

**ARCHIV
MACKEN
17995**

IDRC-266e

Research Issues in Child Health and Child Care

Proceedings of a workshop
held in Accra, Ghana,
22–26 September 1986

Proceedings



The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; engineering and earth sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

The Institute was first established in 1962 as the Institute of Statistics in the University of Ghana to provide a program of teaching and research in statistics with particular reference to the methodology of collection and analysis of official statistics and to advise interested bodies on statistical design, analysis, and computer programming. A U.N. Statistical Training Centre established at Achimota in 1961 to run a middle-level Statistical Training Programme for public servants in Africa was brought under the auspices of the Institute in 1966. In 1969, the Institute was expanded to include research activities in the Social Sciences and was renamed the Institute of Statistical, Social and Economic Research (ISSER). ISSER now serves as the research wing of the Faculty of Social Studies, University of Ghana. Its work is oriented toward applied research. ISSER's broad objective is to serve as the centre for comprehensive and sustained research in the social sciences by providing fundamental and applied research in the field of the social sciences to establish the basic information essential for effective socioeconomic development. Within the University, the Institute's role is to generate data and research material to support the teaching programs in the economic and social sciences and to disseminate research findings to practitioners in the field of social and economic development.

Il existe également une édition française de cette publication.

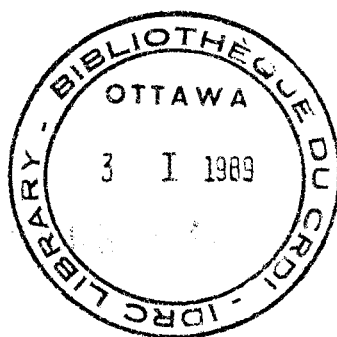
17995

IDRC-266e

Research Issues in Child Health and Child Care

Proceedings of a workshop
held in Accra, Ghana,
22-26 September 1986

Editor: Fiona Mackenzie
Associate Editor: Kodwo Ewusi



*Jointly organized by
the International Development Research Centre
and the Institute of Statistical, Social and
Economic Research, University of Ghana*

ARCHIV
MACKENZIE
no. 2

© International Development Research Centre 1988
Postal Address: P.O. Box 8500, Ottawa, Ont., Canada K1G 3H9

Mackenzie, F.
Ewusi, K.
University of Ghana, Institute of Statistical, Social and Educational
Research, Legon, Accra GH
IDRC, Ottawa CA

IDRC-266e

Research Issues in Child Health and Child Care : proceedings of a
workshop held in Accra, Ghana, 22-26 September 1986. Ottawa, Ont.,
IDRC, 1988. viii + 118 p. : ill.

/Child care/, /health/, /child mortality/, /West Africa/ -
/research methods/, /organization of research/, /vital statistics/,
/human nutrition/, /women's status/, /primary health care/, /health
indicators/, /measurement/, /research needs/, /data collecting/,
/conference reports/, /lists of participants/, references.

UDC: 613-053.2

ISBN: 0-88936-523-7

A microfiche edition is available.

The views expressed are those of the authors and do not necessarily
reflect the views of IDRC or ISSER. Mention of proprietary names does
not constitute endorsement of the product and is given only for
information.

Abstract

This workshop brought together West African health scientists and social scientists to discuss methodological and conceptual issues in the study of infant and child health and mortality, and to identify new research needs. Health and social scientists from the Gambia, Ghana, Nigeria, and Sierra Leone attended the workshop. Emphasis was placed on evaluation of research design and procedures for analyzing the determinants of child health rather than on the presentation of findings. Discussions and papers focused on four central themes: conceptual frameworks more appropriate to local contexts, questions of scale and measurement, the search for indicators of child health, and directions for future interdisciplinary research. This publication is intended to serve as a record of the proceedings of the workshop and to promote further communication and interaction among researchers working in the area of infant and child mortality and health.

Résumé

Cet atelier réunissait des spécialistes de la santé et des sciences sociales de l'Afrique occidentale qui ont discuté de problèmes méthodologiques et conceptuels liés à l'étude de la santé et de la mortalité du nouveau-né et de l'enfant, et qui ont cerné de nouveaux besoins en matière de recherche. Des spécialistes des sciences de la santé et des sciences sociales de la Gambie, du Ghana, du Nigéria et de la Sierra Leone y participaient. On a mis l'accent sur l'évaluation de la conception de la recherche et sur les procédures d'analyse des déterminants de la santé des enfants, plutôt que sur la présentation des conclusions de travaux de recherche. Les discussions et les communications ont porté sur quatre grands thèmes : paramètres conceptuels mieux adaptés au contexte local, questions d'envergure, la recherche d'indicateurs de la santé des enfants et les orientations futures de la recherche interdisciplinaire. Cette publication a pour objet de faire le compte rendu des délibérations et en même temps de promouvoir la communication et les interactions entre les chercheurs dans le domaine de la mortalité et de la santé des nouveau-nés et des enfants.

Resumen

Este taller reunió a científicos del campo de la salud y las ciencias sociales para discutir cuestiones conceptuales y metodológicas en el estudio de la salud y mortalidad infantiles y para identificar nuevas necesidades investigativas. Asistieron al taller científicos de la salud y las ciencias sociales de Gambia, Ghana, Nigeria y Sierra Leona. Se hizo más énfasis en la evaluación del diseño y los procedimientos investigativos para analizar los determinantes de la salud infantil que en la presentación de los resultados. Las discusiones y documentos se centraron en cuatro temas: marcos de trabajo conceptuales más apropiados para los entornos locales, cuestiones de escala y medición, búsqueda de indicadores de salud infantil y pautas para la investigación interdisciplinaria futura. El propósito de esta publicación es el de registrar las sesiones del taller y promover una mayor comunicación e interacción entre los investigadores que trabajan en el campo de la salud y mortalidad infantiles.

CONTENTS

Foreword	vii
Introduction	1
Keynote address: Infant and child mortality and morbidity: reflections on theoretical and methodological issues Diana Oya Sawyer	3
Conceptual framework for the study of child health and child care K. Venkatacharya and Tesfay Teklu	11
Socioeconomic determinants of child health in Ghana Patrick A. Twumasi	26
Methodological and operational problems in the collection of data on infant and child mortality Rebecca Appiah	40
Child health and child care in Pelotas, Southern Brazil: methodology and results of a longitudinal study Fernando C. Barros, Cesar G. Victora, and J. Patrick Vaughan	48
Issues in an examination of the relationship between maternal education and child mortality Bamikale J. Feyisetan	66
Measuring child mortality from maternity histories collected at time of childbirth: the EMIS surveys Cheikh S.M. Mbacké	77
Research Proposals and Preliminary Findings	95
Operations research and MCH/FP health care delivery Charlotte N. Gardiner	96
An alternative approach to vital events registration in Ghana: the Suhum experience G.A. Ashitey and A.O.C. Nettey-Marbell	97
Survey of correlates of mortality in Sierra Leone H.B.S. Kandeh	98
Culture and health: lessons from data collection on child health in Ghana S.R. Ubomba-Jaswa	100
Infant mortality and second-year death rates in the Gambia, 1973 and 1983, and a vaccination compliance survey M. Yamuah	101

Infant and child mortality, environmental factors, and the socioeconomic status of women in two rural centres in the western part of Nigeria: a research proposal Folsade Iyun	102
The determinants of infant and child health and survival in Sierra Leone: a research proposal Fatu Yumkella	104
Infant and child health in the Gambia: overview of a research proposal M.S. Jeng and M. Yamuah	104
Population, food production, and nutrition in a northern savannah village of Ghana G. Benneh	105
Population, health, and nutrition in Upper East Region, Ghana, with special reference to child health and child care G. Benneh, R. Orraca-Tetteh, P.A. Twumasi, and J.S. Nabila	106
Summary and Reflections Fiona Mackenzie	108
Participants	115
Observers	117

CONCEPTUAL FRAMEWORK FOR THE STUDY OF CHILD HEALTH AND CHILD CARE

K. Venkatacharya and Tesfay Teklu ¹

Introduction

The provision of means to achieve health for all by the year 2000 and maintaining it thereafter is a laudable goal toward which all developing countries must strive. A particular concern is maintaining reasonable health for children under 5 years owing to the high mortality and morbidity of this age group. Yet, the task is difficult in view of the many socioeconomic and political problems that beset a developing country.

Health and morbidity or mortality are inversely related. Because high mortality of infants and children was prevalent in the early 1960s, attention was focused on reducing mortality. The vertical health interventions through mass immunization and medical therapy produced the initial breakthrough in the control of mortality without any significant increase in living standards or nutritional improvements. The use of powerful insecticides, mass vaccination, and antibiotics has been very effective. The major infectious diseases such as malaria, smallpox, measles, and cholera that accounted for the majority of deaths have been brought under control and smallpox is eradicated. Many countries in the developing world that passed through this phase have failed to record further declines and in some cases signs of an upward trend are noticed. Success stories include Sri Lanka, the Republic of China, and the State of Kerala in India. Emerging opinion attributes the various degrees of success to a number of causes including lack of socioeconomic development and improvements in living standards.

The success or failure of a particular program in the field of health or family planning can be explained in terms of three elements: appropriate technology, efficient delivery systems, and social acceptance and motivation.

Technology development is the concern of biomedical experts who develop techniques to reduce morbidity under clinical conditions. The task of adopting these technologies, sometimes with modifications to suit field conditions, is a management problem. Public, governmental, and nongovernmental support are needed for this. The political will of the nation is a determining factor. The last, and most important, element is the acceptance of the technology by the population.

¹ The views expressed in this paper are those of the authors and do not necessarily reflect those of the United Nations or the Regional Institute for Population Studies.

It is also critically significant to develop a conceptual framework that informs the design of such health or family planning programs. In the past, the partial analysis of demographic phenomena has been a limiting factor in the development of adequate programs. The efforts of merging Maternal and Child Health (MCH) and Family Planning Programs have paid dividends in many developing countries. Now there is a need to integrate MCH, Family Planning, and Rural Development Programs into one single intervention. UNICEF is promoting a "child survival revolution" based on an approach that integrates growth monitoring, oral rehydration, breastfeeding, immunization, food supplements, and family planning (GOBI-FF).

To policymakers as well as scientists, the need to determine factors that affect health, morbidity, and mortality of a population is well recognized. Understanding the determinants of the life process or, specifically, mortality and health will help determine the nature of the intervention, the appropriate point in the life process at which such an intervention is effective, and the background preparation necessary for such an intervention. It will also assist in the evaluation of a particular program.

The objective of this paper is to develop a framework within which the health and mortality of children under 5 years of age may be studied. It draws heavily on research in the field of fertility, and particularly on the concept of proximate determinants. This concept has led to important insights in the analysis of fertility. Development of such a framework is expected to increase our understanding of the mechanisms underlying mortality and health. In this paper, we are concerned with the health and mortality issues of children under 5 years.

Two approaches to the use of proximate determinants are illustrated in the recent discussions of conceptual frameworks for the study of child health and mortality (Mosley 1985; Venkatacharya 1985). The core themes are similar; differences lie at the operational stage.

In the proximate determinants framework of Mosley (1985), nine variables of fertility and mortality are integrated under four main categories. These are shown below:

- I Conception exposure factors
 - (1) Sexual union
 - (2) Intercourse frequency
- II Lactation factor
 - (3) Breast feeding
- III Ecological risk factors
 - (4) Dietary deficiency
 - (5) Environmental contamination
 - (6) Accidents
- IV Direct interventions
 - (7) Personal prevention measures
 - (8) Curative measures
 - (9) Intentional injury

Most of these variables are easily measurable and studies based on single-round surveys can provide the data required for the analysis.

A second approach, with a biomedical bias, is suggested by Venkatacharya (1985) to examine health and mortality as a life process from birth to death of a child. The proximate determinants of mortality are not always fixed for all situations. Further, there is a chain causation and the ultimate cause of mortality is difficult to determine. An attempt is made to illustrate the spectrum of causes of mortality (Fig. 1). Mosley's general framework of proximate determinants is illustrated in Fig. 2.

One pertinent question related to the development of an efficient framework for the study of the child health and mortality is the gap between such knowledge and our ability to put it into effective use. There is no doubt about the importance of safe drinking water, better toilets, and immunization in reducing child morbidity and mortality. Despite this knowledge, interventions based on this knowledge have not succeeded in reducing child morbidity and mortality to the levels theoretically expected. There is thus the need to bridge the gap between knowledge and effective implementation, and to analyze socio-economic as well as biomedical variables.

Before we proceed to a discussion of how we can implement these models, a brief review of the determinants of infant and child health and mortality will be useful. In presenting the findings of many studies done in this area, the scheme shown in Fig. 1 is followed.

Review of Determinants of Infant and Child Health

Healthy State

The WHO definition of health, i.e., "Health is a state of complete physical, mental and social well-being, and not merely an absence of disease and infirmity," is an ambitious one. In many countries, even the mere achievement of physical health and absence of disease is a laudable goal. The problems of defining health are well recognized. In most developing countries, the closest approximation to the measurement of health is indirect and is gained from the study of the incidence of disease and causes of death. These data are scarce or unreliable. At the individual level, there is no satisfactory index of health. In most cases, the health of an individual is the balance between the host, the disease agent, and the environment. Various factors disturb the health equilibrium leading to morbidity and death.

The survival of a child in the 1st and subsequent weeks depends on a number of biological, socioeconomic, and cultural factors. The factors that influence the survival of the child in the 1st week are more dependent on the "gestational environment" of the mother and, to a lesser extent, on the "birth environment" of the child. The health of the mother, which includes the nutritional status during pregnancy, is a particularly important determinant. For instance, inoculation of mothers against neonatal tetanus in areas where tetanus is a major cause of death reduced infant and child mortality considerably (Smucker et al. 1980). Maternal and child health programs with nutritional components have contributed greatly to the births of healthy children. In fact, birth-weight-for-gestation-age (or simply birth weight) is found to be the major determinant of child survival in the early stages (Davanzo et al. 1983).

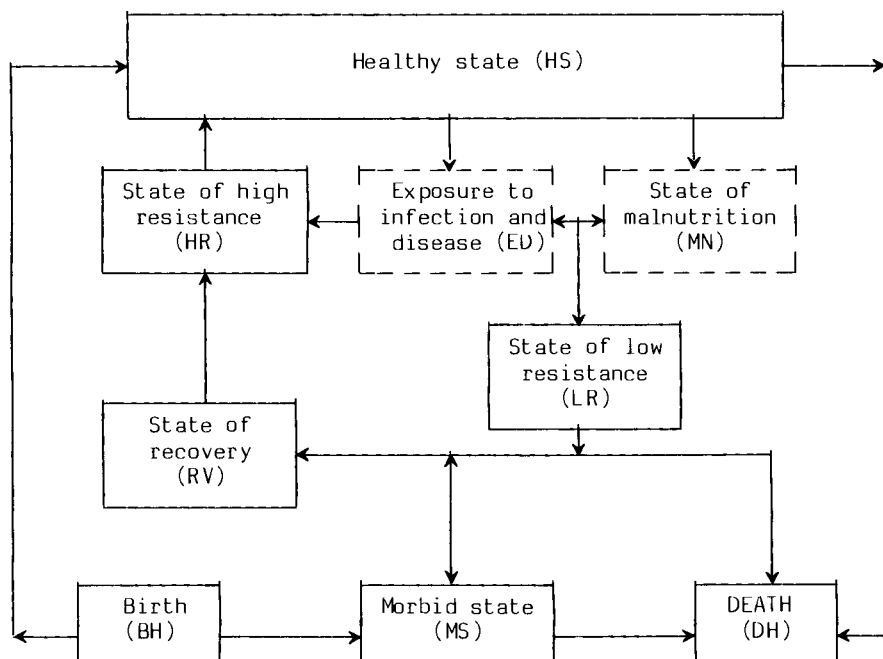


Fig. 1 Process from birth to death among children (Venkatacharya 1985:239).

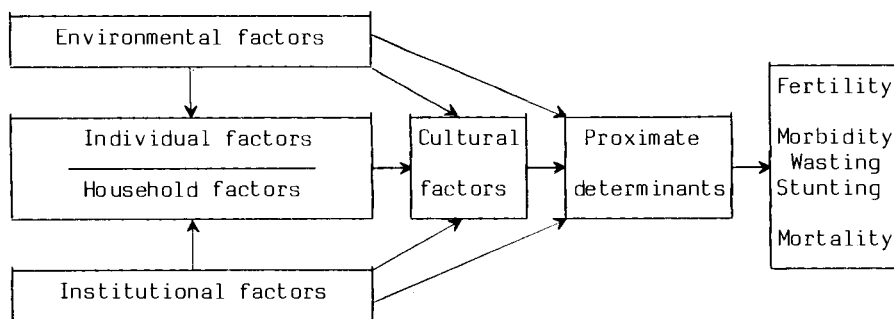


Fig. 2. General model of the interrelationships of underlying and proximate determinants to fertility and child survival (Mosley 1985:197).

Sex differentials in infant and child mortality are also well documented. Male mortality in the neonatal and postneonatal periods is found to be higher than that for females in most of the countries of the world. Behavioural factors such as preference for male children in feeding and health care are advanced as causes for higher female mortality in the childhood ages for some South Asian countries (Nadarajah 1983).

Table 1. Factors that affect transition from one state of health to another.

Transition type	More proximate variables	Proximate variables	Less proximate or remote variables
Birth to healthy state	Birth weight Sex Gestational age Genetic endowment Ethnicity/race Maternal nutritional status during pregnancy Maternal health Mothers age and/or parity Birth practices Pregnancy spacing	Education of mother Education of father Standard of living of the household Marital status of mother	National level of socioeconomic development (national income) Religion Geography and physical environment Mother's childhood residence Level and spread of MCH, nutritional and family planning interventions Literacy of population Level and spread of public health services
Birth to morbid state	Low birth weight Sex (female) Low gestational age Poor maternal nutrition during pregnancy Poor maternal health Low age and/or first parity; and high parity and age of mother Poor birth practices/injuries Poor genetic endowment Ethnicity/race	Low education of mother Low education of father Low standard of living of household Marital status (unmarried)	Same as above

continued

Table 1. Continued.

Transition type	More proximate variables	Proximate variables	Less proximate or remote variables
Health state to state of malnutrition	Short preceding (and/or succeeding) birth interval Early weaning and/or inappropriate infant foods Delayed, inadequate and/or inappropriate infant foods Higher age and/or parity of mother Sex preference in feeding	Low household income and standard of living Attitudes and tastes of food High fertility, crowding, sibling competition Child rearing practices Behaviour related to child feeding Education of the mother	National level of socioeconomic development (national income) Food production and special programs on nutrition and dietary supplements Literacy of population Rural/urban residence
Health state to exposure to infection	Household hygiene Type of household water supply Lack of good toilet Early or too late weaning and/or inappropriate feeding Poor sanitary conditions of baby feeding Prevalence of disease around household Level of child immunization Genetic endowment Ethnicity/race Injuries	Mother's education Father's education Community sanitation High fertility and crowding conditions Household income (Household standard of living)	National level of socioeconomic development (national income) Migration during wars and famines Availability of health care Level of preventive programs for disease

continued

Table 1. Continued.

Transition type	More proximate variables	Proximate variables	Less proximate or remote variables
Exposure to disease and malnutrition to low resistance	Level of malnutrition Poor medical care Short birth interval and/or short duration of breast feeding Genetic endowment Ethnicity/race Injuries	Household income Standard of living Poor maternal care Mother's education Father's education	National level of socioeconomic development (national income) Level and spread of MCH, nutritional and family planning interventions Level and spread of public health and medical care Literacy level
Low resistance to morbid state	Lack of initiative to avail medical care Poor nutrition Medical care not accessible	Mother's education Father's education Household income	National level of socioeconomic development (national income) Level and spread of MCH, nutritional and family planning interventions Literacy level
Morbid state or low resistance state to recovery state	Access to medical care Proper nutrition	Mother's education Father's education Household income (standard of living)	National level of socioeconomic development (national income) Level and spread of MCH, nutritional and family planning intervention Literacy of population

The health of a child in the initial stages of life is also found to vary by age (proxy for biological age) and parity of the mother. Children born to young mothers, under 18 years of age, have higher mortality risks owing largely to biological factors. First-parity children are found to have higher mortality as a result of low birth weight, whereas higher-parity children exhibit higher mortality as a result of behavioural factors (Davanzo et al. 1983).

Evidence is accumulating on the impact of short birth interval on infant and child mortality and morbidity (ICMM). The magnitude of the impact and its implications are not clear, however, mainly because the available data fail to account for confounding effects and many factors of relevance are not controlled. This is systematically argued in an interesting paper by Winikoff (1983). In societies where prolonged breastfeeding is a norm and birth intervals average 36 months, women experiencing short birth intervals (less than a year) will be a selective group. They may be women experiencing a high rate of premature births, children with low birth weight, or previous infant deaths. From the available data, it is difficult to isolate the "active component" of short birth interval that affects ICMM. What is possibly true is that very short birth intervals combined with low-birthweight-for-gestation will contribute to higher neonatal and postneonatal mortality. The "active component" of short birth interval that may have relevance to neonatal mortality is basically biological in nature, i.e., the nutritional depletion of the mother during pregnancy and lactation. In the case of postneonatal and infant mortality, the behavioural component of sibling competition and poor "mothering" could also be responsible.

The prevalence of breastfeeding during the 1st week after birth in most countries, especially developing countries, is found to confer bacterial and viral immunity against gastrointestinal infection (Winikoff 1983). This contributes to lower mortality under 6 months and, to some extent, lower mortality in the postneonatal stage. Together with birth weight, breastfeeding forms a major determinant of neonatal mortality. In the medical literature, the relevance of the standard level of birth weight of 2.5 kg in analyzing mortality in the developing world has been questioned.

Beyond the 1st week of the child's life, the importance of birth environment increases. Birth practices affect the outcome of delivery, that is, the survival chances of the newborn from such causes as neonatal tetanus (4-10 days after delivery). Premature births may be saved if trained birth attendants are present or the high-risk deliveries are done in hospitals. These factors contribute to lower neonatal and postneonatal mortality. In a study in India, neonatal mortality due to tetanus was found to claim 66% of all neonatal deaths. In fact, neonatal deaths themselves formed about 60% of infant deaths (Smucker et al. 1980). In Sri Lanka, also, neonatal mortality formed about 60% of infant mortality, but neonatal deaths due to tetanus accounted for only 1.7% (Meegama 1980). The presence of trained midwives or birth attendants and the use of sterile equipment to cut the umbilical cord and similar measures to improve sanitation were found to result in lower neonatal mortality.

Unfortunately, the current data and analysis have given relatively little importance to genetic factors, partly because of the difficulty of treating these factors. Even studies that may reflect

these factors indirectly through ethnicity are few and far between (Davanzo et al. 1983; Mensch et al. 1983).

The above factors are more proximate to birth into a healthy state and continuance in that state during the period of infancy and childhood than other variables. There are, however, other important factors, behavioural, socioeconomic, and cultural, that can be treated as proximate variables. The most important variable that has emerged from cross-country comparisons is mothers' education (Caldwell 1979; Frenzen et al. 1982; Simmons and Bernstein 1982; and Mensch et al. 1983). Although higher levels of maternal education are found to lower mortality, the magnitude of the impact is not uniform (Palloni 1983). The mechanisms through which mothers' education affects ICMM are not clear nor are the relationships among maternal education, paternal education, and household socioeconomic characteristics. The "active component" of mothers' education that leads to lowering ICMM has great policy relevance, although in the absence of such knowledge, it is still worthwhile to advocate programs aimed at increasing female education. An increase in female education may reduce fertility (or increase the birth interval) which in turn tends to reduce mortality. Caldwell, who has pioneered work on this, believes that female education contributes greatly toward lower ICMM by a mother's ability to break with tradition or become less "fatalistic" about illness. She may also adopt alternative improved, child-care arrangements and play a larger role in family decision-making with respect to preventive and curative health care that benefits the child (Caldwell 1979; Caldwell et al. 1983).

If we move to the outer spheres of the individual family or household, we will find a number of less proximate variables or background variables that are found to influence indirectly the health of the child. Studies have established correlations or associations between variables such as national income, literacy, mother's childhood residence, parental education, and expenditure on health, and infant and child mortality (Preston and Nelson 1974; Rodgers 1979; Diaz-Briquets 1981; Flegg 1982; and Palloni 1983). Many of these variables are found to be related to mortality levels although the magnitude of the association varies between countries and over time for the same country. Although such studies help indicate the relevance of certain factors to mortality decline, by the nature of their analysis, they fail to provide useful information on the causation of ICMM.

State of Malnutrition

Increasing evidence is emerging on the salience of maternal and child nutrition in lowering ICMM (Scrimshaw et al. 1968; Winikoff 1983; and Edmonston and Martorell 1984). A high standard of maternal nutrition, especially during pregnancy, has great impact on lowering child mortality through the mediating effect of birth weight. After the birth of a child, especially during the weaning period, the nutrition of the child is of paramount importance (Winikoff 1980; Edmonston and Martorell 1984; Caldwell et al. 1983) as in most developing countries, children grow in an unsanitary environment and concomitantly suffer from malnutrition. The synergistic effects of these two on ICMM are far greater than the sum total of their individual effects. Malnutrition affects the immune responses of children which in turn renders them susceptible to infections. Children suffering

from kwashiorkor have both cell-mediated and humoral immunity whereas, in marasmus, both these responses appear normal. The household economic level and high fertility of the mother influence both these factors.

The role of breastfeeding is very important in the postneonatal period. Mothers' milk not only provides complete nutritional requirements for the child in the first 6 months but also provides defence against infection. After the first 6 months, however, the child needs extra nutrition and research indicates that the weaning period is the most critical period for the child from the point of view of morbidity and mortality (Winikoff 1982). Early weaning, late weaning, inadequate or inappropriate foods, and contaminated weaning foods are all responsible for increased infant and early child mortality (Gordon et al. 1963). Many studies have drawn attention to the beneficial effect of breast milk. The counter arguments to bottle feeding are becoming more effective (Baer 1983). Poor nutrition exposes the child to greater chances of infection and repeated infection reduces the nutritional level of the child. Protein Energy Malnutrition (PEM) leading to marasmus and kwashiorkor is probably the "hidden killer" of many children, through their exposure to infectious diseases such as measles, diarrhea with dehydration, and respiratory tract infections.

State of Exposure to Infection and Disease

The transition from a healthy state to a state of susceptibility to infection and disease takes place, in most cases, through the passage to the state of malnutrition. The prevalence of infectious diseases in the neighbourhood and the susceptibility of the child brought about by malnutrition determine the chances of infection and disease. Many factors are responsible for this malnutrition syndrome as discussed above. Other factors such as personal hygiene of the child, toilet facilities, safe water supply (Meegama 1980; Caldwell et al. 1983), and prevalence of diseases in the environment also influence the child in succumbing to infection and disease (Anker and Knowles 1980). These variables can be influenced by others such as mother's education, father's education, climate, household income, and community sanitation (Caldwell et al. 1983; Palloni 1983). These variables are, in turn, affected by global factors such as national income, national policy, migration during wars and famines, and the absence or ineffectiveness of preventive and curative health-care programs. It is important but also difficult to evaluate the contribution of each of these factors, in the presence of many other relevant factors, to child morbidity and mortality.

State of Low and High Resistance

The human body, from the moment of birth until the last breath of life, is continuously exposed to diseases. What determines survival is resistance to disease, which can be viewed as consisting of two components. One is purely determined by genetic factors and, over the life of the individual, might remain constant. The other is acquired. Innate immunity contributes to the first type of resistance. But this basic level of resistance can be improved or lowered by socioeconomic and personal characteristics of the host. Mention has been made of the synergistic effects of malnutrition and infection that tend to lower host resistance and operate cyclically. Other aspects of child care further affect resistance. Higher infant mortality rates for males

compared to females is frequently attributed to females' higher resistance to disease and infection. It may be recalled that behavioural factors such as preference for male children and short duration of breastfeeding also contribute to lower resistance through the mediating effects of malnutrition. All these factors can be treated as more-proximate determinants of ICMM compared with household income, poor maternal care, parental education and occupation and so on.

High resistance to infection is mostly due to host immunity of either an active or passive type. Maternal immunization offers a child passive resistance. The child acquires active immunity by previous exposures to infections and disease and through immunization programs. The resistance in the child can be enhanced greatly by following the recommended immunization schedule for polio, measles, typhoid, tetanus, and pertussis. The child's resistance is also built up by breastfeeding, optimal use of baby foods, and proper medical care.

This is an area where definition and measurement problems abound. No direct measure of host resistance exists outside the medical laboratory. Only indirect measures such as nutrition and levels of immunization provide the best possible estimates.

Morbid State

Reducing mortality rates alone does not increase the health of children. The level of morbidity must be reduced to attain and sustain low mortality levels in developing countries. Morbidity in a child is not only difficult to define but also to measure. At the macro level, morbidity indices such as frequency of illness associated with water-borne diseases, insectborne diseases, and diseases due to crowding give an idea of the level of morbidity in a population. Disability rates based on hospitalization are also useful. But the measurement of morbidity in the case of infants and children is very difficult especially when the majority live in rural areas. Among children, the principal causes of morbidity are infectious and parasitic diseases; viral diseases such as measles; and bacterial diseases such as cholera, dysentery, and gastroenteritis. Malnutrition and lack of proper medical care are the more proximate causes. In rural areas, both accidental and intentional injuries also contribute to child health and mortality. Here, mothers' education and care will have a great impact in reducing ICMM.

State of Recovery

Recovery after entering a morbid state or at an earlier stage when host resistance is weakening can be achieved through medical care. Chemotherapy and improvement in the nutritional levels will help the child regain a resistance level required to maintain the health equilibrium. Whereas medical care and nutrition are more proximate variables, household income, mother's education, father's education, and standard of living can be treated as proximate variables. As we move further from the individual, the recovery depends on the national income, literacy, level and spread of maternal and child health, nutritional, and family planning programs. The magnitude of the impact of these variables varies from country to country. The state of recovery will also vary between individuals.

Designing Studies Based on Proximate Determinants

From the foregoing review, we can attempt to list the proximate determinants under five categories, following those suggested by Mosley (1985).

- I Demographic (fertility) variables
 - (1) Age, parity, and birth intervals
- II Maternal and child nutrition
 - (2) Maternal nutrition during pregnancy
 - (3) Breastfeeding
 - (4) Child feeding
- III Sanitation and environmental variables
 - (5) Safe drinking water and good toilet facilities
 - (6) Incidence and prevalence of diseases such as diarrhea, measles, malaria, and tetanus
- IV Preventive and curative measures
 - (7) Birth practices
 - (8) Immunization and preventive care
 - (9) Curative medical care
- V Accidents and intentional injuries
 - (10) Accidents and practices such as infanticide and female circumcision

In the literature, many studies have been made to determine the relationship between child health and mortality and socioeconomic and cultural variables. The simplest studies are those based on censuses and governmental statistical publications. These studies have helped to establish mortality differentials. More powerful methods, although indirect in nature, have been developed and applied to the routine tabulations of children ever born and surviving by age of the mothers (Mensch et al. 1983). Sample surveys conducted with specific objectives, such as the World Fertility Survey Program that included household as well as individual questionnaires, have helped to sharpen mortality differentials. These studies, which are based on relatively large sample sizes, have helped establish the association between infant and child morbidity and mortality. By their very nature, however, they are not particularly useful in establishing causal linkages.

In recent years, micro studies have attempted to focus more closely on a small number of cases. Such studies are usually prospective and longitudinal. Micro studies using an anthropological approach have also contributed immensely to our understanding of the underlying mechanisms of child health and mortality. These studies, although offering greater depth, lose generality, which is crucial for designing health interventions.

A synthesis of the macro and micro approaches, retaining the strengths of both methods, appears to offer more than either one used individually in the study of determinants. Three important studies in this connection come to mind. One is a longitudinal study in South India by Caldwell et al. (1983) that employed both the sample-survey approach and the microstudy approach with an emphasis on intensive observation. This study has considerable social content and many qualitative observations are employed in the analysis. The other studies, one by Julie Davanzo et al. (1983) in Malaysia, the other by Barros et al. (1986) in Brazil, are unique in the way biomedical and

social variables are incorporated in a carefully designed survey. For example, both studies have included proximate determinants such as birth weight, birth order, duration of supplemental breastfeeding, sanitation, and household density.

Where financial constraints are not serious, the establishment of population laboratories probably offers the best understanding of the complex mechanisms underlying child health and mortality. Two such studies can be cited: the Matlab studies in Bangladesh and the Gandhigram studies in South India. The results coming from such longitudinal studies with action program components are of greater value than many sample-survey studies. The studies based on Ngayokheme in Senegal and the Danfa Project in Ghana are also useful examples.

In view of the costs involved in establishing such population laboratories, efforts must be made to seek assistance from international donor agencies such as IDRC, UNICEF, WHO, UNDP, and the national governments concerned. The benefits from such an effort in our understanding of the complex process of child health and care will far outweigh the investments.

References

- Anker, R., Knowles, J.C. 1980. An empirical analysis of mortality differentials in Kenya at macro and micro levels. *Economic Development and Cultural Change*, 29(1), 165-185.
- Baer, E. 1983. An update of the infant formula controversy. *Studies in Family Planning*, 14(4), 119-122.
- Barros et al. 1988. Child health and child care in Pelotas, Southern Brazil: methodology and results of a longitudinal study. This volume.
- Caldwell, J.C. 1979. Education as a factor in mortality decline: an examination of Nigerian data. *Population Studies*, 35(3), 395-414.
- Caldwell, J.C., Reddy, P.H., Caldwell, P. 1983. The social components of mortality decline: an investigation in South India employing alternative methodologies. *Population Studies*, 37(2), 185-205.
- Davanzo, J., Butz, W.P., Habicht, J.P. 1983. How biological and behavioural influence on mortality vary in Malaysia during the first year of life. *Population Studies*, 37(3), 381-402.
- Diaz-Briquets, S. 1981. Determinants of mortality transition in developing countries before and after the second World War: some evidence from Cuba. *Population Studies*, 35(3), 399-412.
- Edmonston, B., Martorell, R. 1984. Mortality and nutrition: a review of selected micro-level relationships. 20 pp. Mimeo.
- Flegg, A.I. 1982. Inequality of income, illiteracy and medical care as determinants of infant mortality in underdeveloped countries. *Population Studies*, 36(3), 441-458.

- Frenzen, P.D., Hogan, D.P. 1982. The impact of class, education, and health care on infant mortality in a developing society: the case of rural Thailand. *Demography*, 19(3), 391-408.
- Gordon, G.E., Chikara, I.D., Wyon, J.B. 1963. Weanling diarrhea. *American Journal of Medical Science*, 245, 129-161.
- Meegama, S.A. 1980. Socio-economic determinants of infant and child mortality in Sri Lanka: an analysis of post-war experience. World Fertility Survey, scientific report no. 8. International Statistical Institute, The Hague, Netherlands.
- Mensch, B., Lentzner, H., Denton, N., Taber, S., Strong, M. 1983. Comparative patterns of child mortality differentials in developing countries. Paper presented at the Population Association of America meeting, Pittsburgh, PA, USA, 14-16 April 1983. 25 pp. Mimeo.
- Mosley, W.H. 1985. Biological and socioeconomic determinants of child survival: a proximate determinants framework integrating fertility and mortality variables. In International population conference, Florence, Italy, 5-12 June 1985, vol. 2. International Union for the Scientific Study of Population, Liège, Belgium. pp. 189-208.
- Nadarajah, T. 1983. The transition from higher female to higher male mortality in Sri Lanka. *Population and Development Review*, 9(2), 317-325.
- Palloni, A. 1983. Health conditions in Latin America and policies for mortality change. Center for Development and Ecology, University of Wisconsin, WI, USA. W. paper, No. 83-10.
- Preston, S.H., Nelson, V.B. 1974. Structure and change in causes of death: an international summary. *Population Studies*, 28(1), 19-51.
- Rodgers, G.B. 1979. Income and inequality as determinants of mortality: an international cross section analysis. *Population Studies*, 33(2), 343-351.
- Scrimshaw, N.S., Taylor, J.E., Gordon, J.E. 1968. Interactions of nutrition and infection. World Health Organization, Geneva, Switzerland. Monograph series no. 57. 329 pp.
- Simmons, G.B., Bernstein, S. 1982. The educational status of parents and infant and child mortality in rural North India. *Health Policy and Education*, 2(34), 349-367.
- Smucker, C.M., Simmons, G.B., Bernstein, S. and Misra, B.D. 1980. Neo-natal mortality in South Asia: the special role of tetanus. *Population Studies*, 34(2), 321-335.
- Venkatacharya, K. 1985. An approach to the study of socio-biological determinants of infant and child morbidity and mortality. In International population conference, Florence, Italy, 5-12 June 1985, vol. 2. International Union for the Scientific Study of Population, Liège, Belgium. pp. 237-253.

- Winikoff, B. 1982. Weaning: nutrition, morbidity, and mortality consequences. Biological and social aspects of mortality and the length of life. Ordina Editions, Liège, Belgium. pp. 113-150.
- 1983. The effects of birth spacing on child and maternal health. Studies in Family Planning, 14(10), 231-245.