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INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

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INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD*

Progress Report for the Advisory Committee on Medical Research**

The objectives and procedures of this continental research program are well known to the Advisory Committee on Medical Research through previous documents.[1, 2] The attached Provisional Report for the First Year of the Investigation[3] provides a partial analysis of the questionnaires for 17,198 deaths in the first year of the 13 Latin American projects. This analysis and others in working drafts on birth weight, breast feeding, provision of foods and socioeconomic and related factors serve as a basis for a final report of the Investigation which is now underway and is to be published in book form with the title Patterns of Mortality in Childhood. Additional analyses and reports will be published later.

The results obtained indicate that new approaches and varied actions are advisable in programs at international, national and local levels for improvement of the health of the population, especially of infants and young children in the Americas. A member of this Committee requested that the results of the Investigation be presented to you in relation to the next steps that should be taken and that concrete recommendations be made so that the Committee could consider support for future activities. Thus a few of the highlights are described, principally to show the evidence for the types of actions which are recommended. The brief summary will be followed by specific recommendations to insure maximum benefits from this large collaborative investigation.

HIGHLIGHTS OF THE RESULTS OF THE INVESTIGATION

First, our community research program has indicated to all of us, the principal collaborators and the staff in the field and in the Pan American Health Organization, that immediate actions are essential for establishment of quality in vital statistics, in hospital statistics and in basic population data. The Investigation shows surprising deficiencies in the collection of such data for nearly all projects - and that such deficiencies are serious. Varying percentages of deaths were not registered, as many as 44 per cent of the neonatal deaths and 20 per cent of the deaths under 5 years of age in one project. Thus the foundations for health planning are not well constructed; in fact, the data on mortality in childhood are so incomplete that they invalidate comparisons of mortality for practically any two countries. The definitions of a live birth and a fetal death of the World Health Organization are not applied consistently which affects reporting and registration of neonatal deaths. The comparability of infant mortality and life expectancy for even highly developed countries is questionable due to differences in inclusions of deaths of low birth weights.

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**Report prepared by Dr. Ruth R. Puffer and Dr. Carlos V. Serrano, for the Eleventh Meeting of the Advisory Committee on Medical Research of the Pan American Health Organization, 19-23 June 1972.

Many deaths of infants, especially of those of low birth weight which occur in hospitals, are omitted from all types of reports, that is reports of hospital discharges and of births and deaths. In fact the only reference to a birth or death may be found on the delivery record of the mother or in the delivery book. Such deaths are forgotten. The Provisional Report(3) provides data on unregistered deaths and the attached Report of the Meeting of Principal Collaborators(4) describes the organized search being conducted in Santiago, Chile, to establish complete information on all neonatal deaths. Also the latter gives recommendations for improvements in vital and hospital statistics. The discovery of incompleteness of data regarding infants is important not only for quality of the research program and for future research on the relation of nutritional status of the mother and outcome of pregnancy but also for new efforts to establish sound procedures for quality and comparability of vital statistics for countries of the world.

Second, measurement of the magnitude of health problems in infancy and childhood such as nutritional deficiency and prematurity as well as the interrelationships of diseases and factors responsible for excessive mortality requires utilization of associated as well as underlying causes of death. The underlying causes have been defined as the top of the iceberg; such important problems as nutritional deficiency, usually an associated cause of death, are below the surface, out of sight. The analyses of multiple causes of death reveal that nutritional deficiency is the most serious health problem in infancy and childhood in Latin America. Thirty-eight to 69 per cent of the deaths were due to nutritional deficiency as the underlying or associated cause of death in these 13 projects. Death rates from nutritional deficiency are very high in infancy, varying from 5.6 to 37.1 per 1,000 live births in the 13 cities and were in excess of 20 per 1,000 live births in 5 areas outside the cities. Of the deaths with infectious diseases as the underlying cause the percentages with an associated nutritional deficiency varied from 40 for Kingston to 71 for Recife and 76 for Ribeirão Prêto. These findings indicate the need for consideration of the susceptibility of the host as well as the infectious agent in designing preventive programs.

Limited breast feeding was noted in several projects, especially in those in Brazil and San Salvador. The finding of unusually high proportions of neonatal deaths of infants classed premature on the basis of birth weight by the WHO definition of 2,500 grams or less points to the need for additional information and greater understanding of the role of low birth weight in natality and mortality. Clarification is urgent of the relationship between the nutrition and health of mothers and the birth weights of their products.

Thus the data on multiple causes serve to uncover problems and show the need for redesign of preventive programs to consider susceptibility to disease, that is the nutritional status, and also to extend nutrition programs in order to prevent morbidity and mortality in infancy and childhood.

Third, excessive reproductive wastage was noted through the study of outcome of products of previous pregnancies with as many as 38 per cent of the products dead as fetal deaths or deaths in infancy and childhood in one city. In all areas infant mortality among previous products was higher than

during the period of the Investigation, thus indicating the concentration of infant mortality in a vulnerable group of the population, that is in mothers with excessive reproductive loss.

In several projects birth rates are high, around 40 per 1,000 population and many of the deaths were of high birth orders in which infant mortality is excessive. The effect of shift from births of high birth orders to those of low order was illustrated by data from the Province of Santiago which experienced a 32 per cent reduction in its birth rate from 37.6 in 1962 to 25.6 per 1,000 population in 1969. Such a shift results in a lower infant death rate. The Investigation is indicating the value of analyses of infant mortality considering many variables for sound knowledge necessary for planning and conduct of family planning programs aiming for survival of infants. However, for full understanding of the existing situation as well as for evaluation of changes, attention should be directed to the provision of the essential basic data regarding births by birth order, age of mother, birth weight, etc., with the requirement of quality, completeness and accuracy of data as discussed in the first point. At present such data are non-existent for practically all countries of the world and yet are fundamental for the study of human reproduction.

Fourth, analyses of socio-economic variables including availability of water supplies and health services, education of the mother, occupation of the father, etc., indicate excessive mortality in vulnerable groups of the population. Prevention of many diseases requires elimination of the method of spread of the infectious agent as well as improvement of the nutritional status. Provision of water to homes is vital. The complexity of problems necessitates a multidisciplinary and multisectorial approach in health planning.

The most important and overall significance of this research is that the size and nature of the health problems are being uncovered and that they require solutions adapted to the areas. Thus, the results indicate the value of a broad approach and new policy of the Organization for community centered research as an essential part of the planning of health programs. The patterns of mortality differ markedly in areas and countries of the world as do the solutions to those problems. The results of research in a highly developed country may not be applicable to the problem or solution in a developing area. For example, a vaccination program against measles will prevent needless complications and deaths of young children in a highly developed society but vaccination only may not be sufficient to prevent deaths in a developing society. The deaths from measles occur mainly in a highly susceptible group, the nutritionally deficient. These children are at great risk of death from infectious diseases; if measles is prevented, the death may still be produced by another infectious agent. The contributory cause may be kwashiorkor or marasmus or an ill-defined nutritional deficiency state. Thus the nature of the problem, measles in the nutritionally deficient young child, and the solution, vaccination plus prevention of nutritional deficiency, is more complicated than in the highly developed countries. The magnitude and complexity of health problems need to be uncovered as well as new designs sought - ideally through operational research.

The Report of the Meeting of the Ministers of Health of the Andean Region expresses well our recommendation in this field, (in translation), namely:

> "If we really desire to invest resources efficiently, we need to measure or evaluate the existing problems and to uncover those that remain hidden and whose magnitude is unknown. Operational research acquires utmost importance, equally in measurement of the advance and productivity of the actual systems and in attaining bases for establishment of new designs and methods of work. Thus, it is important that our countries not remain in isolation but that endeavors be combined for the conduct of joint research programs such as the 'investigation of mortality in children under 5 years of age', carried out by the Pan American Sanitary Bureau with the participation of various countries, among them Bolivia, Chile and Colombia, members of the 'group', which is now nearly completed."

SPECIFIC RECOMMENDATIONS

Our first and comprehensive recommendation is for the establishment and implementation of the policy by the Organization that community centered research, preferably coordinated, is necessary for uncovering and designing health programs in all areas of the Continent; and that the Organization and other international agencies promote and coordinate such research with the local collaboration of health services, universities and institutes. The implementation of this policy requires the creation of centers and programs with major emphasis on epidemiology, statistics and pathology for the preparation of research oriented personnel. The proposed community centered research projects should constitute excellent training opportunities for the various members of research teams.

Earlier this year at the Meeting of Principal Collaborators, pertinent recommendations were made for actions and research in the following five fields:

- Registration of Vital Events and Vital Statistics
- Hospital Records, Procedures and Statistics
- Maternal and Child Health and Nutrition
- Education in Health Sciences
- Future Research Programs

These recommendations which are given in detail in the document should serve as the basis for next steps in local, national and international programs. Each principal collaborator has unique opportunities for utilizing the results of the Investigation and these recommendations in his area and country. Several

collaborators will influence health programs and obtain actions in the future through education in schools of medicine and public health. Others as health officials and planners are establishing new maternal and child health programs, as in Bolivia and Recife. One principal collaborator has already revised procedures and regulations for recording deaths in hospitals and another is utilizing the findings from the search for unregistered deaths (and births) to establish correct procedures in hospitals and civil registration offices.

Several specific proposals for programs by staff of the Pan American Health Organization have been or are being designed and submitted for support by the Organization and other agencies. The objectives and work plans of four such proposals are described briefly.

Methodology for Maternal and Child Health Programs

The long-range objective of this project is to develop methodology for use in planning and conducting effective comprehensive, coordinated programs in maternal and child health, with active participation of the university, health agencies and the community. Emphasis is placed on the coverage of high risk groups, on the constant improvement and use of statistical data for dynamic evaluation and for changes in actions as indicated.

The immediate objectives are as follows:

1. To develop and test criteria for identification and measurement of high risk groups and to provide them with adequate medical care. Health services to pregnant women and to children under 2 years of age will have the highest priority. The criteria and the procedures will be developed bearing in mind their potential application in other places.

2. To develop and test procedures of coordination between university, health agencies and community in the implementation of programs of maternal and child health in which optimum use of existing resources will be made.

3. To define and test procedures of evaluation of results from actions in coordinated programs of maternal and child health. This will include the establishment of surveillance procedures for obtaining high quality data for current utilization and periodic analyses of their efficiency.

4. To developed the basic structure and facilities for conducting community centered research, for in-program and in-service training of all components of the health team and for the execution of special programs in which national and international agencies may combine efforts for specific purposes and gain experience from coordinated actions.

The work plan provides for a planning phase of two years in which the basic criteria and procedures would be prepared, the resources available evaluated and a trial or pilot project would be conducted in Recife or Campinas, Brazil.

In the main phase of the program for a period of 5 years, the experience gained in the trial project would be applied in seven other urban areas followed by expansion to their respective rural areas. In this phase research would be conducted and methods for extending health services to vulnerable groups would be developed. These programs are to be designed to obtain the maximum benefit of the existing resources having as the target the vulnerable individual, family and community groups.

International agencies, such as UNDP PAHO/WHO, UNICEF, World Food Program, W. K. Kellogg Foundation, Agency for International Development and others, could join resources for complementary actions for financing various phases of this large program in which research is an important component.

Study of Outcome of Pregnancies and Survival of Newborn

The long-term objective of this project is to develop accurate and comparable statistics in the field of human reproduction as well as on birth weight and survival of products of gestation and to promote their full utilization for planning and evaluating actions, for teaching in health sciences and for conduct of community centered research in maternal and child health.

The immediate objectives are as follows:

1. To develop and introduce procedures for recording and handling of data regarding each pregnancy and its outcome (early and late fetal death and live birth), birth weight, health and nutritional status and survival of live births, with the active participation of health and university personnel.

2. In order to understand the implication of certain interrelationships between the outcome of pregnancies, circumstances of delivery and biological and sociological factors, periodic analyses of data collected will be made and the results utilized for evaluation and readjustment of programs.

3. To establish the foundation for the conduct of a prospective study on the nutritional status of pregnant women and their reproductive histories (parity, spacing, outcome and survival of previous children) and the relationship of these factors with the course of pregnancy, birth weight, the health condition of the newborn and during early childhood.

The work plan includes a pilot phase of two years within a local program of maternal and child health in a city such as Recife, Brazil. A set of recommendations for recording and reporting standard basic data (forms and tabulations) will be prepared and discussed at a planning conference and a manual of procedures elaborated. These procedures will be tested with the full cooperation of local health agencies and university units and will be accompanied by educational activities directed to professional and auxiliary personnel, administrators of hospitals and health centers, students and midwives.

In the main phase the procedures tested and revised will be gradually implemented in various centers with introduction at regional and national levels. After standard procedures are introduced, collaborative longitudinal studies of human reproduction will be planned and conducted.

Intensive Program to Improve Vital and Health Statistics in Latin America

The Department of Health Statistics has developed a proposal for an intensive program for improvement of vital and health statistics. The emphasis on health planning has created a widespread awareness of the needs for statistical data which has resulted in use of available data, often incomplete in coverage and of unknown quality. Also the Inter-American Investigation of Mortality in Childhood demonstrates serious and surprising deficiencies of data from death registration systems as well as in hospital statistics. A new approach - a strategy - for rapid improvement has been devised with an expanding program for its initiation with teams of consultants working for improvement of civil registration, hospital statistics and statistics of health centers.

Effect of Malnutrition on the Immune Response to Infectious Diseases

The synergistic action of infectious diseases and nutritional deficiency is responsible for excessive mortality in childhood in the areas of the Investigation. In spite of important findings of studies by Smythe *et al*[6], Woodruff[7] and Marigo[8] and others, the mechanism of the interrelationships between immunity response and nutritional deficiency has not been clearly established.

The existing PAHO/WHO program on Training and Research in Immunology, as well as the great interest on the part of various scientists (such as Dr. Carlos Marigo in São Paulo) could be used to conduct investigations in this promising area with implications even in the field of cancer.

A research project with the following objectives could be proposed:

1. To measure immune responsiveness in malnourished and well-nourished living children and in children recovering from malnutrition.

2. To study histopathologic changes occurring in thymus and bursa-dependent lymphoid tissues during malnutrition as revealed by autopsy.

3. To study histologiccally the state of immunologic system of children who die in the newborn period and its relationship to maternal nutrition and health and to conditions during pregnancy and birth.

Patterns of Breast Feeding

Other agencies are interested in research indicated by the Investigation. For example, the MIL Research Limited of England at the request of the FAO Nutrition Division has proposed an investigation on breast feeding aimed:

1. To measure trends in breast feeding in areas of rapid urbanization and surrounding rural areas in order to determine the extent of the problem.

2. To provide the basis of a strategy for encouragement of breast feeding.

3. To develop alternative strategies for improving infant nutrition.

4. To provide the basis for education in weaning foods using locally grown cereals and vegetables rather than expensive milk products.

Recife, Brazil, has been tentatively selected as one of the areas in view of the provisional results of the Investigation, the other areas being considered are Ibadan, Dakar, New Delhi and Kuala Lumpur. Research of this type is considered essential to define mechanisms to improve chances of survival of children in areas in which socio-economic and environmental conditions are unfavorable and in which early weaning patterns exist.

Other Projects

The World Health Organization has adapted the methodology of the Investigation in order to obtain accurate measures of infant and child mortality in areas of the world without satisfactory statistics. This activity of WHO, utilizing funds from the United Nations Population Program, is a direct result of our Investigation. A period of six months is being used for training of national personnel. The four projects already designed are in the following countries: Afghanistan, Sierra Leone, Algeria and Indonesia.

Thus the methodology of the Investigation is suitable for adaptation for projects designed for the study of mortality or of specific health problems in many areas of the world.

The ultimate success of the Investigation depends on the actions taken for the health of children through out the continent, through the combined efforts of the principal collaborators, health authorities and educators as well as those of the international organizations. The greatest contribution of the Investigation will be the acceptance and implementation of the principle that community centered research should be incorporated as an efficient and essential part of programs for uncovering health problems and for seeking new designs for their solution.

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Attachments: 1) Provisional Report of the First Year of the Inter-American Investigation of Mortality in Childhood.

2) Report of the Meeting of Principal Collaborators of the Inter-American Investigation of Mortality in Childhood.

April 26, 1972