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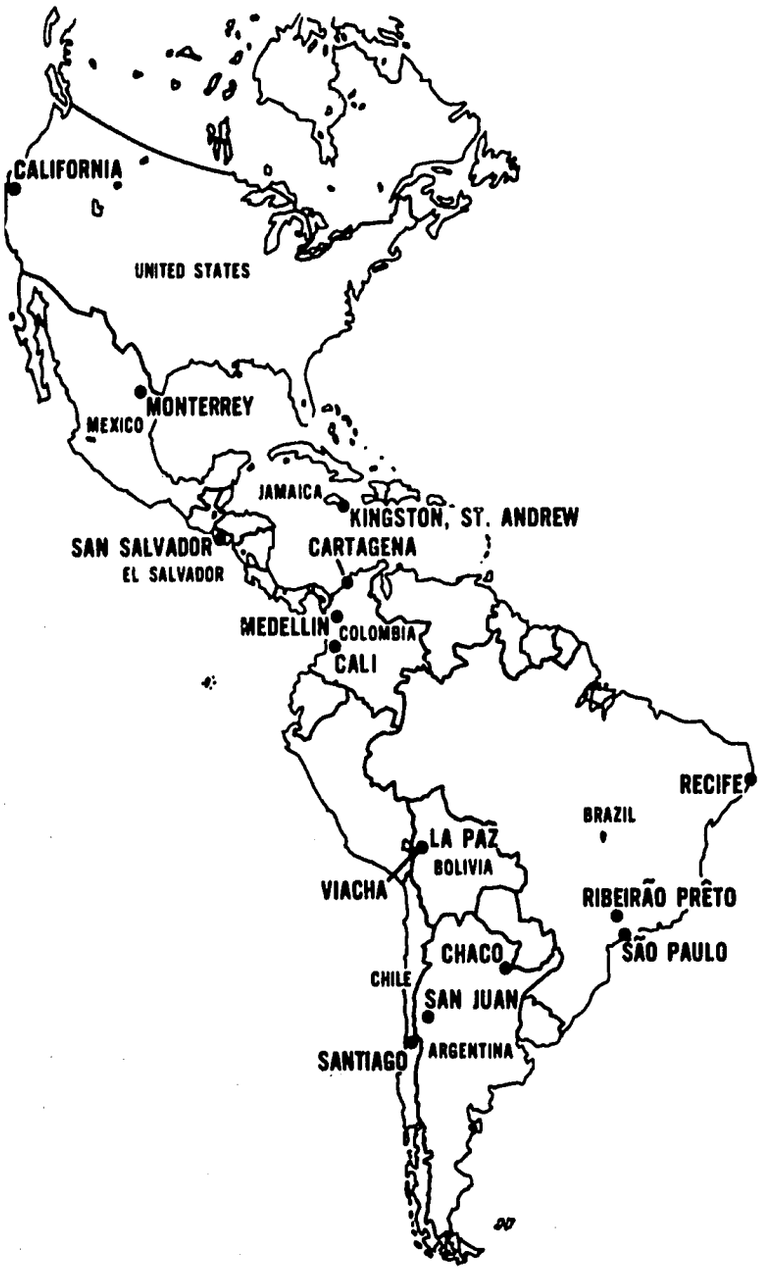
THE TECHNICAL FRONT



Inter-American Investigation of Childhood Mortality

By Ruth R. Puffer, Dr. P.H. and Carlos V. Serrano, M.D.

One of the goals established in the Charter of Punta del Este was "to reduce the present mortality rate in children under five years of age by one half." To approach this goal realistically, quantitative and qualitative data on the causes of death in this segment of the population must be provided to those persons responsible for planning, programming, and executing health programs at local, national, and international levels.

The Inter-American Investigation of Mortality in Childhood, a continental collaborative study, is working to develop accurate and comparable statistics related to causes of death of children in 15 widely separated areas of the Americas. In 1966, the Agency for International Development provided funds to the Pan American Health Organization for the planning phase of the investigation and in 1968 awarded a grant for the collection of data on deaths and of samples of the living population in the same areas over a two year period. The collection of data in the field started in mid-1968 and will be completed in late 1970.

Information on approximately 35,000 deaths of children under five years of age is now being collected. Hospitals, clinics, private physicians, autopsy reports, family interviews and death certificates are sources used to determine the multiple causes of death. In addition, a probability sample of households for each community over the two-year period will yield data for 20,000 living children in this age group. Thus, the interrelationships between diseases and socioeconomic and ecological factors can be studied.

Thirteen areas in Latin America have been

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selected for inclusion in the investigation. They were chosen to give representation to the different geographic and topographic areas and because resources for direction of the studies were available.

Principal Projects

Principal Latin American projects are located in: Argentina, where part of the Province of El Chaco and the entire Province of San Juan are under investigation; Bolivia—La Paz and Viacha; Brazil—Ribierao Preto and neighboring villages in Sao Paulo State, the City of San Paulo, and Recife; Chile—Santiago; Colombia—Cali, Florida, Cartagena and Medellin; El Salvador—San Salvador; Jamaica—Kingston and St. Andrew; and Mexico—Monterrey.

Several other areas have expressed interest in conducting similar projects as part of this collaborative continental study. A project in California, for example, has received financial support from the U.S. Children's Bureau and is included in the investigation. Planning is also underway for a small project in the Province of Quebec, Canada.

So that the research might benefit both medical education and health programs, all of the projects except one have been developed in schools of medicine and public health with collaboration from those responsible for delivery of health services.

Field Investigations

In each project the principal collaborator directs a small team consisting of at least two physicians, two public health nurses or social workers, and a secretarial staff. For each death included in the investigation, a home visit is made by the public health nurse or social worker to obtain the following information:

(1) Facts about the illness leading to death—details of the birth, breast feeding, weaning, foods added to the diet and medical attention received;

(2) Pregnancy history, medical attention and complications of pregnancy and delivery for the mother;

(3) Age, education and occupation of each parent;

(4) Composition of the household in which the child was a member; and

(5) Housing conditions of the household.

The medical interviewer completes the medical portion of the questionnaire utilizing hospital, clinic and autopsy records and interviews with physicians for deaths with such attention. For deaths without prior medical attention, the medical interviewer goes to the home to obtain data regarding the fatal illness. Efforts are made to obtain the weight of the child and a clinical evaluation of nutritional status at birth and at subsequent intervals.

The last page of the questionnaire is designed for a summary of the diagnostic information leading to the assignment of the underlying and associated causes of death. The underlying cause of death, defined as (a) the disease or injury which initiated the train of morbid events leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury, is assigned following the rules of the *International Classification of Diseases*. The associated causes are all those conditions which are either a consequence of the underlying cause or any preexisting pathologic condition contributing to the death process. The medical interviewer prepares summaries of these causes directly or indirectly leading to death. These in turn are reviewed at staff conferences in which the principal collaborator, medical interviewer, nurse interviewer, pathologist, pediatrician, statistician and other members of the team participate.

Probability Samples

The field investigation also includes visits to sample households in order to obtain comparable data on children who are still living. The households included in this portion of the study are selected in advance according to a probability sample design for the area. Every month, 50-80 households are visited by the public health nurse or social worker who records data regarding living members of the sample households similar to data obtained from households in which deaths have occurred. In addition, this record includes live births, fetal deaths, and pregnancies of each woman 15 to 49 years of age during the 12 months prior to the interview.

For each living child under five years of age in the sample, a second page is being completed with data regarding the parents, pregnancy history of the mother, place of and attendance at birth, weight at birth, breast feeding, weaning, addition of foods to the diet, and medical attention received—that is, data similar to that obtained for the dead children. For the living children two measurements for evaluation of nutritional status—weight and arm circumference—are obtained at the time of the home visit.

Probability sampling is relatively new to most of the Latin American areas, and thus is providing valuable experience for the local teams.

The current study of infant mortality will highlight major health problems and help Latin American doctors, educators and mothers keep children alive.

Many of the areas are using the sampling frames developed for this investigation in other collateral studies.

Files Established

To obtain accurate data on infant mortality, each area establishes files of births, deaths and fetal deaths. In addition to official records of these events, other possible sources are used for knowledge of unregistered births and deaths—hospitals, midwives, health departments, church records, baptisms, cemeteries, etc. All projects use the World Health Organization definition of a live birth, irrespective of local practice. In brief, WHO defines a live birth as one in which a child born after any length of pregnancy breathes or shows any other indication of life (heartbeat, pulsation of the umbilical cord, etc.), regardless of duration.

Careful checks are made to secure birth records of all infants who die shortly after birth and also records of fetal deaths of those who show no signs of life in accordance with the WHO definition. Perinatal mortality, that is, the combination of fetal deaths (28 weeks of gestation and over) and deaths under seven days, will be analyzed.

Another important phase of field work involves extending performance of autopsies to as large a portion of the deaths as possible. The availability of pathologists varies but it is hoped that during the period of the investigation special efforts will be made to have residents in pathology assigned to pediatric pathology.

Central Office Procedures

Completed questionnaires are being transmitted monthly to the Central Office at the Pan American Health Organization. They are reviewed and the information coded for processing by computer. Assignment of the underlying and associated causes of death is carried out in accordance with procedures developed with the assistance of the medical referee. This phase of the investigation is receiving special attention as rules for assigning multiple causes are being developed. Through this extensive study of deaths in infancy and childhood, it is expected that the investigation will contribute to international rules which will be considered for the 1975 Revision of the *International Classification of Diseases.*

Provisional Results

Probably the most important finding thus far in the Inter-American Investigation of Mortality in Childhood is the recognition of the seriousness of nutritional deficiency and the high proportion of deaths in childhood in which nutritional deficiency is one of the causes contributing to death. In the past, official mortality statistics have failed to reveal the size of this problem. Nutritional deficiency as a serious health problem in many areas of the world cannot continue to be overlooked because mortality statistics fail to be geared to its measurement. Mortality statistics in the past have been based on tabulations of underlying causes of death; in this study, however, the associated as well as the underlying causes—the multiple causes of death—are being obtained and analyzed.

Malnutrition, for example, becomes increasingly serious over a period of time, and eventually, an acute infectious disease actually kills the malnourished child. According to the rules established in the *International Classification of Diseases* for assigning causes of death on death certificates, an acute infectious disease, such as measles, is the underlying cause of death. The malnutrition, an important pre-existing condition contributing to a fatal outcome, is ignored.

In this research program, the interrelationships of diseases and conditions are being analyzed.

Provisional data regarding causes of death are available for the age group six months through four years for the first few months of four projects. For these four projects combined, nutritional deficiency was the underlying cause in 10 percent of the deaths, a contributory cause in 31 percent and a consequence of the underlying cause in 15 percent. Thus, in all, 56 percent of these deceased children had a severe nutritional deficiency. Of the deaths due to nutritional deficiency, 40 percent in Recife were protein deficiency (kwashiorkor). In Kingston only 11 percent of the nutritional deficiency deaths were due to this syndrome.

Measles Vaccine Provided

One of the early findings of the study was that many deaths due to measles were occurring in Recife, Brazil, and La Paz, Bolivia. In Recife in the first few months of the field work nearly half (19 percent) of the deaths of children six months through four years of age were due to measles as the underlying cause. Two-thirds of these had a pre-existing nutritional deficiency. Evidently 1968 was an epidemic year for measles in a serious endemic situation, for many deaths from measles in young children have been occurring each year.

During the same period in La Paz, many deaths (39 percent) were also due to measles. This finding of excessive mortality from measles in the investigation was reported in the Special Meeting of Ministers of Health held in Buenos Aires in October 1968. One of the recommendations of the meeting was that "The Pan American Sanitary Bureau promote the production of measles vaccine so as to reduce its cost and thereby permit the routine use of this vaccine to protect susceptible persons."

The introduction of vaccination against measles was recommended to the principal collaborators in November 1968, and the Organization is trying to assist them in obtaining vaccine. Health officials in the Brazilian State of Sao Paulo announced state-wide vaccination.

Congenital Anomalies

Congenital anomalies are also being studied in this investigation. Of the 420 deceased children studied in the first six months in Santiago, 66 or 16 percent had one or more anomalies. The proportion of deceased children with congenital anomalies was practically the same in Jamaica, 13 percent, but the distribution by system involved differed.

To judge the accuracy of the data being collected, infant death rates have been calculated for the first few months in each area. A standard is used of 10 deaths in the first day of life per 1,000 live births (the death rate for that age in the United States for 15 years). In several areas, many deaths occurring in the first few hours of life have not been registered. Thus, in every project, local staffs are searching for deaths which occur early in life and are taking the necessary steps to compile complete information for all births and deaths. Improvement of vital statistics systems is already underway.

Projected Goals

These preliminary findings as well as the programs being developed in the field projects have indicated important goals for action at local, national and international levels.

- The improvement of maternal and child health, especially the nutritional component, stands out as essential. Likewise the vital statistics systems need improvement and modernization, both for more complete knowledge of the specific problems and for better definition of problems such as nutritional deficiency through study of multiple causes. These programs and community-centered research can be important contributors to medical education. The medical profession must give leadership in these fields.
- Effective preventive programs can be introduced, such as measles vaccination and tetanus and diphtheria immunization. Breast feeding should be stressed, and protein foods should be made available to the pregnant woman and her child for optimal growth and development and for prevention of unsatisfactory physical conditions conducive to illness and probably to lowered intelligence.
- These results can be utilized in local and national health planning.
- At the international level these results can reorient our health programs as well as those of other agencies.

At this time some of the preliminary investigation results are being used to improve local procedures; others to illustrate problems to be solved currently and to demonstrate the value of the data not only to local groups but also to the national health authorities and to international agencies.

In summary, this research program is directed to the immediate application of the findings as they unfold during the course of the investigation and thus has an important impact on both current and long-range development in the region.