Pan American Health Organization

ADVISORY COMMITTEE ON MEDICAL RESEARCH

Seventh Meeting

Washington, D.C., 24-28 June 1968

Item 14 of the Agenda

INITIAL PHASES OF THE INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Ref: RES 7/3

13 May 1968

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau, Regional Office of the
WORLD HEALTH ORGANIZATION

Washington, D.C.

INITIAL PHASES OF THE INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD*

1. Introduction

The Inter-American Investigation of Mortality[1] carried out in the years 1962-1967 clearly demonstrated the value of coordinated continental research. Each city appeared to have its distinct pattern of mortality in adult life (15-74 years of age). The Investigation indicated clearly that additional information was available in hospital and autopsy records which combined with the clinical data permitted the cause of death to be defined more precisely. These analyses resulted in recommendations relevant to (1) preventive actions, (2) epidemiological research, and (3) development and improvement of standard procedures.

The first large collaborative project showed excessive mortality in Latin American cities in the productive period of adult life, 15-44 years. It revealed also that death rates in young adult life in these large cities, of which six were capitals of countries, were much lower than in the rural areas of the countries. Thus the results indicated that preventive actions were required also in rural areas where more than half of the population lives.

Mortality in infancy and early childhood is known to be responsible for excessive death rates in Latin American countries.[2] One of the objectives of the Charter of Punta del Este[3] was "to reduce the present mortality rate in children under 5 years of age by one-half." The recent deceleration of the decline of the infant death rate in the United States

---

*This research project was made possible by a grant of the Agency for International Development of the United States.
Paper prepared for the Seventh Meeting of the PAHO/ACMR by Dr. Ruth R. Puffer, Principal Investigator and Chief, Health Statistics Department, Pan American Health Organization.

is a matter of increasing concern to national health authorities.(4) Thus coordinated continental research was proposed for greater understanding of the problems in infancy and early childhood using both urban and rural areas in the Americas. The development of such coordinated research was one of the recommendations of the collaborators of the Investigation of Mortality of adults.

The proposal for the Inter-American Investigation of Mortality in Childhood which was submitted to the Agency for International Development of the United States in January 1966 was approved by the Advisory Research Committee of that Agency and a grant for the planning phases was awarded in July 1966.

2. Objectives and Method of Procedure

The overall objective of the research proposal is to carry out in selected communities an Inter-American Investigation of Mortality in Childhood to develop death rates in infancy and early childhood, as accurate and comparable as possible, considering nutritional, sociological and environmental factors. To analyze the underlying and associated causes of death and to study the interrelationships of infectious diseases, nutritional deficiency states, and sociological factors, complete data on deaths under 5 years of age are to be collected following standard definitions and procedures. To study and compare biologic and social differences in those who died in early childhood and in those who live, data regarding living children under 5 years of age are to be collected through probability sampling of households and of children under 5 years of age.

The deaths of infants and young children are to be investigated through interviews in the homes, hospitals and clinics and with physicians

to obtain a complete record of the fatal illness, results of laboratory and other examinations and autopsy findings. In order to evaluate the factors resulting in death of these infants and young children the information to be collected includes the pregnancy history, condition of the infant at birth, breast feeding, growth and development as well as social and environmental conditions. In each area selected for inclusion from 650 to 2,000 deaths will be investigated each year for two years (24 consecutive months). Rural as well as urban areas will be included in many of the projects. The number of deaths available for inclusion in each area is dependent in part on the size of the death rate and in part on the density of population. High altitude areas, as well as those with serious nutritional problems, will be included.

Similar information regarding pregnancy history, condition of the infant at birth, breast feeding, growth and development and environmental conditions is to be collected for a group of living children in the study areas on a sample basis. The two-year period is portioned into 24 one-month periods and in each of these periods a sample of households and living children is drawn. Strict probability sampling techniques are to be used for selection of households and completion of questionnaires of all children under 5 years of age. The number of children to be included for each of two years will vary from 650 to 1,000.

In order that the research program benefit both medical education and health programs, the projects are being developed in schools of medicine and public health with the collaboration of health services.

3. Planning Phase

This Inter-American Investigation of Mortality in Childhood is far more ambitious than the previous study of mortality in adult life. Thus an important feature has been the establishment of the planning phase

for the development of pilot testing of the questionnaire and procedures. The original proposal included a period of 18 months for the planning phase and funds for this period were provided by the Agency for International Development in July 1966.

After exploration of areas for pilot testing and potential collaborators an initial Working Group was convened from October 17-20, 1966 for review of a draft questionnaire and discussion of procedures for pilot testing. Twelve participants from Brazil, Colombia, Guatemala, Jamaica, Venezuela and the United States attended this Working Group.

Pilot testing was undertaken in five areas in Latin America beginning in January 1967-Recife and Ribeirão Prêto in Brazil, Colombia, Guatemala, and Jamaica. Also the interviewers of the National Morbidity Survey of the United States tested the questions in North Carolina. Tabulations of data were prepared from the first seven hundred completed questionnaires from five Latin American projects. In two rural areas diagnostic evidence and medical attention were lacking and did not justify their inclusion. The tabulation of deaths by age group revealed incompleteness of registration of deaths in the first day of life in two areas which indicated the failure to follow the WHO definition of a live birth. In several areas relatively high proportions of the deaths and also births of these children who died occurred in hospitals and thus medical data should be available. However deficiencies in the hospital records indicated the need for improvement of the record systems in hospitals and short courses have been or are being provided for the personnel in charge of medical records. Information being collected on piped water and toilet facilities was adequate. On the whole the pregnancy histories of the mothers were

completed well indicating the competency of the public health nurses and social workers in this field. However, the previous pregnancy losses of these mothers either as abortions, fetal deaths or death of the child born alive were large. In one city 42 per cent of the previous pregnancies resulted in death either before or after birth. Birth weights were recorded for over three fourths of the births of these children who died under 5 years of age in Recife and Ribeirão Prêto, Brazil and were incomplete in other areas. Thus efforts should be made to establish weighing of infants as routine practice.

Data were provided regarding the length of breast feeding and for those babies who lived 6 months or longer the length of breast feeding was analyzed. In Recife breast feeding was discontinued frequently within the first three months (56 per cent) and in only 15 per cent was breast feeding continued as long as 6 months. In contrast, in Jamaica in slightly more than half of the group breast feeding extended for 6 months or longer and in only 14 per cent was breast feeding discontinued in the first three months of life. The information on this item was incomplete in over 10 per cent. Since nutritional assessment is an important aspect of this Investigation complete information regarding breast feeding and the introduction of other milk and food is essential. The proportion with autopsies was relatively high in three areas: Jamaica (48 per cent), Recife (36 per cent), and Ribeirão Prêto (40 per cent). The pilot project indicated the need not only to improve the quality of pediatric pathology but also to extend its provision to higher proportions of deaths of infants and young children.

The degree of malnutrition is useful information to be obtained and in two areas (Recife and Ribeirão Prêto) data were lacking in only

one-fifth of the deaths. However standard procedures were needed and greater attention should be given to assessment of nutritional status. The underlying and associated causes of death were classified in accordance with the 1955 Revision of the International Classification of Diseases. Of deaths from one month through 4 years of age, nutritional deficiency was the underlying or associated cause of death from 19 to 56 per cent of the deaths in five areas. Thus the role of nutritional deficiency as a contributor to mortality in early childhood will be clarified in this Investigation. In areas with relatively satisfactory autopsies, congenital anomalies contributed heavily to mortality. The original plans for the control group were revised and a more practical sampling program developed than had been originally visualized. Thus the planning phase and the pilot testing have indicated the steps necessary to establish a satisfactory research program.

In 1967 staff of the Pan American Health Organization explored suitable areas and collaborators for participation in the Investigation. Applications were received and specific plans made for the research project in 12 areas of Latin America. An application for support of the program for the four years 1968-1972 was submitted to the Agency for International Development on July 28, 1967.

The results of pilot testing were reviewed by a small working group from December 4-8, 1967 and revised questionnaires developed for further testing in January, February, and March 1968. Also several sections of the documents of the Manual of Procedures were discussed in order to be prepared for the rapid development of the field work when funds became available.

On January 30, 1968 the document supporting the Investigation for four years was signed in the Agency for International Development and on March 11, 1968 the Director of the Pan American Health Organization signed the agreement for funding of the first 15 months of the project.

4. Planning Conference of Principal Collaborators

The Planning Conference was held in the Department of Preventive Medicine of the University of Valle in Cali, Colombia, from March 25-29, 1968. In addition to principal collaborators, medical interviewers from six projects and two potential collaborators from the United States attended this meeting. Also there were several participants from the Faculty of Medicine and health services in Colombia and from the Pan American Health Organization.

One of the reasons for holding the Conference in Cali was that the procedures in the pilot testing program could be demonstrated to the group. Also this Department had made such community centered research an important part of the training program of residents in preventive medicine. A third reason was that the procedures and the findings of the Study of Health Manpower and Medical Education[5] recently completed in Colombia were pertinent for this group of investigators. One of its important phases was a national health survey of the same type as the probability sampling of household and of children under 5 years of age included in the present Investigation.

A Director for the Ministry of Health of the Study of Health Manpower and Medical Education, Dr. Carlos Agualimpia, attended the Planning Conference and described the national health survey, giving the objectives, characteristics, sampling methodology, operational procedures and completeness achieved, as well as some of the results. This was a pilot study and

its success demonstrated the usefulness and feasibility of employing sampling methods in Latin America and gave support to the sampling methodology recommended for the present Investigation. A deep understanding of the purposes and objectives of study had been acquired by the professional groups through their involvement. Medical and nursing students and resident physicians had participated in various phases. The importance of the involvement of both groups - medical education and health services - was emphasized because in this new Investigation similar close relationships of personnel including specialists in several fields of medical education and health services will strengthen the program and ensure use of the products and subproducts.

A recent publication(6) of the Ministry of Health Hechos Demográficos illustrated well the use of data on fertility from the health survey. This report also showed the incompleteness of current registration of births and of baptisms in Colombia. On the basis of baptisms, only 62.0 per cent were registered and on registrations 62.2 per cent for the country in 1965-1966. Thus the deficiency in current registration of live births is great and methods of obtaining information regarding each birth currently are essential. Even comparing total baptisms including those of births born in previous years with the household survey an 8 per cent deficiency remained.

The plans for sampling of households and of living children under 5 years of age were outlined by the consultant on sampling. For probability sampling in each area detailed maps are necessary with boundaries and estimates of households in each block of the study area. Fortunately satisfactory data are available in nearly all of the study areas.

In accordance with the program for the Conference, the questionnaires for collection of data regarding deaths and samples of households and living children under 5 years of age were reviewed. As a result revised questionnaires and instructions for their use were prepared and released in early May. Also the Manual of Procedures was discussed and in its final form was released in May to the principal collaborators.

In addition to the principal collaborators specialists in pathology, pediatric pathology, pediatrics, nutrition, preventive medicine, epidemiology and statistics participated in the discussion of specific phases of the program (from the Faculty of the University of Valle and of the Pan American Health Organization) and stressed the contributions in their fields to the Investigation as well as the benefits.

An example was given of local collaboration in regard to births and deaths. The Director of the Municipal Health Department in Cali, Colombia, who attended the Conference will have local responsibilities in regard to the records of births and deaths and also he will benefit from the program.

Assessment of nutritional status is an important phase of the Investigation. Although nutritional deficiencies contribute to morbidity and mortality they are not reflected in the official statistics. However, in this Investigation in which the underlying and associated causes of death are analyzed, the pilot testing has indicated that the role of nutritional deficiency will be clarified. Also in this Investigation data regarding dietary histories, including breast feeding, and anthropometric measurements will be obtained. The living children will be weighed and arm circumferences measured. Also the degree of malnutrition utilizing weights and clinical observations will be classified using the scale proposed by Gómez[7,8] and the weight standards from Harvard.[9] The Assessment of the Nutritional Status of the Community[10] by Jelliffe is a useful reference and a copy will be provided to each collaborator.

One-half day of the Conference (arranged by Dr. Pelayo Correa) was devoted to pathology in which emphasis was placed on the importance of pathological findings in this research program. There was common agreement of the need to include the largest possible number of autopsies. The situation in regard to pathologists in each area was described and will receive further study by the principal collaborators.

Since the hospitals and health centers are sources of information on the medical care rendered to the children and also sources of birth and deaths, the development and improvement of hospital and clinic records received attention. Courses for personnel responsible for hospital records have been or are being given in Ribeirão Prêto, Cali and Recife. Staff of the Pan American Health Organization render consultant services in this field.

The methods of coordination of the projects at local, national and continental levels are being developed. Local coordinating committees are already in operation in the pilot testing areas and were recommended for all areas. There is need of national coordination when there is more than one study area in a country such as in Argentina, Brazil and Colombia and should involve the Ministries of Health and Associations of Faculties of Medical Schools. The Pan American Health Organization through its central and field staff will assist on coordination.

Medical interviewers from six projects attended the Planning Conference in Cali and interviewers from five others and three collaborators a meeting especially planned for medical interviewers in the Department of Preventive Medicine of the University of São Paulo in Ribeirão Prêto from April 3-9, 1968. The principal collaborators and medical interviewers were great

concerned with their responsibilities in conducting the research program. Both meetings proved to be very profitable serving to familiarize the staffs with the several objectives of the Investigation and methods of study of deaths and samples of living children and of establishing complete files of births and deaths.

5. Principal Collaborators and Projects

Twelve principal collaborators and areas in Latin America have been selected for inclusion in the Investigation. A brief description of each area follows:

Argentina, El Chaco - Dr. Rubén A. Castro, statistical adviser to the Ministry of Health in the Province of El Chaco and professor of hygiene and social medicine of the University of the Northeast (Corrientes), is the principal collaborator. Ten Departments of the Province which include both urban and rural areas will be included in the Investigation. Since this Province in the northern part of Argentina is in the River Plate Basin, the results of the research program will contribute statistical data, as complete and accurate as possible, for an understanding of the problems in childhood in that area.

Argentina, San Juan - The entire Province of San Juan which is located in the central-western region of Argentina bordering with Chile is a part of the study. Of the estimated population of 400,000, 55 per cent live in urban areas and around 57,000 population in four small valleys in the Andes at a high altitude. Dr. Valois Martínez C., the director of health of the Province of San Juan, will be the principal collaborator and Dr. Neri Romero the

assistant collaborator. Dr. Romero is also a professor in the Department of Preventive Medicine of the University of Cuyo in Mendoza, the medical center for this area in Argentina.

Bolivia, La Paz - The project in Bolivia at a high altitude will include approximately 2,000 deaths per year from La Paz, a suburban area, adjacent rural area and Viacha, a small community of 6,000 inhabitants. Dr. Gregorio Mendizábal, professor of public health at the "Universidad Mayor de San Andrés" and director of the Office of Planning of the Ministry of Public Health, will be the principal collaborator.

Brazil, Recife - The principal collaborator in Recife is Dr. Fernando Figueira, professor of pediatrics of the School of Medicine of the Federal University of Pernambuco. The project will be carried out in three urban zones, Casa Amarela, Encruzilhada and Beberibe, with a total population of 430,000. The Headquarters of the project will be in the new Institute of Infant Medicine of Pernambuco (IMIP). Pilot testing has already been successfully carried out in Recife.

Brazil, Ribeirão Prêto - Dr. José Romero Teruel, the principal collaborator of the Department of Preventive Medicine of the Faculty of Medicine of Ribeirão Prêto, has conducted pilot testing using residents in preventive medicine and social workers. The area for the Investigation will include the small city of Ribeirão Prêto situated in the interior of the State of São Paulo and five municipios surrounding the city to give around 650 deaths per year.

Brazil, São Paulo - Dr. Ruy Laurenti of the Department of Applied Statistics of the School of Public Health and also of the Department of Internal Medicine of the School of Medicine of the University of São Paulo will be the principal collaborator. The area of the Investigation will be the city of São Paulo and a sample of deaths will be obtained for the Investigation.

Chile - The area for the Investigation will have both urban and rural populations of Santiago and nearly areas from which a sample of deaths will be selected. Infant mortality has remained high in Chile (101.4 per 1,000 live births in 1966). Thus efforts will be directed to a thorough investigation of the situation (with some additional questions) as the basis for orienting the program to the vulnerable groups. Dr. Adela Legarreta, the principal collaborator in the earlier Investigation, will also serve as principal collaborator in this one. She is on the Faculty of the Department of Biostatistics of the School of Public Health.

Colombia, Cali - Dr. Guillermo Llanos of the Department of Preventive Medicine of University of Valle, who also participated in the previous Investigation will be the principal collaborator, and will assist also in the development of the projects in Cartagena and Medellín. In Cali, one out of every two deaths will be included in the Investigation as well as all deaths of Florida, a rural area with 24,000 inhabitants. The residents in preventive medicine and in pediatrics participate in the program. The involvement of three medical schools in Colombia, in the Pacific, Atlantic and Central Regions, was planned in order to have a similar effect

on medical education and health programs as the recently completed Study of Health Manpower and Medical Education. The projects are relatively small ones (in costs as well as in numbers of deaths to be investigated), but should make an important contribution to both medical education and health services in Colombia, a country in which there is great interest in such research.

Colombia, Cartagena - Dr. Abel Dueñas, the Dean of the Medical School of the University of Cartagena who is also Chief of the Department of Preventive Medicine, will be the principal collaborator. The small coastal city of Cartagena which has 275,000 population will be the area for the study.

Colombia, Medellín - Dr. Julio León Trejos, Chief of Health Administration of the School of Public Health of the University of Antioquia, will be the principal collaborator. A sample of one out of every 5 deaths in Medellín or approximately 700 deaths per year will be included in the study.

Jamaica - The area of the Investigation will have two major divisions, Metropolitan Kingston and rural St. Andrew in which the number of deaths to be investigated will be nearly 2,000 per year. Dr. Kenneth Standard, Head of the Department of Social and Preventive Medicine of the University of the West Indies, will be the principal collaborator.

Mexico, Monterrey - The plan for the study in Monterrey is to sample deaths in the city and adjacent rural areas. Three-fourths of the deaths in the urban area will be included. Dr. Dionisio Aceves, Professor of Preventive Medicine of the University of Nuevo León, will be the principal collaborator for this project.

Other Areas.

A project in a Central American country has been proposed. In several other areas interest has been expressed in the inclusion of projects in this collaborative continental project. Pilot testing was conducted and a project proposed by the School of Public Health of the University of North Carolina with Dr. James Abernathy as principal collaborator. Dr. Ira Gabrielson attended the Planning Conference because of his possible involvement in a project being proposed by the School of Public Health of the University of California. The new medical school of the University of Sherbrooke in Canada may obtain financial support for a project which would include Montreal, Quebec, Sherbrooke and surrounding areas.

The areas of the 12 definite projects and four proposed projects are shown on an attached map of the Continent. All of these field projects have been designed so that they involve and will benefit medical education and health services.

6. 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 secretarial staff. For each death under 5 years of age included in the Investigation a home visit is made by the public health nurse or social worker to obtain information (1) regarding the illness leading to death, facts about birth, breast feeding, weaning and foods added to the diet, medical attention received; (2) regarding the mother, her pregnancy history, medical attention and complications of pregnancy and birth; (3) regarding both parents, age, education, occupation; and (4) regarding housing and the household in which the child lived (or of the mother).

The medical interviewer completes pages 4 to 8 of the questionnaire utilizing hospital, clinic and autopsy records and interviews of physicians, and for deaths without medical attention makes interviews in the home to obtain data regarding the fatal illness to determine the underlying cause and associated causes of death. Efforts will be made to obtain the weight at birth, any additional weights of the child and a clinical evaluation of nutritional status.

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 medical interviewer prepares such summaries. These in turn are reviewed at staff conferences in which the principal collaborator, medical interviewer, nurse interviewer, pathologists, pediatrician, statistician, and other member of the team participate.

The field investigation also includes visits to a sample of living units selected in advance according to the probability sample design for the same area. A consultant on sampling visited the pilot testing projects in 1967, prepared the plans for sampling, attended the Planning Conference and visited all 12 areas in Latin America to assist in the selection of samples.

During each month, 60-100 living units will be visited by the public health nurse or social worker. Page 1 of the questionnaire for the sample has spaces for recording the members of the household, housing, occupation of those employed and for recording vital events in the past year, that is during the 12 months prior to the interview. This record includes live births, fetal deaths and pregnancies of each woman 15-49 years of age and deaths of members of the household.

For each living child under 5 years of age in the sample page 2 of the questionnaire will be completed in which data regarding the parents, pregnancy history of the mother, place and attendance at birth, weight at birth, breast feeding, weaning, addition of foods to the diet and medical attention received; that is similar data to that obtained regarding the dead child. For the living child two measurements for evaluation of nutritional status, weight and arm circumference, will be obtained at the time of the home visit.

In order to obtain accurate data on infant mortality each area will establish files of births, deaths and fetal deaths. In addition to the official records of births and deaths (the certificates) all sources will be used to find additional births and deaths such as hospitals, midwives, health departments, church records, baptisms, cemeteries, etc. All areas will use the WHO definition of a live birth, irrespective of local practice. Careful checks will be 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 7 days, will be analyzed.

For calculation of infant death rates a complete count of births is required. If facilities for tabulation of data from birth records are not available locally they will be processed in the Central Office. Consultant services will be provided in order to insure satisfactory local procedures for finding births, deaths and fetal deaths and maintaining these files.

Another important phase of the field work involves the extension of autopsies to as large a portion of the deaths as possible and of obtaining complete information. 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.

7. Central Office Procedures

Completed questionnaires will be transmitted monthly for processing in the Central Office. They will be reviewed at once and the information coded for transfer to punch cards and tape for processing by electronic computer. The assignment of the underlying and associated causes of death will be carried out by the medical referee or in accordance with procedures developed by him (Dr. Darío Curiel). These assignments will be made in accordance with the 1965 Revision of the International Classification of Diseases. This phase of the Investigation will receive special attention as rules for assigning multiple causes are being developed. Utilizing this extensive study of deaths in infancy and childhood the Investigation is expected to contribute to international rules which will be considered for the 1975 Revision.

8. Time-Table

For the 12 areas in Latin America described earlier, agreements have been prepared for signatures by the Director of the Bureau, by the Ministers of Health and by Deans of Medical Schools. These should be signed so that the projects will begin in June 1968. The projects are planned for 27 months with the collection of data for 24 months. It was agreed that all areas* should begin the collection of data at the same

*Due to unusual circumstances an exception was made in Jamaica; the collection of data will begin one month in advance on June 1, 1968.

time, namely July 1, 1968. However, employment and training of the staff would begin on June 1, 1968. The collection of data would continue until July 1, 1970 and in July and August 1970 all records would be completed and transmitted to the Central Office.

Processing of data will be carried out currently and each project will forward completed questionnaires of deaths and of samples monthly. Tabulations and analyses of data for the first year should be available in 1970 and for the two years in 1971.

Two characteristics of this research project are important for its success. First, the collaboration and participation of specialists in several fields such as pediatrics, nutrition, pathology, preventive medicine, epidemiology and statistics will strengthen the project and will benefit medical education and health programs. Second, the establishment and maintenance of high standards of operation of every phase of the project are essential in this Investigation.

REFERENCES

1. Puffer, R.R. and Griffith, G.W.: Patterns of Urban Mortality, Pan American Health Organization, Washington, D.C., Sc. Pub. No.151, 1967, 353 pp. Published in Spanish in 1968 as Características de la Mortalidad Urbana.

2. Pan American Health Organization: Health Conditions in the Americas, Washington, D. C., Sc. Pub. 138, 1966, 133 pp.

3. Pan American Union: Alliance for Progress, Washington, D. C., 1961, 49 pp.

4. U.S. Department of Health, Education and Welfare: International Comparison of Perinatal and Infant Mortality, National Center for Health Statistics, Washington, D. C., Series 3, No. 6, 1967, 97 pp.

5. Ministry of Public Health of Colombia and Colombian Association of Medical Schools: Study of Health Manpower and Medical Education, 2 Volumes, Pan American Health Organization, Washington, D. C., 1967, Vol. I 108 pp. Vol. II 92 pp.

6. Agualimpia, C., Pabón A., Galán R., Gómez, L.C., González, L.E.: Hechos Demográficos, Ministry of Public Health and Association of Medical Schools, Bogotá, Colombia, Jan. 1968, 76 pp.

7. Gómez F., Galván, R.R., Cravioto, J., and Frank, S.: "Malnutrition in infancy and childhood with special reference to kwashiorkor (1955)." In Levine, S. (ed) Advances in Pediatrics, New York, Year Book Publishers, Vol. 7, p. 131.

8. Ramos-Galván, R., Cravioto, J., and Navarrete A.: "La letalidad en el niño desnutrido" Mexico City, Boletín Médico del Hospital Infantil, 1958, p.875.

9. Nelson, W.E.: Textbook of Pediatrics, Philadelphia, W.B. Saunders Co., 1959, 1462 pp. (Pages 50-57 contain data on weights from Studies of Child Health and Development, Department of Maternal and Child Health, Harvard School of Public Health.)

10. Jelliffe, D.B.: The Assessment of the Nutritional Status of the Community, World Health Organization, Geneva, Switzerland, Monograph Series No. 53, 1966, 271 pp.

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD
LOCATION OF PROJECTS