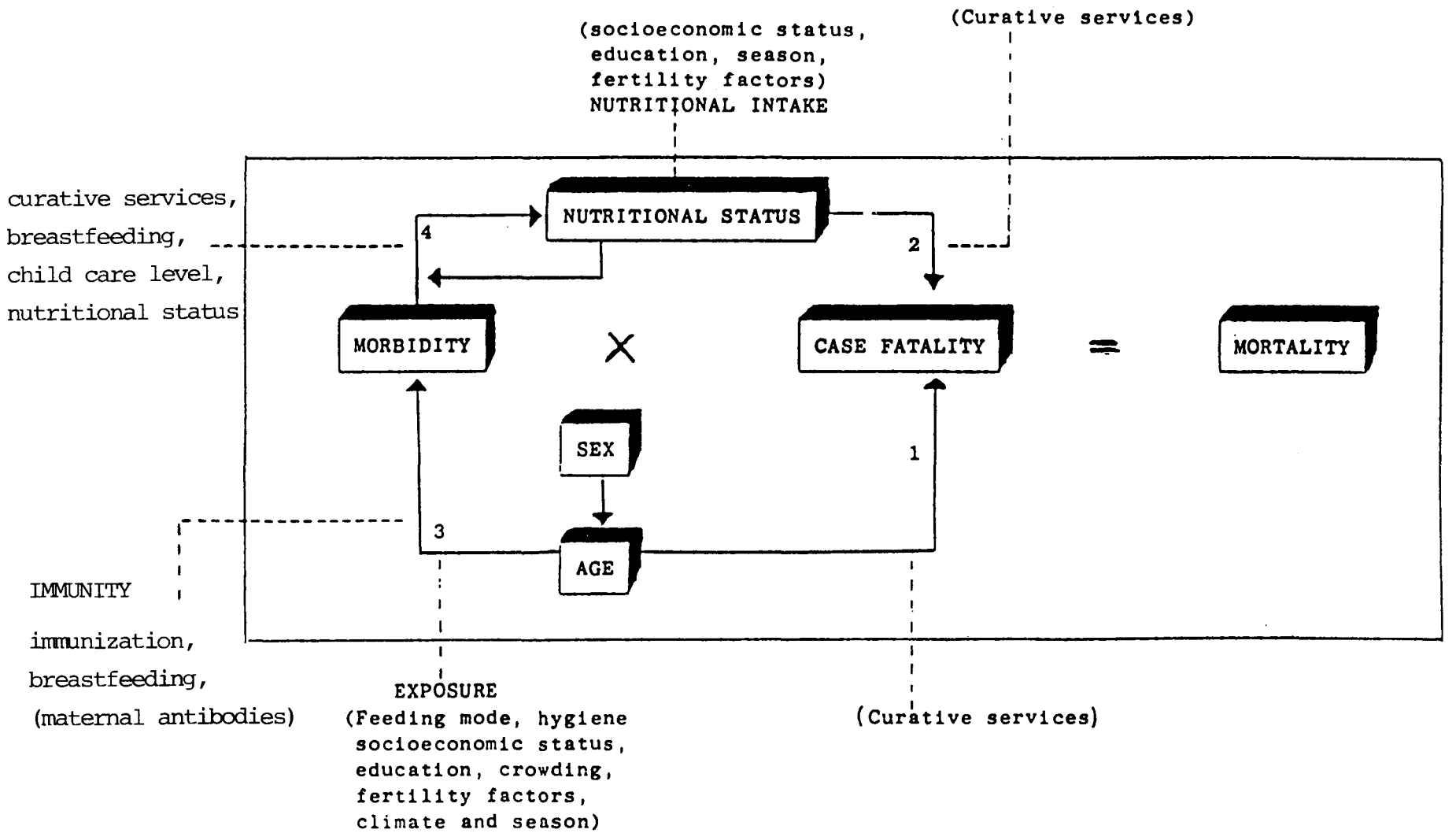


FIGURE 3: CONCEPTUAL FRAMEWORK OF INFANT AND CHILD MORTALTIY INCLUDING AGE



COMMUNITY BASED RECORDING AND REPORTING OF MORTALITY AND VERBAL AUTOPSY IN BAGAMOYO PRIMARY HEALTH CARE PROJECT

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Introduction

The world in 1977 embarked on a programme to achieve health for all by the year 2000 through community participation and intersectoral cooperation in primary health care. This is an ambitious goal. One important method for evaluating strategies towards that goal is to determine mortality levels, which is the best indicator of how health measures and quality of life are. This is because deaths are precise events recognised and unforgettable in the family. Measurement of morbidity and health status would be more difficult as it is more difficult to differentiate health from illness and more so to remember past illness over a long period. Records of mortality are, however, not made routinely in Tanzania. Civil registration of deaths and births and national census are two important sources of mortality data but they are so far inadequate for use in the evaluation of Primary Health Care (PHC).

Civil registration of births and deaths was started in Tanzania in 1920 for European and Asian populations only. In 1952 Africans in one town (Tanga) were added, while in 1966 the law was extended to all residents of 15 urban centres in the country. The enforcement of this law was not successfully done as in 1984 only 1% expected deaths were registered in Dar es Salaam, one of the 15 towns where registration was compulsory. Since 1984 a pilot project (Civil Registration Project - CRP) was started in 9 districts, Bagamoyo, Morogoro Rural, Morogoro Urban, Iringa Rural, Iringa Urban, Moshi Rural, Hai, and Kilosa using both health facilities and community reporting. The registration of deaths changed from 6% in 1984 to 14% in 1985 while that of births changed from 30% in 1984 to 42% in 1985. Majority of these data, however, were mainly collected in hospitals (85% for births and 68% for deaths.) Community reporting was therefore still very insignificant. The Ministries of Health and Justice seem to be collaborating in improving data registration in this project (Mbaruku 1987). National census data on the other hand is available for 1957, 1967 and 1978 and another census is being planned for 1988. From this it has been possible to see decreasing mortality and increasing population growth. But it is not possible to see a yearly change as the census occurs every ten years. These are therefore not very good indicators of the success of Primary Health Care.

Community Based Register and Reporting

Civil registration as tested in 10 districts could be successful if the majority of deaths occurred in hospitals. However, in Tanzania the majority of deaths occur in the community. A seven year study of mortality was carried out in Tanzania in the seventies in 6 different villages and the urban area of Dar es Salaam. This revealed that the proportion of all deaths which occurred in hospital was 50% in Dar es Salaam and as low as 5% in rural Morogoro. (Takulia and Bennett 1976). In that study a trained enumerator visited all ten cell leaders at least once per month and recorded all deaths known to them. This system was later evaluated by a yearly house to house mortality survey. This revealed that ten cell leaders knew or could report between 22.6 to 65.6% of all deaths according to the annual census. This study therefore showed that lay reporting of death was feasible, but the method used was expensive and unreliable in diagnosis. The search for a more feasible solution should therefore continue.

Evaluation of Primary Health Care

Tanzania has embarked on a village health worker programme providing services to each village, with lines of supervision, distribution and referral of patients from the village to the national level. There is need to investigate if such a system could enable reporting of deaths too. Indeed, we needed an evaluation system in the implementation of the Bagamoyo pilot Primary Health Care programme which started in 1983 as an operations research project.

This paper therefore describes the mortality recording, reporting and verbal autopsy in the Bagamoyo Primary Health Care project, a system devised as part of the Primary Health Care operations research.

Specific objectives were:

- To determine the efficiency and effectiveness of village health workers in recording and reporting mortality in children under five.
- To describe the under fives mortality by age, sex, seasonal causes, and place variations.
- To determine the health care given to children who died.

Methodology

Study Area

The study was conducted in Bagamoyo District with a population of about 160,000 people and 30,000 children under the age of 5 (based on 1978 census) living in 76 registered villages. Up to 1983 there was one district hospital, 3 health centres, and 30 dispensaries in the district. The main tribes are Wakwere, Wazigua, Wadoe, and Wazaramo. They are mainly of Islamic faith. The district depends on subsistance farming and a little fishing along the coast.

The Primary Health Care System in Bagamoyo District

Bagamoyo was chosen to be a demonstration area (operations research) for the implementation of Primary Health Care. This was done according to Ministry of Health Primary Health Care guidelines prepared in 1982 as Tanzania's implementation of the Alma Ata Declaration. Accordingly, Primary Health Care includes Village Health Workers, Dispensaries, Health Centres, District Hospitals, and Primary Health Care committees at the village, ward and district levels. The main Primary Health Care activities are training, supervision, and drug distribution. The Programmes so far being carried out include Control of Acute Respiratory Infections (ARI), Control of Diarrhoeal Diseases (CDD), Non-Communicable Diseases (NCD), Mother and Child Health (MCH), Nutrition, Essential Drugs Programme (EDP), Expanded programme of Immunisation (EPI), Universal Child Immunisation (UCI), and TB/Leprosy Control. Programmes under preparation are child spacing and malaria control. A distinct feature of the Primary Health Care project in Bagamoyo is team supervision (so called "Team Safari"). There is a full time Medical Assistant as Primary Health Care supervisor in each division who also carries out verbal autopsy on births and deaths reported by village health workers.

Mortality Recording and Verbal Autopsy

Village health workers have been instructed to record and report immediately to their division supervisor every death of under fives in their respective villages. When death is reported, the supervisor arranges to visit the bereaved family within two weeks, usually accompanied by the local ten cell leader, a member of the Village Primary Health Care Committee and the village health workers. The supervisor then conducts an interview with the child's parents (usually the mother) following a structured precoded questionnaire. The supervisor usually knows all the questions by heart and does not fill the forms or read from them in front of the subjects. The form reveals the

history of illness prior to death, any treatment, modern or traditional and where treated, either hospital or at home or both. In the end the supervisor arrives at a most probable cause of death. All forms are then sent to the project's office where the project principal researchers review and discuss them with the supervisors. It has been established that the village health workers do not cover all deaths in the community. A census of children and deaths was therefore conducted every year. This has so far been done in July 1984, 1985, 1986 and 1987. This also made it possible to evaluate the efficiency of village health workers in recording and reporting mortality.

Village health workers were also used in the mortality census. Specially designed census forms were provided. Village health workers were trained on how to fill them and rehearsed in about 10 houses with their Primary Health Care suypervisor before the exercise. The homes were visited systematically according to ten cell leaders in each village. There is continuous supervision of the exercise by the Primary Health Care supervisor who performs verbal autopsy on all newly discovered deaths.

Results

Efficiency of village health workers in recording and reporting mortality

Of the 1198 deaths confirmed by routine reporting and yearly mortality census, 480 (40%) were reported by village health workers and a verbal autopsy done within two weeks of their occurrence. The following are some of the analysis done with the data indicating part of what could be done with such data when collected.

Child mortality rates

In the first year routine reporting and the mortality survey covered 16,126 children under the age of five years. The survey revealed that 585 deaths occurred during the twelve months between the feasts of Ramadhan in 1983 and 1984, i.e., June 1983 to June 1984, giving an overall child mortality rate of 36.3/1,000 children per year.

Sex and age distribution

Of the 1,198 deaths enumerated, 604 (50.4%) were males and 557 (46.5%) were females while in 37 cases (3.1%) sex was not filled in.

Table I: Age Distribution of under fives who died

AGE	NO. OF CHILDREN	%	CUM .%
Less than 1 week	97	8.1	8.1
Less than 1 month	71	5.9	14.0
Less than 2 months	51	4.3	18.3
Less than 3 months	58	4.8	23.1
Less than 6 months	183	15.3	38.4
Less than 12 months	187	15.6	54.0
Less than 18 months	137	11.4	65.4
Less than 24 months	79	6.6	72.0
Less than 30 months	86	7.2	79.2
Less than 36 months	48	4.0	83.2
Less than 42 months	72	6.0	89.2
Less than 48 months	41	3.4	92.6
Less than 54 months	48	4.0	96.6
Less than 60 months	8	0.7	97.3
Age unknown but less than 60 months	33	2.7	100.0

54% of all deaths occurred under the age of 12 months (Table I). Mortality markedly decreased with age and even though mortality under the age of one month is probably under reported it is still the highest.

Direct and indirect causes of death and their combinations

In the 1,198 deaths the most important direct causes were pneumonia, malaria, and diarrhoea, accounting for 35.1%, 23.0% and 14.4% of all deaths respectively. These were followed by malnutrition (9.4%), prematurity (3.7%), and accidents (1.8% of all deaths). Tetanus neonatorum (1.8%), prematurity and other neonatal problems contributed to only 6.7% of all deaths (Table II).

Table II: Direct cause of death

DIAGNOSIS	NO. OF CHILDREN	%
Pneumonia	421	35.1
Malaria	275	23.0
Diarrhoea	173	14.4
Malnutrition	113	9.4
Prematurity	44	3.7
Accidents	22	1.8
Tetanus neonatorum	21	1.8
Anemia	16	1.3
Neonatal deaths	14	1.2
Meningitis	14	1.2
Pertussis	10	0.8
All others	75	6.3

There were 752 deaths where only a single diagnosis could be made or where there was no indirect cause of death detected. Indirect cause of death meant a second diagnosis, i.e. where there were one or more contributory causes of death. Of the indirect causes, measles headed the list accounting for 148 (12.4%) of the deaths. Other indirect causes were convulsions (9.5%), malnutrition (5.6%), dehydration (3.4%), anaemia (2.9%), and malaria (1.4%) (Table III).

Table III: Associated cause of death

DIAGNOSIS	NO. OF CHILDREN	% OF ALL CHILDREN
Measles	148	12.4
Convulsions	114	9.5
Malnutrition	67	5.6
Dehydration	41	3.4
Malaria	17	1.4
All others	59	4.9

About 26% of pneumonia deaths had measles recognised as an indirect cause while another 9% had other associated causes. This is different from findings in hospitals where about 60% of pneumonia deaths had measles as the underlying disease. 36.6% of deaths from malaria had convulsions pointing to cerebral complications of the disease. 14.8% of diarrhoea deaths had malnutrition and another 30% were combined with either malaria, measles or pneumonia. It is therefore concluded that acute respiratory infections control must go along with control of

measles, malaria, malnutrition and diarrhoea diseases to reduce mortality. In Bagamoyo District our emphasis was the control of pneumonia rather than measles. We therefore chose pneumonia as the direct cause and measles as the indirect where the two were combined (Mtango et al, 1987).

Source of Treatment

The proportion of dead children not treated was 17.8%. Those treated at home or by traditional healers was nearly 45%. Village health workers, dispensaries, and health centres treated roughly 65%. This shows that the cases were more likely to be untreated or treated by traditional healers.

Oral fluids were given only to 43.3% of those who died of diarrhoea. Thus those children under five who died in the community had grossly inadequate treatment and proper care could have saved a number of lives.

Seasonal distribution of deaths

In Bagamoyo the highest mortality occurs from April to June. This is a period of heavy rain and greatest shortage of food. The main causes of death are pneumonia and malaria.

Discussion

This paper presents the rationale, the methodology, and some of the data from the community based mortality recording and verbal autopsy system in Bagamoyo District. The core of the system is village health workers as compared to the other systems of counting mortality in Tanzania which depend on either hospital reporting, national census, or civil registration (Mtango 1979, Takulia et al 1976, Mbaruku 1987). Village health workers are fairly efficient in reporting deaths as they reported 40% of those occurring in their communities. Low reporting in some villages was caused by the absence of village health workers or the temporary migration of the child. It is thought that if village health workers cooperated with village secretaries or the latter took over where there is no village health worker functioning, one could achieve a near 100% registration of deaths in the District.

On the other hand, verbal autopsies performed in Bagamoyo Primary Health Care project depended on the availability of a medical supervisor, visiting villages at least once a month routinely and available at any time in case of a death. This person is currently not available in the Primary Health Care system. This function however could be easily achieved by

dispensary workers for at least the population within 5 km of a dispensary which is now about 90% in Tanzania. The exercise would then be useful for counting deaths and births and for monitoring the performance of the Primary Health Care system and continuous education of both Primary Health Care workers and the community. The Bagamoyo mortality recording, reporting, and verbal autopsy system should therefore be regarded as a multi-purpose approach in Primary Health Care which should be done in addition to national censuses and sample surveys. It could be part and parcel of civil registration. It is a pity that civil registration in the same district has not so far used our data which would make Bagamoyo the highest covered district in mortality registration in Tanzania. This is an example of how badly we need intersectoral cooperation. Combining the two systems (Civil registration and Primary Health Care) would be very easy in all districts since by 1991 all districts will have village health workers (Ministry of Health Primary Health Care Guidelines, 1982).

The value of verbal autopsy was evident for both the monitoring and the evaluation of the Bagamoyo Primary Health Care project. The evaluation has already been published (Mtango and Neuvians 1986). However, an evaluation was only possible after the annual mortality survey due to low coverage of mortality by the routine system (only 40%). Routine verbal autopsy is therefore useful mainly for the monitoring of Primary Health Care activities, i.e., measurement of performance. Most of the deaths were first attended by traditional healers before coming to modern treatment, a practice which should be discouraged unless traditional healers have Primary Health Care training. People revert to traditional healers and delay getting modern treatment partly because they live in remote farming areas far away from a village health worker or health facility. Thus the full operation of the Primary Health Care system is still far from realization even in Bagamoyo due mainly to the lack of payment of village health workers leading to their absconding, village health committees not functioning, and lack of supervision. If verbal autopsies are to be useful, they have to be done as soon as possible after the death, but that can be impossible if reporting depends on village health workers whose presence should have averted the death itself. For more success therefore, there must be alternative reporting systems, e.g., reporting by ten cell leaders and village secretaries.

In any case I conclude that the community based recording and reporting system operated by the Primary Health Care system at the village level has proved useful in Bagamoyo District. It was also fairly cheap as it was done as part of existing Primary Health Care system. It is however, more costly than the previous system, i.e., more reporting of deaths or the attempt to use lay dignosis by informers as occurs in the civil registration system. But it is more efficient as it is the extension of hospital reporting of deaths to the village or family level using

the type of health workers at that level. An alternative approach would be to have the verbal autopsy done by village health workers themselves or dispensary workers, which could be done with less cost than that of our present Bagamoyo Primary Health Care project.

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SOME INDICATORS OF EFFECTIVENESS AND IMPACT FOR USE BY MCH PERSONNEL IN SELF EVALUATION

by

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Abstract

Material and Child Health Care (MCH Care) comprises specific interventions which are aimed at improving the health status of mothers and children. It is specifically concerned with the biological demands of reproduction, growth and development, and with the vulnerability of mothers and children, as a result of these demands.

Tanzania has realised commendable achievements in extending the coverage of MCH Care and this has resulted in improved utilization of the care. There is, however, no viable system for monitoring the changes in health status of mothers and children attributable to MCH Care.

This paper proposes six indicators for the purpose of monitoring the effectiveness and impact of MCH Care at the peripheral level. These indicators should be measured periodically and used by MCH aides for self evaluation.

The research process of which the proposed indicators are the outcome is also described.

Introduction

Tanzania's policies, plans, programmes and achievements in the field of health have received international acclaim (1, 2). Indeed according to a publication of USAID,

> "Indices of health status, such as life expectancy and infant mortality, have improved during the development of Tanzania's rural health system. Since the concomitant economic growth has only been 4.8% per year, it is not unreasonable to attribute much of the improvement in health status to the development of the health services system".

Maternal and Child Health Care, is one of the major health programmes which have received considerable attention.

The available data suggest that the extension of health services delivery system has improved the accessibility of health care. And with improvement in accessibility the number of outpatient,

> "visits increased from 55 million in 1974 to 66 million in 1977, ...(and) in 1969 coverage of pregnant women at antenatal care were only 31%, but by 1978 attendance at MCH services reached 1.3 visits per person per year for the population of women of fertile age and children under five year" (3).

Even though improved coverage has resulted in increased utilization of MCH care not much has been done in establishing a system for monitoring the effectiveness and impact of the care on the health status of mothers and children. The surveillance system for the immunisable diseases is still very rudimentary, and no system for monitoring the other child health problems as well as maternal health problems towards which MCH care as a whole is targetted has been instituted.

The fact that MCH care is known to be effective in dealing with common maternal and child health problems in no way means that it will be effective under all conditions. This is not just with reference to the effectiveness of immunisation which is subject to the vulnerability of the cold chain. Growth monitoring depends on properly tuned scales and correct reading of the weights. Similarly inadequecies in the skills of MCH Aides or the lack of relevant apparatus at MCH clinics and dispensaries would nullify the effectiveness of the screening and subsequent referral of high risk pregnant women, even if such mothers initiated antenatal care quite early during their pregnancy and were seen a number of times at the clinic. Furthermore, inappropriate health education approaches and media used may not motivate parents to use oral rehydration therapy at home, to modify infant feeding practices, or to adopt effective contraception.

In other words implementation of the MCH Programme is not just a matter of attaining high coverage and utilisation rates. The quality of care provided is of critical importance for the realisation of the goal of reducing infant and child morbidity/ mortality. Hence the need for a system for monitoring the impact of MCH care as a whole and of the effectiveness of its components. MCH Aides need to be aware of the impact the care they provide has on the target health problems in their own catchment areas. Any lack of demonstrable impact over a period of time should lead to a serious appraisal of their performance.

This paper proposes six Indicators which MCH Aides can use towards this end and suggests a new record keeping system to facilitate routine collection of data for measuring them. The process used in the formulation and testing of these Indicators is also described.

The Formulation of Indicators

The World Health Organization is promoting the use of indicators of effectiveness and impact to assess health status and to document its change. The use of such indicators is imperative particularly now that many countries are implementing specific PHC programmes which aim at improving health status (4).

We undertook a small research project, in collaboration with the MCH Unit of the Ministry of Health, aimed at formulating a set of indicators which could be used at the peripheral level, to assess the effectiveness and impact of MCH care in Tanzania.

The focus of the project was on the kind of indicators which could be measured and used by MCH Aides. Such indicators would have to be measured on the basis of the data which MCH Aides can collect routinely. As such the indicators would reflect the changes in health status among the target population within the catchment areas of individual MCH clinics.

MCH Aides have little or no influence on overall organization of the MCH programme, but they can improve the quality of care they provide. An appreciation on their part of the empirical evidence for the usefulness and effectiveness of their routine work rather than tradition or the authority of supervisors should be the major source of motivation in performing their work.

On the basis of an extensive literature search and a review of the literature a number of indicators were formulated by the Research Team. These were discussed in a workshop which was organised for that purpose. The workshop brought together people involved in MCH care from all over the country. Some of the indicators were eliminated, others were modified, and new ones added.

Twenty six of the recommended indicators were field tested in a household survey. The survey covered women of child bearing age and children below the age of five years. The household survey was complemented by another survey of MCH clinics. Both surveys were done in Kisarawe district during the month of May and June in 1986 and 1987.

The household survey collected information on maternal and child health, pregnancy, births and deaths, as well as on the use of MCH care. The clinic survey in turn dealt with MCH Aides and Rural Medical Aides. It collected information on care provided, use of services by the target population and the feasibility of monitoring its impact.

Following the advice received from the World Health Organization and the analysis of the findings only nine indicators were selected for another field test. The survey

covered only four MCH clinics in Kisarawe district. The MCH record cards of all women and children who attended the clinics during a period of one week were scrutinised. Relevant information missing from the cards was obtained from the women and children's mothers. The MCH registers and other records available at the health units were also scrutinised. Missing information was obtained from the MCH personnel.

The proposed six indicators (Table I) therefore represent the outcome of a long process of distillation (Figure 1). These indicators deal exclusively with effectiveness and impact - an area of evaluation which is relatively untouched as compared to coverage and utilisation. They also relate directly to the main forms of MCH care which currently occupy much of the time of MCH aides.

Both the numerators and denominators of these indicators are highly circumscribed in that they relate to a delimited population which is serviced by individual MCH clinics (Table II). Some of these indicators refer to absolute numbers rather than proportions or averages due to the small size of the target population in the catchment area and subsequent expected levels of occurrence of the relevant phenomena within that population.

Empirical Findings of the Values of the Proposed Indicators for Population Covered

In this section the values of the proposed indicators obtained from the analysis of the findings of the surveys are presented.

The values of the indicators given below serve only as examples of what can be expected. They relate only to the four health units and their catchment areas. It is expected that they would be calculated from the data for every health unit and they could form part of the annual report for those health units. Only data from the second survey which dealt with actual users of care are used for measuring most of the indicators. This is the kind of data which could be obtained solely from clinic records if they were organised and kept in the appropriate manner. Such data could therefore be collected through normal record keeping and no special surveys would be required. Furthermore only such data reflect the changes in the health conditions among people using MCH care.

The data from the first survey is used to measure the first indicator. While preparing for the second survey it was realised that only a very small number of multigravida mothers attending the clinic for antenatal care could be covered during the study period. Indeed the survey covered only 69 of these. However 194 women had already been covered by the household

survey during the first field test. This would not have been necessary had an appropriate ante-natal record system - such as a folder for each woman with forms and notes containing relevant information collected at each visit - been available.

First Indicator

Information was available on 194 out of the 278 women covered by the survey. The percentage of mothers with intervals of less than 24 months between the outcome of the penultimate pregnancy and last conception was found to be 31.95.

Second Indicator

Of the 83 mothers coming to the clinic for antenatal care 43 of them were in the third trimester. Only these were considered as having the appropriate length of exposure to the risks for anaemia and high blood pressure. Women with a history of anaemia were 13. There was one woman with a history of high blood pressure.

Third Indicator

Of the 43 mothers in the third trimester attending the clinic for antenatal care only 35 had been weighed and their weight recorded on at least two occasions while in the third trimester. 11 pregnant women had not gained weight during the last trimester.

Fourth Indicator

Two variants of the indicator are reported. The first one is based on a review of the MCH record card of each of the 227 children who attended the clinic during the survey. 20 did not have the card, and another 31 had no birth weight entered on their cards. Thus only the birth weight of 176 children was taken into account. The analysis showed the percentage of children with birth weight equal to or less than 2.5 kg to be 29.54.

The second one is based on a review of the birth weight of full term live births recorded at clinics for one year - 1986. Overall 664 full term live births were registered. These included 232 home deliveries as well as children born before arrival at clinics. Birth weight was recorded for 519 of the registered births. A review of the birth weight records showed that 6.94 percent of the full term live births had birth weight equal to or less than 2.5 kg.

The main explanation for the difference between the two is that the second one is limited to full term live births which occurred in one year while the first one covers the birth weights of children who were born in different years, some of whom may not have been full term births, as such information is not indicated on the child's card.

Fifth Indicator

Of the 227 children seen at the clinics during the week of survey only 172 children had a sufficient number of weight record entries over a three month period or longer. 72 of these underfives, i.e. 41.86 percent did not gain weight during a three month period.

Sixth Indicator

Both MCH clinic records and Dispensary records for the period of one year-1986-in the four health units were reviewed. Cases of measles were found in all the units. Other cases of immunisable diseases found in two different units are those of Polio and Tuberculosis.

Overall there were 173 cases of measles, i.e. 31,65,47 and 30 cases in the four health units, one case of Polio (in one health unit) and 20 cases of Tuberculosis (also in only one health unit).

It is noteworthy however that the one case of polio and the 20 cases of tuberculosis were among children who were above five years. Data on measles from three of these units show that 61.11 per cent of the cases were among under fives. One health unit did not record the ages of children with measles.

Discussion

There is already concern over the wide variety of records, numerous types of data, and high frequency of reporting demanded of MCH Aides. The merit of the proposed indicators lies in their smallness of number and their focus on major activities within MCH care. The first indicator monitors the effectiveness and impact of family planning services. A lot of work is being done to promote family planning. MCH clinics educate prospective users and offer more than one method of contraception.

The second, third and fourth indicators monitor the effectiveness and impact of Antenatal Care activities. These include regular screening for anaemia and high blood pressure, provision of iron and folic acid, education on nutrition and weight checks. Education is also given concerning the hazards of heavy workloads during pregnancy. Chemoprophylaxis against malaria is also provided.

The fifth and sixth indicators deal with growth monitoring and immunisation. Each child has its growth regularly monitored during the first five years of life. It is a major activity at every clinic.

As for immunisation, concern has been expressed about the efficacy of measles vaccination (7). Mothers have also been reported to be reluctant about having their children immunised against measles on the grounds that even those who are immunised do get the disease (8). Now that Tanzania has established a viable cold chain thereby ensuring availability of potent vaccines any case of immunisable disease particularly among the immunised should be a matter of serious concern.

Prospects for the use of the proposed indicators

The trend in health care delivery is shifting from preoccupation with extending coverage and improving utilisation to making sure that the care thus extended and used is beneficial.

This move has important implication for resource allocation not only to the health sector but also within the health sector in developing countries. Health programmes will only be justified by their effectiveness.

Record keeping systems at MCH clinics need to be changed to enable regular measurement of these indicators. At the moment of birth weight of a child, the immunisations received and date they were given and any records of the child's weight gain are entered in different registers and record forms which are not systematically linked. Similarly a woman's antenatal care records are not systematically linked to those of her obstetric performance and outcome of pregnancy. Furthermore the record keeping system does not allow for linkage between records on the mother and those on her child.

The current MCH cards for expectant mothers and children, which are kept by the mothers, contain vital information including weight gain, but this is not entered in any register. When these cards get lost as often happens all the information is lost.

Comprehensive registers and folders would solve this problem. The folder for a mother would also contain particulars of her child/children, or be cross-referenced to the folders of each of her children.

Conclusion

The efficacy of health care to prevent disease, disability and premature death even within the socioeconomic and environmental conditions of developing countries is no longer in doubt. The debate currently centres around the choice of the appropriate strategy for organising health care to have the maximum impact (9).

East African countries are low-income countries with high infant and child mortality rates. Similiarly these countries have accepted Primary Health Care as a method for improving health status, and are at various stages of implementing it.

The establishment of viable surveillance systems including selection and use of indicators proposed in this paper will ensure that the scarce resources expended in health produce the expected results.

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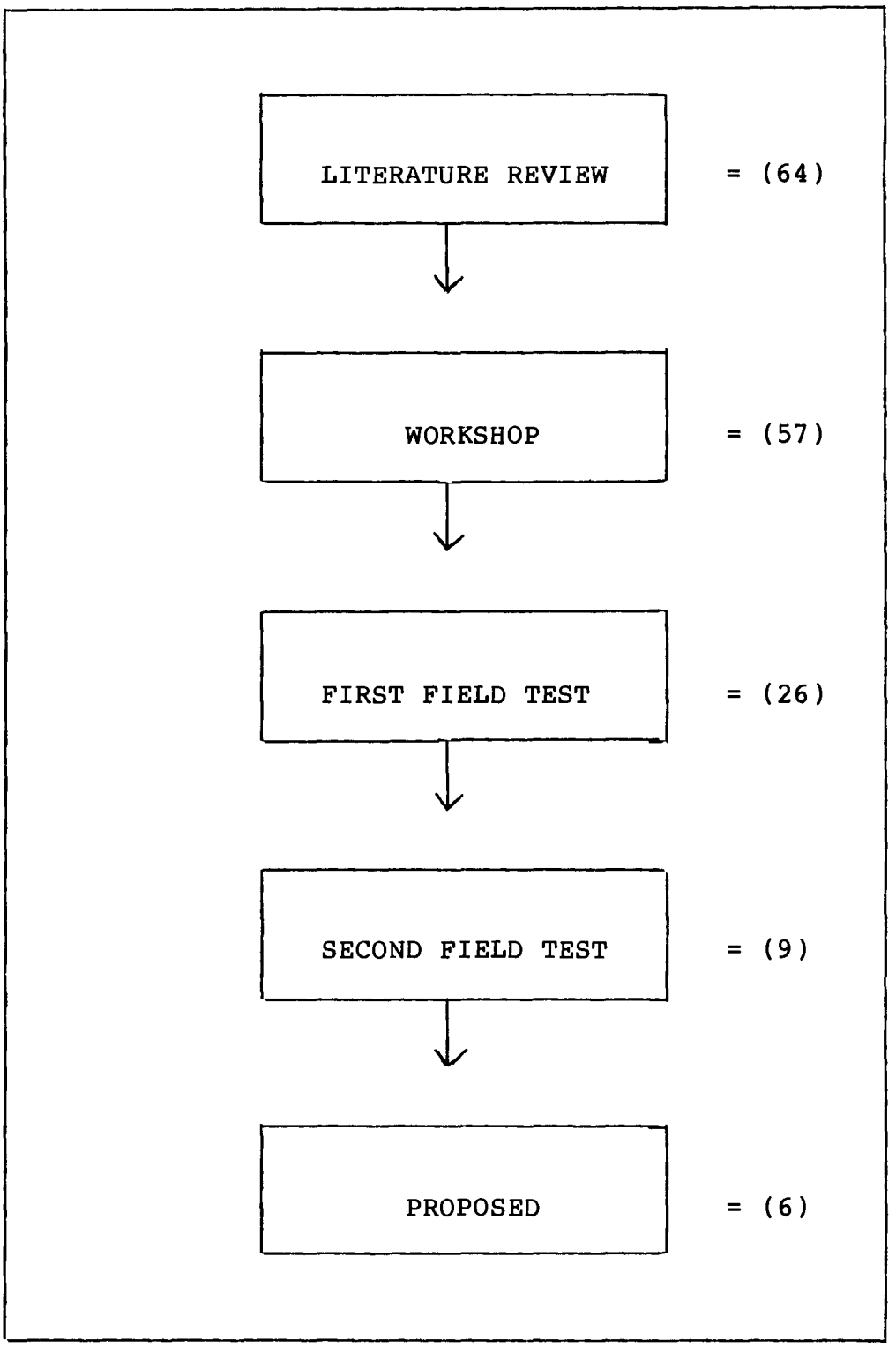

FIGURE 1: THE FORMULATION AND DISTILLATION PROCESS OF THE PROPOSED INDICATORS

TABLE I: THE PROPOSED SET OF INDICATORS

1.	Percentage of women with intervals of less than 24 months between outcome of penultimate pregnancy and last pregnancy.
2.	Number of pregnant women with anaemia or high blood pressure during third trimester.
3.	Number of pregnant women not gaining weight during third trimester.
4.	Percentage of full term live births of 2.5 kg or less.
5.	Percentage of underfives not gaining weight during any three month period.
6.	Number of cases of immunisable diseases among underfives.

TABLE II: SPECIFICATION OF THE COMPONENTS OF THE SELECTION INDICATORS AND CURRENT SOURCE OF DATA.

INDICATOR	NUMERATOR	SOURCE	DENOMINATOR	SOURCE
1	Number of women with intervals of less than 24 months between outcome of penultimate pregnancy and last conception.	Interviews	All multigravida registered for care.	Antenatal Care Registered.
2	Absolute number of pregnant with anaemia or high blood pressure.	MCH 4	-	-
3	Absolute number of pregnant women not gaining weight.	MCH 4	-	-
4	Number of full term live births with weight of 2.5Kg.	Obstetric Register/ MCH 1	All full term live births	Obstetric Register
5	Number of underfives not gaining weight or losing weight.	MCH 1	All underfives registered for care at the clinic.	Child Care Register.
6	Absolute number of cases	MCH 6/ D2	-	-

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5. WHO publications in the HFA Series, especially Numbers 4 and 6 are cases in point.

6. It is noteworthy that WHO has proposed a minimal list of 12 global indicators for the purpose of monitoring and evaluating the "Health for All By the Year 2000" Strategy. Only four of these are indicators of health status; vide Global Strategy for Health for All by the Year 2000 WHO, Geneva 1981.

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REDUCTION OF MORBIDITY AND MORTALITY RATES THROUGH GROWTH MONITORING AMONG CHILDREN IN A RURAL POPULATION OF IRINGA REGION, TANZANIA: A JOINT NUTRITION SUPPORT PROGRAMME (JNSP) EXPERIENCE

by
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Preamble

Tanzania is among the 18 countries implementing a 5 year Joint WHO/UNICEF Nutrition Support Programme (JNSP). This programme was inaugurated on 3rd December, 1983. The programme is aimed at the:

1. Reduction of infant and young child mortality and morbidity.
2. Better child growth and development.
3. Improvement of maternal health and nutrition.
4. Improvement of the capabilities of society to assess and analyse nutrition problems.
5. Design of appropriate action for the achievement of these objectives.

Seven Divisions having 168 villages with a population of 250,000 people were selected in Iringa region for the study. In this area there are about 50,000 children aged from 0-5 years.

General Health and Nutritional Status of Iringa Region (Population Census 1978)(2)

Total population	925,044
Children aged 0 - 4 years	19.3%
Women in child bearing age	21.8%
Infant mortality rate (National average IMR 137/1000)	152/1000
Mortality in the age 1 - 4 years (National average 231/1000)	257/1000
Life expectancy at birth (National average in 45 years)	41 years
Crude death rate (National average 19.1/1000)	21.8/1000
Total fertility rate (National average 7.3 children per woman)	6.9 children per women

Children aged 0-4 years and women in child bearing age are the two most vulnerable sectors of the population. A high infection rate of communicable diseases results in high infant and childhood mortality and morbidity rates.

The main causes of death (3,4) are the following:

causes	number	percentage
Diarrhoea	54	25.7%
Measles	42	20.0%
Malaria	38	18.1%
Acute Respiratory infections (ARI)	17	8.0%
Malnutrition	17	8.0%
Abdominal pain	7	3.3%
Convulsions	6	2.8%
Unknown	24	11.4%
Others	5	2.3%
	210	99.6%

Nutritional status of the population (5,6,7,8,9,10)	percentage
Total Protein Energy Malnutrition (PEM) 0-5 years (high during 2nd year of life followed by 4th year)	50%
Severe PEM 0 - 5 years	6%
PEM average in the older children and adolescents	30%
PEM adult population	5 - 16%
Anaemia children 0 - 5 years (11)	40%
Adult females	70%
Immunisation coverage (12) (low)	40%

Vitamin A deficiency and endemic goitre affect large sectors of population.

The health delivery structures in the programme area according to the National Health Inventory (13,14) are as follows:

	PROGRAMME AREA	NATIONAL TARGET	NTL AVERAGE
Population per hospital bed	263	1,000	791
Population per health centre	99,553	50,000	92,000
Population per Dispensary	8,618	6,000	6,700
Avg. distance to Dispensary	3 kms	5 kms	4.6 kms
Avg. distance to hospital	24 kms	-	24 kms
% delivering in health institutions	36%	-	46%
Facilities with daily MCH activity	50%	100%	60%

60% of pregnant women use Traditional Birth attendents (TBAs)(15) for the delivery of their children. The average weight gain during pregnancy is 2.5 kg (16).

Iringa is a fertile area producing various cash crops and is able to meet its nutritional needs and those of other areas of Tanzania. The district is therefore a suitable base for the spread of JNSP activities to other areas in Tanzania.

Conceptual Framework

The state of nutrition has been analysed, using a conceptual framework that reflects different causes of malnutrition. These include disease and inadequate food intake, inadequate child care, and the inadequate provision of or absence of essential commodities and services.

The first two are considered the immediate causes while the last is described as the underlying cause. Socio-economic, political and cultural aspects are considered basic causes. Figure I illustrates this framework of causes of child deaths.

In Iringa region child deaths have a high cost in terms of loss in human production as shown below:

10 child deaths in each village/year
4 days of funeral per death
100 strong men and women involved in mourning full time
400 x 10 = 4,000 man days lost/child deaths/year/village
(1,270/= minimum wage/person/month)
50/= minimum wage/person/day
50/= x 4,000 = 200,000/=lost/child deaths/per year/village
600 villages in Iringa Region x 200,000 =
120,000,000/=lost/child deaths/year/Iringa Region.

This excludes the cost of loss of life; contributions e.g. money, food, firewood, transportation, etc.

The programme therefore was directed at an attack of immediate causes, especially the disease factors. This was done by universal application of some cost-effective interventions and a reduction of those underlying causes that directly relate to dietary and disease factors. The programme aims at achieving a rapid and sustained reduction of the rates of malnutrition, infant, and child mortality.

Methodology

As the Iringa Nutrition Programme is community based, the methodology adopted for the study is that of establishing a viable infrastructure for the target population. This ensures accurate data collection, analysis, use, and eventually the monitoring of progress and problems through a village monitoring system. This was done by:

i) Setting up Committees at all levels from bottom to top. There is a Village Health Committee (VHC) in each of the 168 villages consisting of the:

-Village Chairman	(Chairman)
-Health Worker	(Secretary)
-Village Secretary	(Member)
-Primary School Teacher	(Member)
-Representative of U.W.T.	(Member)
-Influential person	(Member)

ii) Establishing a Village Health Worker (VHW) Programme

Each of the 168 villages has a trained male and a female Village Health Worker. A total of 336 VHWs have been trained in the programme area.

iii) Conducting seminars and training courses for Village Health Committee Members (in which Village Health Workers are included) on the:

- Establishment of Village Registers
- Weighing of Children and plotting weights on growth charts
- Analysis, use of data collected and reporting to Village Government and eventually to higher authorities using standardised Reporting forms (See Appendix I)

iv) Establishment of Village Registers: These are established in each village (See Appendix II)

v) Establishment of Village Health Days: Each village has its own Health Day for weighing children 0 - 5 years; conducting immunisations; demonstration on health and nutrition activities, e.g. food using power flour. This is done once per month.

vi) Establishment of catchment areas per health facility. Each health facility has known number of villages by name which it has to cater for.

vii) Establishment of outreach programme. Each health facility has an outreach programme for its catchment area.

viii) Establishment of responsibilities for every cadre of officials in the programme area from bottom to top. Through various seminars and workshops each cadre official has formulated its own responsibilities for which they are accountable in the programme.

ix) Establishment of functions for each transport mechanism available. Each transport mechanism provided by the programme, ie. motor vehicles, motorcycles, bicycles, have specified functions which have to be adhered to by everybody.

x) Mass mobilisation to create awareness so that parents turn up with their children on Health Days.

xi) Give feedback to the worst and best villages and conduct follow-ups to the worst villages. The best performing village in nutrition status is given a trophy.

Through this Village Monitoring System we have gained the following advantages:

(a) Quarterly Nutritional Status data are collected by the VHWs and compiled and analysed for every village, Division, District and for the region. It is also used to plan for interventions at the village level. This data have information on the percentage of total underweight, percentage of severe underweight, percentage of healthy children, number of deaths and the cause, and number of births. (See Appendix III and IV).

(b) Immunisation coverage data is available monthly and quarterly. This is collected by Dispensary Health Centre and Hospital staff during their outreach programmes.

(c) Village-based Nutrition rehabilitation system has been established in each village.

(d) The village monitoring system has been a great mobilization tool to create awareness among the public on programme activities and interventions. For instance, the monthly weighing and recording of weights of children on MCH Cards has created concern among parents for the nutritional status of their children.

(e) The system has enabled each village to have an accurate census of its population for planning purposes; i.e. tax collection, etc.

(f) This data has been a source of information for other donor agencies operating in the same areas with other development programmes, e.g. EEC - supported agriculture development programme, voluntary agency programmes; CONCERN programmes (Irish) etc.

(g) The system has been adapted in other areas and regions in Tanzania as well as by other JNSP countries whose representatives have been paying frequent visits.

(h) The potential for programme follow ups and evaluation on its impact are high.

The disadvantages however are that the system cannot be replicated to other areas due to local variations from place to place. There is also a very high initial cost of investment in establishing a village monitoring system in order to get the long term benefits described above. Therefore under an ordinary local budgetory system, it may not take off early enough.

Interventions, Results and Implications

The intervention, results and implications of the monitory system are summarized in the table below.

INTERVENTIONS	RESULTS	REMARKS AND IMPLICATIONS
1. SYSTEMS DEVELOPMENT & SUPPORT		
- Policy and Programme communication	- Cultural groups intensified; - Two films made; - One village correspondent in each village, 5 issues of NIPE HABARI newsletter out; - Mass mobilisation successful	- Success of Social mobilisation led to success of the Programme.
- Monitoring and Evaluation	- Mid-term evaluation showed remarkable success	- Total malnutrition reduced from 56%(1984) to 38 %(1987)
- Integrated training	- Training materials produced by Training Coordinating Committee; - Integrated training workshops conducted	- Severe malnutrition reduced from 6%(1984) to 2%(1987); - No. of deaths reduced from 300 (1984)per quarter to 197 (1987) per quarter.

INTERVENTIONS	RESULTS	REMARKS AND IMPLICATIONS
- Infrastructure Support	- Vehicle Support to crucial points resulted in a very effective use of human and material resources.	- IMR reduced from 152/1000 (1978) to 107/1000 (1986)
2. MATERNAL AND CHILD HEALTH		
- Construction and renovation of Dispensaries	8 new dispensaries constructed. 20 Staff houses constructed. 14 dispensaries renovated.	- Increased self-help activities. - 70% human labour
- Improvement of MCH Services	- Turn-up for MCH Services greatly increased. Health days established in each village.	- Demand for services outside programme area.
- Village Health worker programme	- 336 VHWs trained. 2 VHW in each village. Remunerated by village Government except in 7 villages. - Village Health Committees established. - Accessibility 5 km walking distance.	- Reduced distance to health services. - Health services brought to the people.
Training of Traditional Healers (THs) and Traditional Birth Attendants (TBAs)	- 229 TBAs trained - 233 THs trained - Accessibility to services reduced to 2 km walking distance.	- Demand for more courses for untrained persons. - Improved traditional health services - Early stages of integration.

INTERVENTIONS	RESULTS	REMARKS AND IMPLICATIONS
Diarrhoeal disease control	Household self medication - Treatment at Village health post (VHP) - Reduced diarrhoeal disease episodes	Reduction in incidence and prevalence of communicable disease
Accelerated immunization	- Village monitoring system adhered to; - Immunization coverage 92% (1986)	- Concentrate on maintenance phase - Concentrate on coverage outside programme area.
Control of Acute Respiratory infections	Treatment at VHP	
Malaria control	- Treatment at VHP - Self medication for prophylaxis of pregnant women. - Research on environmental control on going	Men to get more involved in child care
Maternity Care	- Care at VHP - Research showed 2.5 kg weight gain instead of 10 kg. - Enough feeding and rest advocated - Men encouraged to help women at work.	Men to get more involved in child care
Nutrition Rehabilitation	Village-based nutrition rehabilitation programmes established in each village for malnourished children.	Locally available foods must be used.
Nutrient Deficiencies	- Goitre control strategies planned. - Vitamin A and Anaemia control research on-going	Demand for a national programme

INTERVENTIONS	RESULTS	REMARKS AND IMPLICATIONS
Water and environmental Sanitation	- 70% of population in Wanging'ombe Division with VIP latrines and access to water supply. - Other 6 Divisions with demonstration V.I.P. latrines	Increased effort to minimize mosquito breeding areas.
3. HOUSEHOLD FOOD SECURITY Food and Nutrition planning	- Introduction of a formula of 3 bags of maize per adult, 1½ bags/child	Awareness on food budgeting, food requirements has resulted in increased demand for more activities
Agroforestry	640,000 forest trees and fruit tree species transplanted	
Crop promotions	Drought resistant crops introduced	Demand for expansion to areas outside the programme by the public.
Home gardens	Demonstration vegetable gardens established in pilot villages	
Small animals	Small animal keeping established in pilot villages.	Draws attention to visitors within and outside Tanzania.
Food processing and preservation	Maize hand mills and mini dehullers for sorghum used in pilot villages.	The programme has to be integrated into District plans.
Food preparation	Methods to reduce dietary bulk (including power flour) developed and used during the village child feeding activities.	
4. CHILD CARE AND DEVELOPMENT Village caretaker organization	- 19 District child care trainers trained. - 148 village child care attendants trained.	Villages should make sure that these centres are maintained throughout the year.

INTERVENTIONS	RESULTS	REMARKS AND IMPLICATIONS
Child to child actions Technology development support.	- Village based nutrition day care taking system established in each village. Studies not yet applied 35 Village craftsmen trained. - 70% of all households in programme area have made improved stoves	A permanent food generating programme established in each village for feeding children by having a farm each year Men have to change their behaviour and assist women in child care using appropriate technology
5. INCOME-GENERATING ACTIONS	- Women groups in 6 pilot villages have been supported with cooking oil extraction.	- Men should also be supported to contribute to women's groups activities, e.g. growing sunflower for cooking oil extraction.
	- Other support to women's access to and control of resources are being identified	
6. RESEARCH	Immediate results have been utilized in the implementation of individual projects.	- Creation of even more areas for further research, e.g. alternative source of energy in villages; - Pregnancy growth monitoring; - Appropriate income generating activities; Other child care programmes; Socio-cultural beliefs; Storage of irish potatoes etc.

The Overall Result

The Infant Mortality Rate was reduced from 152/1000 (1978) to 107/1000 (1986) in the programme area. Better child care, improved maternal health, and nutrition have also been realised in abilities of the members of the community to assess, analyse, and deal with nutrition problems.

Problems Faced

A number of problems were faced throughout the period of implementation of this programme.

1) The programme was not successful in persuading men to assist women in child care, especially during pregnancy.

2) It was not possible to curb the high level of alcoholism which has adverse effects on the care of children and causes food shortage as cereals used for food are used to make the local brew.

3) It has been difficult to persuade pregnant mothers to have their babies in the Health Care Centres. They prefer having babies at home in traditional ways which are not very hygienic.

4) It was difficult to persuade women to participate actively in committees dealing with Child and Maternal issues.

5) As a result of social mobilisation the programme gained such popularity that it has not been able to meet the demands from the community, such as demands for the construction of dispensaries and the expansion of the programmes to other areas beyond the target area.

Conclusion

This programme has been used by many regions within and outside Tanzania. In Iringa Region the programme has been fully integrated into the District plans using the ordinary District Councils' budget. It is hoped that in this way continuity of the programme is ensured even beyond its 5 year span.

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APPENDIX I:

RIPOTI YA ROBO MWAKA YA LISHE NA AFYA

JINA LA KIJIJI.....

JINA LA KATA.....

KIPINDI CHA RIPOTI.....

TAREHE.....

MTAYARISHAJI.....

IDADI YA WATU KIJIJINI.....

IDADI YA WATOTO MIAKA 0-5.....

HALI YA LISHE YA WATOTO

	ENEO LA KADI							
UMRI (miezi)	KIJANI		KIJIVUJIVU		NYEKUNDU		JUMLA	
	Na.	%	Na.	%	Na.	%	Na.	%
0 - 12								
13 - 36								
37 - 60								
JUMLA								

VIFO NA SABABU ZAKE

	SABABU				
UMRI (miaka)	HOMA	SURUA	KUHARISHA	KIKOHOZI	MENGINEYO
0 - 1					
1 - 3					
3 - 5					
+ 5					

APPENDIX II:

REJISTA YA KIJIJI

JINA LA BALOZI:_____ NAMBA YA KAYA:_____

1	2	3 4 5	6 7 8	9	
Majina ya watu wote katika kaya ukianza na jina la mkuu wa kaya	Jinsi	Tarehe ya Kuzaliwa	Kifo cha munojawado katika kaya	Sababu ya kifo	

APPENDIX III:

CHILD DEATHS AND CAUSES - JNSP DIVISIONS 1985/1 TO 1987/1

YEARS & QUARTER:

1985/1							1985/2					
DIVISION/ CAUSES	F	M	D	RTI	0	TOTAL	F	M	D	RTI	0	TOTAL
Pawaga	9	4	5	1	6	25	15	2	8	16	4	45
Kalenga	23	2	17	9	2	53	9	5	4	3	1	22
Mlolo	12	8	18	18	5	61	21	3	11	3	14	52
Ifwagi	12	2	14	1	4	33	11	1	2	3	10	27
Wanging'ombe	43	7	10	2	13	75	33	4	0	11	11	59
Lupalilo	4	1	6	1	5	17	7	0	3	0	3	13
Mlangali	4	0	23	1	10	38	13	0	7	2	7	29
Region	107	24	93	33	45	302	109	15	35	38	50	247
	1985/3						1985/4					
Pawaga	4	0	4	1	4	13	5	0	4	0	6	15
Kalenga	8	3	2	0	3	16	3	0	2	0	4	9
Mlolo	17	1	12	8	2	40	12	1	11	0	7	31
Ifwagi	8	2	6	4	17	37	10	3	3	3	17	36
Wanging'ombe	9	1	1	1	10	22	8	1	3	1	11	24
Lupalilo	11	2	5	2	2	22	0	0	0	0	0	0
Mlangali	8	1	4	0	6	19	8	5	4	1	10	28
Region	65	10	34	16	44	169	46	10	27	5	55	143
	1986/1						1986/2					
Pawaga	16	9	9	0	8	42	9	5	5	0	5	24
Kalenga	14	4	10	6	12	46	9	2	4	0	3	18
Mlolo	23	4	18	15	8	68	12	2	10	1	9	34
Ifwagi	15	6	18	3	26	68	18	1	11	1	9	40
Wanging'ombe	11	2	7	2	9	31	19	0	5	2	12	38
Lupalilo	7	0	1	2	3	13	3	1	1	1	1	7
Mlangali	11	0	1	1	14	27	11	2	3	6	14	36
Region	97	25	64	29	80	295	81	13	39	11	53	197
	1986/3						1986/4					
Pawaga	4	0	5	2	5	16	4	0	4	1	5	14
Kalenga	8	3	3	2	5	21	9	2	5	0	5	21
Mlolo	10	5	12	2	4	33	7	6	16	2	7	38
Ifwagi	7	1	3	1	10	22	10	1	2	2	14	29
Wanging'ombe	8	2	4	0	8	22	15	3	3	3	21	45
Lupalilo	2	0	1	1	5	9	3	0	1	0	1	5
Mlangali	6	0	2	2	1	11	16	0	4	0	5	25
Region	46	11	29	10	38	134	64	12	35	8	58	177
	1987/1											
Pawaga	5	1	4	0	0	10						
Kalenga	20	1	13	1	3	38						
Mlolo	11	3	18	0	9	41						
Ifwagi	6	1	21	3	12	43						
Wanging'ombe	35	1	7	1	11	55						
Lupalilo	3	0	0	0	2	5						
Mlangali	8	0	1	0	9	18						
Region	88	7	64	5	46	210						

KEY

F .. .. fever
M .. .. Measles
D .. .. Diarrhoea
RTI Respiratory Tract infections
O .. .. Other Causes

APPENDIX IV:

MASTER FILE FOR VILLAGE GRAPHICS - TOTAL UNDERWEIGHTS

IFWAGI DIVISION:

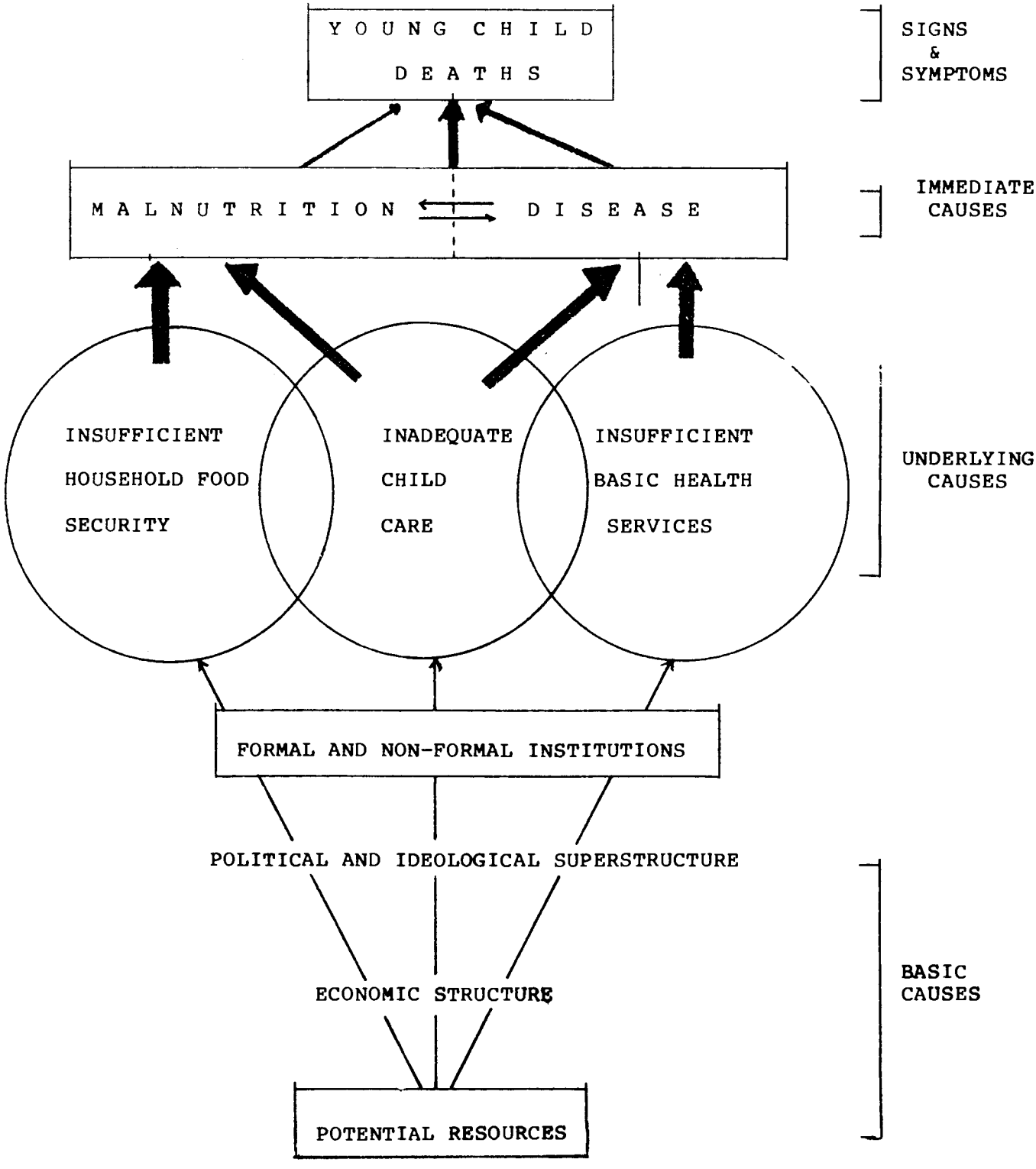
84/2	84/3	84/4	85/1	85/2	85/3	85/4	86/1	86/2	86/3	86/4	87/1	87/2
57.42	48.58		50.67	49.57	45.07	40.63	47.84	43.14	41.42	42	43.90	43.78
KALENGA DIVISION												
52.26	40.01	39.27	43.72	42.4	39.44	41.37	42.81	43.32	41.86	41.21	42.80	43.67
LUPALILO DIVISION												
60.81	52.17	51.10	49.58	48.25	46.44	44.72	42.33	44.33	45.35	44.28	44.85	40.16
MLANGALI DIVISION												
55.51	44.58	48.60	46.32	43.45	38.83	36.68	34.09	40.37	35.19	34.88	31.37	35.11
MLOLO DIVISION												
59.1	48.98		46.46	47.34	44.04	40.92	40.78	39.1	42.47	43.38	44.69	42.48
PAWAGA DIVISION												
50.26	50.87	48.11	42.78	36.42	36.08	39.37	34.71	40.93	42.98	35.19	43.83	37.57
WANGING'OMBE DIVISION												
52.53	41.19	38.49	38.72	39.13	38.73	35.29	36.87	35.79	34.53	33.07	34.81	34.44
REGION (TOTAL)												
55.92	46.19	44.56	45.99	44.87	41.89	39.07	40.5	40.69	39.73	39.23	39.84	39.73

APPENDIX V:

MASTER FILE FOR VILLAGE - SEVERE MALNUTRITION

84/2	84/3	84/4	85/1	85/2	85/3	85/4	86/1	86/2	86/3	86/4	87/1	87/2
6.11	5.22	5.05	7.57	5.01	3.20	2.47	3.98	2.76	2.60	4.34	3.63	2.30
KALENGA DIVISION												
7.18	4.19	3.82	3.98	2.68	1.36	1.69	2.77	2.27	1.98	2.00	1.93	2.13
LUPALILO DIVISION												
5.79	3.47	4.42	2.91	1.94	1.77	1.35	1.32	1.38	1.67	2.35	2.03	2.16
MLANGALI DIVISION												
4.39	0.00	3.52	3.57	2.91	2.21	1.82	2.10	2.41	1.84	2.64	1.49	1.64
MLOLO DIVISION												
8.58	4.55	0.00	1.80	4.33	3.29	2.71	2.22	1.89	2.28	1.65	1.55	1.38
PAWAGA DIVISION												
9.23	7.87	8.83	7.86	7.46	3.65	3.58	4.36	3.88	2.05	2.03	4.16	1.93
WANGING'OMBE DIVISION												
5.78	4.36	3.90	3.25	2.81	2.24	1.81	2.05	1.72	1.40	1.18	1.69	2.38
REGION (TOTAL)												
6.25	4.73	3.95	5.53	3.69	2.59	2.24	2.61	2.24	2.05	2.53	2.17	1.94

FIGURE I Causes of Young Child Deaths



ACUTE RESPIRATORY INFECTIONS INTERVENTION PROJECT IN MARAGUA, KENYA

by
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Introduction

Acute respiratory infections (ARI) are a common cause of hospital attendance, hospital admission, or mortality among under fives in most developing countries. Morbidity and mortality from ARI is highest among malnourished children and infants.

The increased susceptibility in this group is due to: reduced immunity, preponderance of bacterial pathogens, and inadequate medical care (1,2,3).

In the last two decades, both developed and developing countries have carried out various studies on ARI. These studies have dealt with epidemiological determinants, aetiological factors, clinical features, and management of ARI. It is now evident that severe ARI, the main cause of morbidity and mortality in developing countries is caused by bacteria, especially the Haemophilus influenzae and Streptococcus pneumoniae. It is inappropriate for health workers in the peripheral units and villages to rely on the stethoscope for diagnosing ARI due to both lack of such equipment and inadequate knowledge in its use in these areas. It has been established that a respiratory rate of over 50 per minute alone or together with chest indrawing, in the presence of an acute onset of cough, fairly accurately indicate moderate or severe ARI respectively (1,2,4,5,6,7). The Health Worker can therefore use this method.

Experience from Brazil, Papua New Guinea, Nepal, and Tanzania has indicated that appropriate case management for ARI at the peripheral level reduced childhood (and especially infant) mortality. In 1984, World Health Organisation (WHO) drew up standardised and simplified case management of ARI with appropriate health education aimed at the primary health workers. A prior 3 month simplified and standardised case management experience in Kenya showed how practical this method is. We emphasize primary health care because most of the population in developing countries have access to it (1,3,8,9,10).

An intervention project on ARI was initiated in Maragua area to demonstrate how effective standardised and simplified case management protocols on ARI are (1,2,11,12).

Methodology of the study

Using an infant mortality of 67 per 1000, (which was the estimate of infant mortality in the area in 1984) a WHO expert committee of epidemiologists recommended that the study needed a population of 12,000 children aged below five years to demonstrate the impact of an ARI intervention programme (13). The committee also decided that the study will have a preceeding period of only data collection followed by a period of data collection with intervention. We chose this approach because we felt that the study population would not accept the ideal situation of a study population and a control population in the same general area.

Twenty field workers, with secondary education were recruited and trained on data collection. They collected the initial demographic data between February and June, 1985. Thereafter, data were collected for children aged below five years in the population on birth, migrations, hospital attendance, hospital admissions, and deaths. A knowledge, attitudes and practice study of ARI was carried out on 300 mothers in the population. Clinical officers, with good experience in looking after children carried out verbal autopsy on children who had died in the study. A record was also made of children admitted to Muranga District Hospital, the main admission centre for children from the study population.

The intervention programme consisted of case management and health education. The case management programme trained health workers serving the study population to differentiate severe from mild ARI and to give appropriate management.

To enable them to recognise ARI, the following categorisation was used according to WHO classification based on simple observations.

a) Mild ARI: presence of cough, running nose or sore throat, with respiratory rate of less than 50 per minute and without chest retraction.

b) Moderate ARI: presence of cough with respiratory rate of more than 50 per minute and without chest retraction. For the sake of management, children with ear ache or acute ear discharge would be considered as moderate ARI.

c) Severe ARI: presence of cough with respiratory rate of more than 50 per minute and with chest retraction. Presence of cyanosis and/or failure to feed makes severity of the ARI greater.

Children with mild ARI would not be given cough mixtures or antibiotics but the parents would be given health education. Paracetamol or aspirin would be given to those with fever. Children with moderate ARI would be given an antibiotic and followed up while children with severe ARI would be admitted.

Health education for parents would consist of recognising moderate and severe ARI by respiratory rate of over 50 per minute and chest retraction. They would be advised to send such children to the health units urgently for appropriate management. Parents would be told what to do with fever and cough, and would be encouraged to continue feeding and giving fluids to their children normally.

Preliminary results

Between February, 1985 and 6/8/87, 3554 babies were born in the study area, with most of them being born at home (32.4%), Muranga District Hospital (29.5%) or Maragua Rural Health Training Centre (14.7%) (see table 1). Of these babies, 1866 (or 52.5%) were male and 1686 (or 47.5%) were female. Over the same period, 211 children aged below 5 years were reported to have died. The most frequent places of death were home (42.0%) and Muranga District Hospital (38.2%) (see Table 2).

Table 1: Births in the study population for the period February 1985 to 6/8/87.

Place of Birth	YEAR OF BIRTH						Total No. of children in the period	Total % of children in the period
	1985		1986		1987			
	No.of children	%age	No.of Children	%age	No.of Children	%age		
Home	401	11.3	517	14.5	232	6.5	1150	32.4
Muranga District Hospital	394	11.1	448	12.6	206	5.8	1048	29.5
Maragua Rural Health Training Centre	196	5.5	225	6.3	101	2.8	522	14.7
On the way to Health Facility	13	.4	28	.8	9	.3	50	1.4
Muthithi Dispensary	0	0	3	.1	0	0	3	0.1
Sabasaba Health centre	1	0	0	0	1	0	2	0.1
Maragua Ridge Dispensary	0	0	1	0	0	0	1	0
Place of birth not specified	3	.1	5	.1	1	0	9	.3
Other health facilities	317	8.9	330	9.3	122	3.4	769	21.6
Total	1325	37.3	1557	43.7	672	18.8	3554	100

Table 2: Deaths in the study population for the period 1st February 1985 to 6th August 1987.

PLACE OF DEATH	YEAR OF DEATH						TOTAL NUMBER AND PERCENTAGE FOR THE PERIOD OF STUDY	
	1985		1986		1987			
	No. of children	No. as percentage	No. of children	No.as percentage	No. of children	No. as percentage	No. of children	No. as percentage
Home	45	21.3	24	11.4	20	9.5	89	42.2
Muranga District Hospital	41	19.4	19	9.0	20	9.5	80	37.9
On the way to health facility	4	1.9	6	2.8	5	2.4	15	7.1
Maragua Rural Health Training centre	4	1.9	3	1.4	2	0.9	9	4.2
Muthithi Dispensary	-	-	-	-	-	-	-	-
Sabasaba health Centre	0	0	1	0.5	0	0	1	0.5
Other health facility	4	1.9	5	2.4	7	3.3	16	7.6
Health facility not specified	0	0	1	0.5	0	-	1	0.5
TOTAL DEATHS	98	46.4	59	28	54	25.6	211	100

A verbal autopsy was carried out on 172 of these deaths. 64% of them were infants and 79.1% aged 2 years or less. Infant mortality in 1985 was 50 per 1000 while that of 1986 was just a little over 40 per 1000. (see table 3).

Table 3: Age distribution of children on whom Verbal Autopsy was carried out

Age in years	Number of deaths	Number of deaths as percentage	Cumulative percentage
Less than 1	110	64.0	64.0
1 → 2	26	15.1	79.1
2 → 3	21	12.2	91.3
3 → 4	13	7.6	98.8
4 → 5	1	0.6	99.4
5	1	0.6	100.0

Acute respiratory infections were the commonest cause of death, accounting for at least 40% of the deaths (see table 4)

Table 4: Probable cause of death

Clinical feature	Number of deaths with clinical feature	Deaths as a percentage for the clinical feature	Probable cause of death
Dead at birth	12	7.0	Stillbirth
Born 1 month or more too early	15	8.7	Prematurity
Was never well	33	19.2	
Small at birth	32	18.6	

Table 4: (continued)

Clinical feature	Number of deaths with clinical feature	Deaths as a percentage for the clinical feature	Probable cause of death
Cough	70	40.7	A.R.I.
Fast breathing	76	44.2	
Difficulty in breathing	93	54.1	
Fever	83	48.3	
Diarrhoea	37	21.5	Diarrhoea Disease
Large stools	7	4.1	
Vomiting	55	32.0	
Thirst	49	28.5	
Sunken Eyes	29	16.9	
Sunken fontanelle	20	11.6	
Swollen hands and feet	10	5.8	malnutrition
Wasting of buttocks	10	5.8	
Skin changes	11	6.4	
Hair Changes	5	2.9	
Misery	5	2.9	
Skin rash	8	4.7	Measles
Cough	40	22.3	
Red eyes and mouth	17	9.9	
Running nose	39	22.7	
Spasms of body	4	2.3	Tetanus
Appearing to smile	0	0.0	
Stiff body	14	8.1	

Table 4 (continued)

Clinical feature	Number of deaths with clinical feature	Deaths as a percentage for the clinical feature	Probable cause of death
Took drugs	2	1.2	Accident
Got burnt	3	1.7	
Got choked	0	0.0	
Involved in a road accident	1	0.6	
Drowned	2	1.2	
Other accident	3	1.7	
Fever	39	22.7	Meningitis
Convulsions	27	15.7	
Neck retractions	12	7.0	
Was drowsy	6	3.5	
Had fever only	13	7.6	Unknown fever

In Muranga District Hospital, over 50% of the children admitted or who died were sufferring from ARI. Muranga District Hospital was responsible for 70% of the study areas' hospital admissions and 25% of the admissions at the hospital were from the study area.

Forty eight responses by mothers, of the 300 responses to a KAP survey were entered in the computer and analysed. Most of the mothers were married, had started or completed primary education, and were housewives (see Table 5).

Table 5: Personal Characteristics of 48 of the mothers who participated in the KAP study.

Category of Characteristic	Specific Characteristic	Number of women	Number as percentage of total
MARITAL STATUS	Single	2	4.2
	Married	44	91.6
	Widowed	2	4.2
	Total	48	100.0
Level of Education	No education	3	6.3
	Primary	25	52.1
	Primary completed	12	25.0
	Secondary	8	16.6
	Total	48	100.0
Occupation	Housewife	46	95.8
	Agriculture for other person	1	2.1
	Industrial for other person	1	2.1
	Total	48	100.0

A significant proportion of mothers thought that high temperature, poor feeding, or frequent coughs were indications of severe ARI (see table 6). Although only 2 mothers thought of difficulty in breathing as indication of severe ARI, 20 mothers described pneumonia as breathing problems or rapid breathing (table 7). Most mothers thought that pneumonia was caused by cold (table 8).

Table 6: How a mother realises that a child with ARI is seriously ill

Indication of severe ARI	Frequency of response	Response as percentage
Coughs many time	9	18.8
Is unable to sleep	1	2.1
Has poor feeding	10	20.8
There is vomiting	2	4.2
Has difficulty in breathing	2	4.2
Has high temperature	13	27.1
Has running nose	2	4.2
Is unhappy or dull	7	14.6
Mother does not know	2	4.2
TOTAL	48	100.0

Table 7: Mothers descriptions of pneumonia

Description	Frequency of description	frequency as a percentage
High body temperature	9	18.8
Breathing problems or rapid breathing	20	41.7
Cough	7	14.6
Fast heart rate	1	2.1
Shrunk limbs	1	2.1
Running Nose	1	2.1
Spasm of the body	1	2.1
Mother does not know how to describe	8	16.7
Total	48	100.0

Table 8: Causes of pneumonia according to the mothers.

Causes of Pneumonia	Frequency of response	Frequency as percentage
Cold	31	64.6
Washing with cold water	1	2.1
Coldness of the body	4	8.3
Chronic cough	2	4.2
Don't know	10	20.8
TOTAL	48	100.0

Most of the analysis has yet to be completed.

Preliminary Impressions

The Maragua ARI project has shed some light on what it takes to handle disease phenomena in a population. It has been made clear that we need direct contributions of an epidemiologist, a biostastician, a demographer, and a sociologist who must work together throughout the study.

The field workers were secondary school leavers. When they were recruited we had no information of those who were basically involved in data collection. The 20 field workers, covered a population of 60,000, working full time, visiting every family once every forty-working days. They were supervised by local health workers and researchers from Nairobi. Fully employed field workers replaced volunteers who were found to be unsuitable. The role of these field workers in the intervention project had to be defined, otherwise their direct participation in the intervention project would introduce them as another category of health worker. Health workers serving the study areas supervised them. We have however, found that these busy workers need incentives in terms of honoraria for the time they spend supervising.

During the project we were able to assess the role of the community health worker, normally a voluntary worker with minimal or no formal health education. Such workers were difficult to get in the area under study as they have to work long hours without pay. Development of such cadre of workers is difficult and differs from one community to another. Such workers in the ARI project would have to prescribe and keep antibiotics. We therefore had to deal with the possible problems of abuse in the use of these drugs at the onset. Access to antibiotics is restricted to prescription by doctors and clinical officers in our country.

We concluded that community health workers should be restricted to health education and early recognition of severe ARI. Cases of severe ARI need to be taken to health facilities for the appropriate intervention. The health workers need to be trained in ARI case management and health education to improve their appropriate early intervention for severe ARI.

Our preliminary results indicate that mortality in the study area is lower than the official records. Although reporting of deaths is a requirement in our country, our field workers reported 4 times as many deaths as the official records. One of the reasons was that deaths in the hospital were not reported because they were given burial certificates in the hospital. Only those who died at home needed burial certificates from the local administrators.

ARI is still the leading cause of death in the community, as indicated by the verbal autopsies. The verbal autopsy correlated with the records in the hospital admitting most of the children from the study population. Although the mothers were aware of ARI, there is still need for appropriate health education in the community.

The low mortality in the study population makes an intervention programme unnecessary as it would be difficult to demonstrate a significant impact. We however, plan to use the experience of the Maragua ARI projects to initiate ARI intervention projects in two districts with infant mortality rates higher than 130/1000.

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