Pan American Health Organization

PAHO/ACMR 11/2
Original: English

ELEVENTH MEETING OF THE
ADVISORY COMMITTEE ON MEDICAL RESEARCH

Washington, D.C.

19-23 June 1972

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

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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 socio-economic 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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*This research project was made possible by a contract with the Agency for International Development of the United States of America to the Pan American Health Organization.

**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

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

525 TWENTY-THIRD STREET, N.W., WASHINGTON, D.C. 20037, U.S.A. CABLE ADDRESS: OFSANPAN

IN REPLY REFER TO: TELEPHONE 223-4700

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Report of
Meeting of Principal Collaborators
24-28 January 1972

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Report of Meeting of Principal Collaborators

Washington, D.C., 24-28 January 1972

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INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Report of Meeting of Principal Collaborators
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I. INTRODUCTION

A meeting of the principal collaborators of the projects of the Inter-American Investigation of Mortality in Childhood was held at the Pan American Health Organization from January 24-28, 1972. The purpose of the meeting was to review the progress made in the analysis of data, to insure its completeness, to make plans and recommendations for its full utilization in health and education programs and to recommend research needed for introduction of practical measures for solution of problems. The Investigation has laid a foundation in community centered research and in demonstrating measures to establish quality of data. The principal collaborators are the ones to give leadership for actions and research of the future.

At this time the Provisional Report for the First Year of the Investigation was available in English and Spanish for review by collaborators. For this report, questionnaires on 17,198 deaths in the first year from the 13 Latin American projects were used for analysis. Additional questionnaires for unregistered deaths are being completed in several areas in order that the final report may be complete. The total number of deaths for the two years is expected to be around 34,000 for the Latin American projects and 1,000 for the United States and Canadian projects.

In addition to the Provisional Report, working drafts of analyses of other pertinent material in which the interrelationships of diseases and other factors were considered were available to the collaborators, namely, Birth Weight, Breast Feeding, Provision of Foods, Socio-economic and Related Factors and History of Communicable Diseases. For the subdivision and analysis of several variables, the data for the two years are needed.

Partial findings from the probability sample of households in Cali and the Kingston Area were presented.

During the general sessions, principles for future actions resulting from the experience gained during the Investigation were discussed, and these discussions served as the basis for recommendations formulated by five working groups.

*This research project was made possible by a contract with the Agency for International Development of the United States of America to the Pan American Health Organization.

II. SUMMARY OF PRELIMINARY RESULTS OF THE INVESTIGATION

Some of the highlights of the Report for the First Year of the Investigation of the 13 Latin American projects and of the exploratory analyses in five working drafts were given with the principal objective of planning the final report and of utilizing the results for actions and planning of future activities. For the meeting of the Advisory Committee on Medical Research of the Organization, a member of the Committee has requested that the results be presented in relation to the next steps needed and that concrete recommendations be made so that the Advisory Committee can consider support for future activities in these fields. A summary of the results of the Investigation follows:

a. First, to establish quality in our projects for the inclusion of information regarding all deaths under 5 years, we have discovered a serious situation in hospital and registration procedures. In several areas significant proportions of deaths, particularly of those occurring in the first few days of life and of infants of low birth weight, were not registered. Although this is being changed with additional efforts, for example in San Juan and Santiago, concerted actions are needed to improve the quality of reporting of these events.

b. Excessive mortality in childhood has been revealed - often in excess of the official statistics. The situation in rural areas is very serious with rates as much as twice those in the cities. These findings indicate the need for action in cities and especially in rural areas.

c. The role of infectious diseases as underlying causes of death has been clarified, with diarrheal disease and measles the principal causes. The synergistic association of infectious diseases and nutritional deficiencies indicates that the susceptibility of the host as well as the specific agent must be considered in effective programs for control of infectious diseases. From 40 to 76 per cent of the deaths from infectious diseases had nutritional deficiency as an associated cause.

d. Only through the study of multiple causes is measurement possible of the magnitude of health problems in infancy and childhood, such as nutritional deficiency and prematurity as well as the infectious diseases, certain perinatal causes, etc., and the interrelationships of these causes. Nutritional deficiency was the underlying or an associated cause of 38 to 69 per cent of the deaths from all causes of children under 5 years of age, excluding the neonatal deaths and immaturity was an associated cause of 47 to 72 per cent of the neonatal deaths.

e. Nutritional deficiency constitutes the most serious health problem in infancy and childhood in Latin America. Death rates are very high in infancy and the situation is even more serious in the rural areas. Preliminary analyses of foods provided to deceased children indicate probable deficiencies in foods with proteins. Thus, the data serve to show the need for extended and improved nutrition programs.

f. Excessive reproductive wastage was found in several areas from the study of outcome of previous products of pregnancy. In all areas infant mortality among previous products was higher than in the Investigation. Mortality was greater among infants of higher birth orders and older mothers. Reduction of the birth rate as in the Province of Santiago with introduction of family planning practices results in a shift from births of higher birth orders to those of low birth orders and thus a lower death rate.

g. Limited breast feeding was found in several projects especially in those in Brazil and San Salvador. Since higher proportions of the deaths were due to diarrhea in infants with weaning started, further investigation of these relationships is advisable which in turn should lead to improvement in feeding of infants.

h. Socio-economic factors such as education and occupation are being analyzed and the interrelationships studied. The level of education of mothers varied widely from over one-half with no education in Recife (52.4 per cent) and in Rural San Salvador (61.6) and Viacha (62.3) to less than 10 per cent with no education in Kingston and the City of San Juan. In the analysis of deaths by occupation of father and education of mother, differences were noted in neonatal and postneonatal mortality. Educational level of the mother appears to be the best single index of socio-economic status as it measures the effect of several factors such as income, occupation, nutrition and environment in addition to education. Thus, the socio-economic aspects of these problems deserve consideration in planning health programs.

i. Piped water supplies were available to less than 20 per cent of the homes of deceased children in two cities and three rural areas with excessive mortality under 5 years of age. Prevention of spread of disease requires provision of water to the homes.

III. PARTIAL ANALYSIS OF DATA ON SAMPLES FROM CALI AND KINGSTON

Data have been processed for the two-year period for only two areas, Cali and Kingston. The opportunities for analyses are many, but for this meeting only those data which can be compared with those already available on deaths were presented.

Many differences between the sample and death populations stood out from review of tables provided. Some support strongly the hypotheses that the deaths of children come from very selected parts of the population. Other differences may have been produced by varying definitions and procedures between the sample survey and the death study.

Interview response

In Cali, about 5 per cent of 2,621 dwellings in the sample were vacant. For those occupied, the household interview was completed in 96 per cent, and in another 4 per cent, information was obtained from a neighbor. The experience in the Kingston Area was somewhat different. In Metropolitan Kingston and St. Andrew, 5 per cent of dwellings were also vacant, but interviews were completed with a household member for only 85 per cent and for another 2 per cent with a neighbor. The large number of households where no one was found at home in Kingston (12 per cent) creates problems in estimating total populations for the area.

Distribution of sample population

The age distributions of the population in the sample households in the two areas were shown. For the Kingston Area, these numbers, scaled up on the basis of the sampling ratio of 1/39.5533, provide an estimate of the population of the metropolitan area 445,687 in mid-1969. Interpolation from data in 1960 and 1970 censuses gives a population for 1969 of 478,000. The sample result is 7 per cent under this. However, the non-response rate was approximately 12 per cent. Since this non-response was based primarily on families never at home, it may be reasonable to assume that the smaller-sized families are the non-respondents. In the Kingston Metropolitan Area, 18.5 per cent of the population are under 5 years of age and 44.9 per cent under 15 years of age, and an estimated 42.7 per cent are under 14 years. Preliminary census data show the population under 14 in the Kingston and St. Andrew Parishes to be 41 per cent.

Reporting of vital events

From the data obtained in the sample households on vital events, the death rates were estimated for the study areas. From total death rates in Cali and in the Kingston Area and age specific rates, together with rates for the two countries, Colombia and Jamaica, for the most recent year for which data were available, it was immediately obvious that in these two areas the samples have not provided adequate estimates of mortality. Birth rates, on the other hand, as estimated from the sample households, were 28.0 in Cali and 40.5 in the Kingston Area. The rate for Cali appears low and for Kingston elevated. Index cards are being prepared for all births and deaths reported in the household interviews and it is hoped that they can be checked against registration records to determine whether they have been registered or not.

Environmental conditions

In both areas, Cali and Kingston, as well as in rural St. Andrew, water was piped into the homes of the children who died far less frequently than to all families with children under 5 years of age. For example, the observed number with piped water inside the house among deaths in Cali was 365, but from the sample data, 553 of the 667 would have been expected to have piped water. Moreover, families with children under 5 years were less likely to have piped water in their homes than other families in the communities.

Medical care

Mothers of living children under 5 years of age included in the sample received more prenatal care than the mothers of deceased children in both Cali and the Kingston Area. Many fewer of the mothers in the sample were in the group with no prenatal care and many more in the group having four or more visits. Prenatal care began earlier in pregnancy for the mothers in the sample than for the mothers of the deceased children. Many more of the sample mothers in both Cali and Kingston first received attention in the second or third month of pregnancy.

Analysis of vaccination status of the deceased children and the living children in the sample suggests that the living children receive more protection. At one year of age, children in the sample were more frequently immunized against whooping cough, diphtheria, tetanus and poliomyelitis in both Cali and Kingston.

Socio-cultural and biological factors

Families of living children in Cali differed from those of deceased children with respect to the presence of parents in the home and their marital status. The greatest difference was related to the marital status of parents. In the sample, the proportion of households with parents married was greater than for the deaths, where common-law unions were more frequent. Similarly, in Kingston in the households with both parents present, common-law unions were more frequent for parents of deceased children than of the living. Also in Kingston, there was for the deaths, when compared with the sample, a great excess of households with only the mother present. The educational level of mothers of deceased children was significantly lower than that of mothers of children in the sample in Cali. In the Kingston Area, no differences were apparent.

It would appear that family size is not different for the living and deceased persons except in rural St. Andrew where the differences may be due to the small numbers.

Nutritional status

The average weights by month of age for children under 5 years of age from the samples for the two areas, Cali and Kingston, were shown graphically. together with the range of weights. Also plotted were the curves for standard average weights used in the Investigation as a basis for assessment of nutritional status and the curves for 90 per cent, 75 per cent, and 60 per cent of the standard. For males in Cali, average weights are above the standard until 6 months of age, falling into the area of 90 to 100 per cent of the standard until 11 months. From then to 5 years of age, the points follow the 90 per cent curve reasonably well. The data for females in Cali suggest weights below the standard begin to occur earlier in life and that shortly after one year of age, the average weights are under 90 per cent of the standard and within the range of Grade I malnutrition.

In Kingston, the average weights for males are in general above the standard curve until 10 months of age. From 10 to 20 months, they are close to the 90 per cent curve. For the rest of the age span to 5 years, averages are usually above the 90 per cent curve. The average weights for females in Kingston are reasonably close to the 90 per cent curve.

Information on breast feeding as obtained in household interviews can be compared with similar information presented in the Provisional Report for deceased children. In Cali, of the deaths from 1 through 11 months of age, more were breast fed than would be expected from the sample data; for those children dying from 1-4 years of age, the proportion breast fed was similar to that for the sample. The findings for Kingston are similar with more breast feeding among the deaths than the sample. Extra effort may have been expended to obtain this information from mothers of deceased children than from the mothers in the sample. In fact, the mother may have more frequently been the source of information for the deaths than for the sample. It will be important to examine the results in more detail comparing the groups where information was provided by the mother.

The questions for the sample households with respect to food received by the child were the same as those in the interviews regarding the deceased children. For almost every food in all age groups, expected numbers in Cali are higher than those observed for the deaths, suggesting better nutrition in the sample group. In Kingston, it also appears that the living children at the younger ages have more foods introduced than those who are to die, but in the 2-4 year group, there is little difference.

Measurement of arm circumference was included in the sample as a possible second indicator of nutritional status. Average arm circumference in centimeters with ranges of values are given by month of age and sex, together with the standard measurements, which appear in The Assessment of the Nutritional Status of the Community by D. B. Jelliffe. In Cali as with weights, average arm circumferences are near the standard in the first six months of life, and fall to the 90 per cent level in the next 12 months. From 20 months on, the averages are usually between the 90 and 100 per cent level for both males and females. In Kingston, the average arm circumferences are near the standard in the first 4 months, falling to the 90 per cent level in the next 6 months, and in the second 10 months are below the latter level. They rise above the 90 per cent level from 20 months to 5 years. The arm circumferences of children in Kingston are higher than those in Cali in the 2-4 year age group.

These data which are provisional indicate the need for further tabulations and exploration. The quality varies in the projects in part dependent on the training, experience and supervision of the interviewers. They indicate the value of the introduction of probability sampling which will give useful results, especially in socio-cultural and biologic data regarding the general population, but also they serve to point out the needs for improvements in utilizing these methods.

IV. SPECIFIC ACCOMPLISHMENTS RESULTING FROM THE INVESTIGATION

The accomplishments reported by the principal collaborators have been described briefly in five fields, followed by actions of a general nature in the final section.

Vital statistics

The lack of registration of deaths in early life in Santiago resulted in a well organized search in the six most important maternities for deaths under 28 days of premature births in accordance with the sampling ratio (one in each five for the first eight months and one in three for 16 months). The results in one institution indicated that the unregistered deaths were frequently those of low birth weight, and death occurred soon after birth. However, some full term births were not registered. The document prepared by the principal collaborator in Santiago had several recommendations for actions in Chile as well as in other countries. After the search is completed in other five institutions in March 1972, a report on the findings should be released for use in Chile and in other countries. It is expected that between two and three hundred deaths will be discovered and added to the Investigation so that the total for the Santiago project will be of the order of 2,700-2,800. Two measures were given for solution of the problem of non registration of deaths in Chile; actions by the National Committee on Vital and Health Statistics and the National Health Service by establishing standards and directly by the chiefs of maternities in Santiago.

An organized search for unregistered deaths was conducted in Cartagena which resulted in the discovery of 20 per cent of the deaths under 5 years of age in the first year of the Investigation. A pilot zone has been established in Cartagena, as well as in several other areas in Colombia, for developing procedures for collection of data in a National Information System.

In São Paulo, a search was made for birth certificates of the deceased infants included in the Investigation and 9.5 per cent of the deaths under 1 year of age were not registered as births, and 82.5 per cent of these births had occurred in hospitals. A document was published to alert hospital administrators to the problem of improving vital statistics.

In Chaco, a continuous improvement in registration procedure has been noted and standards of the National Plan for Health Statistics are being applied.

Hospital statistics

In San Juan, Argentina, a Manual for Procedures in Hospitals was developed in the first year and is in use in the Province. The principal hospital prepares a monthly list of the deaths by age in the maternity and in other services of the hospital which aids in the evaluation of their mortality and is also forwarded to the Vital Statistics Office of the Provincial Health Service.

In Kingston, the WHO definition of a live birth was introduced in the hospitals in the early phases of the Investigation and steps are being taken for improvement of records and procedures in hospitals.

Registration of live births is being established in the hospitals in Cartagena as well as in other areas in Colombia. This is an important development as previously records of baptisms were used for live birth statistics.

Hospital records and procedures are being improved in Recife.

The project in Ribeirão Prêto designed a record for use in the maternities so that the product of each delivery would be known and so that all deaths of live born infants would be included in the Investigation.

Definitions of WHO are being introduced in institutions in Santiago for correct procedures with live births, fetal deaths and neonatal deaths.

Maternal and child health

The actions in Recife as a result of the Investigation are outstanding. The principal collaborator was appointed Secretary of Health of the State of Pernambuco on March 15, 1971, and some members of the staff of the project were incorporated into the Ministry of Health. The results of the first year of the Investigation are being utilized as the basis for the program in the new ministry. A document "Plano de Saúde" for 1972-1975 has been developed based principally on the Investigation, since the research program provided the first accurate statistical data on mortality in childhood in Recife. Copies of the document were provided to the group. The seriousness of the nutrition problem is the basis for supplementary supervised feeding of infants and children 1-4 years.

Vaccination programs against measles were undertaken in Recife and La Paz during the second year of the Investigation. In La Paz, 35,427 vaccinations to children 1-4 years of age were given in three years, 1969-1971. As the result of early findings of high fatality from measles which were reported to the Meeting of Ministers of Public Health in 1968, a recommendation was made for continent-wide use of measles vaccine. Vaccination programs are underway in Argentina and the State of São Paulo and other parts of Brazil. The vaccination program against measles is continuing in La Paz and has been extended to the rest of Bolivia.

Committee action has been taken in São Paulo for planning for utilization of the findings in maternal and child health and planning of the Ministry of Health.

In Bolivia, the results are being used in the new integrated maternal and child health program in which AID and UNICEF are participating. This program in which national standards will be carried out is planned for four local areas, Santa Cruz, La Paz, Chuquisaca and Cochabamba. The establishment of the structure of services, medical education and operational research in demography, applied nutrition and epidemiology of abortions are incorporated.

In Kingston, findings have been reported to a Nutrition Committee of the Ministry of Finance and to the Maternal and Child Health Committee of the Ministry of Health for actions.

In the San Francisco project, a weekly case-conference system was set up to review each death and this was used as a teaching device for staff, students of maternal and child health and residents in pediatrics. These conferences were attended at times by a pathologist and neonatalogist and physicians from the community. Also, there were several meetings with physicians in the community to discuss the problem of sudden infant deaths, which represent about 10 per cent of the total deaths.

In Santiago, a paper has been published on acute bronchopneumonia as a contribution to the knowledge of the problem in the program of the National Health Service against broncopneumonia. Also, a working group of specialists in maternal and child health and planning is responsible for the design of a clinical record for the newborn.

Education

The Investigation is being utilized continuously in teaching programs in schools of medicine and public health and nearly all of the principal collaborators described specific activities in this field.

In California, students are utilizing material collected in the Investigation for theses and special studies. In São Paulo the methodology and the results are being used in the courses of preventive medicine in the school of public health and special courses on demography. Also, they were used in an intensive course on demography of the Department of Sociology of the Catholic University of Rio de Janeiro on April 1971. Also in São Paulo, the basic data are serving for theses and special studies. In Sherbrooke, in a medical school oriented toward community based research, subjects for research projects for medical students, residents and graduate students have been selected from the Investigation of mortality and probability samples. Important components of the master of science program in epidemiology derive from the research in childhood.

In Recife, the public health nurse who participated in the Investigation has utilized the material in the teaching as professor of nursing and in her participation in meetings in other areas of Brazil, thus giving leadership to promotion of research and its utilization in education of nurses.

Research

In São Paulo, the sample of living children was used for a more intensive study of nutrition.

The findings on breast feeding have interested a research group in England to develop research on breast feeding in Recife as well as in Ibadan, Nigeria.

The principal collaborator in Ribeirão Prêto presented certain aspects of the methodology and results in the meeting of the International Epidemiological Association held in Ibadan, Nigeria, in April 1970. Also the data from the Investigation served as the basis for a study of seasonal variation in mortality from diarrheal disease and malnutrition. Results were used by the pediatrics departments as well as in departments of preventive medicine for conferences and meetings and will be presented to the Medical Association of the Region of Ribeirão Prêto in 1972.

Plans have been made for inclusion of Chaco Province in an investigation on nutrition in the northeast of Argentina considering medical, biological and socio-economic aspects. These are tentative plans for a study on provision of and demand for medical attention and on subregistration of vital events.

In Sherbrooke, the probability sample of households has served as a framework for several special regional studies, among which are those on dietary habits, on the role of maternal nutrition on the products of pregnancy, on the familial distribution of obesity on population patterns of health practices, on fertility characteristics of women of reproductive age, on the role of distance to hospitals on mortality patterns, and on the aggregation of arthritic diseases. On a more global aspect, the Investigation has aided in promoting the orientation of the department toward population based epidemiological research.

In California, a new research project has received financial support for the study of the patterns of delivery of community health care to children under 5 years of age in Alameda County, one of the counties included in the Investigation.

Other actions

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 with the approximate dates of establishment are in the following countries:

1. Afghanistan - January 1972
2. Sierra Leone - March 1972
3. Algeria - March 1972
4. Indonesia - July 1972

Because of the importance of this research, the Head of Demographic Statistics Section of WHO participated in our meeting.

The principal collaborator in California presented material from the Investigation at a conference in Uganda, and has participated in discussions of possible applications of the methods used in the Investigation for studies by medical schools in Africa and India.

Material from the Investigation was used by the principal collaborator in San Salvador in a meeting on medical education held in Guatemala for the medical schools of Central America. In Mexico, a large meeting of the "Jornadas de Salud Pública" was held in the National Medical Center for Social Security on July 9, 1971. The material from the Investigation was presented by four persons with the principal collaborator of Monterrey giving an analysis of the data for Monterrey. This meeting created great interest in the health problems revealed.

At a Maternal and Child Health Conference sponsored by the Ministry of Health and the University of the West Indies on June 3, 1971, in Kingston, Jamaica, several papers were presented using data from the Investigation and the discussions centered on the needs for extending prenatal care and preventive measures to a higher proportion of the mothers, infants and young children.

On March 10, 1969, a meeting was held in Buenos Aires, Argentina, with representatives of the Ministry of Health, Association of Faculties of Medicine, pediatricians, the two principal collaboratos in Argentina and Central Office staff. One of the direct results was the provision of greater pathological services in San Juan.

In Sherbrooke, Canada, the results of specific phases of the Investigation have been presented to meetings of the Canadian Genetics Society, the Canadian Association of Teachers of Social and Preventive Medicine, Canadian-French Association for Advancement of Science, Symposium on Perinatalogy and Canadian Pediatrics Society.

Several meetings have been held in Brazil. The first was held on March 7, 1969, in the Ministry of Health in Rio de Janeiro. On October 1971, two meetings were developed by the principal collaborator in São Paulo; the results of the first year of the Investigation were presented to a large group at the School of Public Health which included leaders in maternal and child health and nutrition as well as vital statistics. Several meetings were held in Recife, and a seminar for the Northeast Area of Brazil is scheduled for which the results of the Investigation will be utilized for planning. The principal collaborator in Recife presented some of the findings at a national seminar on maternal and child health in Salvador sponsored by the University of Bahia and the Association of Faculties of Medicine. Great interest is developing throughout Brazil.

The three principal collaborators in Colombia participated in a meeting in the Ministry of Health of Colombia on October 22, 1971, in which the health problems revealed were discussed and solutions sought.

Preliminary results of the Inter-American Investigation of Mortality in Childhood in La Paz were presented by the principal collaborator in a seminar on education on maternal and child health directed to the community in Sucre, Bolivia, in June 1971 and by the professor of pediatrics at the meeting of the Bolivian Society of Pediatrics in Cochabamba in October 1971.

The pathological findings on deaths were presented by the principal collaborator in Chaco in an Argentinian-Paraguayan Meeting on Pediatrics.

In São Paulo, the provisional results have been presented in three congresses, namely, Congress of the Paulista Association of Medicine, Brazilian Congress of Hygiene and the Medical Congress of the State of Espirito Santo.

A Workshop on Pediatric Pathology was conducted in São Paulo, Brazil, from 23 March-10 April 1970, in which eleven pathologist from the projects of the Investigation participated. Another workshop is planned for early 1972 to be conducted in San Salvador, El Salvador.

Members of the Central Office staff have participated in international meetings which included the following:

- Consultation on Growth and Development, Consultation on Multiple Cause Analysis, Study Group on International Classification of Disease, WHO, Geneva, October 5-25, 1969.
- Consultation on Fetal, Infant and Childhood Mortality, WHO, Geneva, March 14-22, 1971.
- Meeting for Planning of Socio-economic Studies of Perinatal Mortality, WHO, Geneva, January 10-14, 1972.
- Internal Meeting on Nutritional Aspects of the Investigation, PAHO, Washington, D.C., March 16-18, 1970. Recommendations were made for the Section on Nutrition in the 1975 Revision of the International Classification of Diseases.
- Regional Meeting on Revision of International Classification of Diseases, PAHO, Caracas, December 7-11, 1970.
- Protein Advisory Group, FAO/WHO/UNICEF, Washington, D.C., October 26, 1971. A paper was prepared for this meeting as the basis for discussions and some of the provisional findings were included in the report of the meeting.
- Regional Advisory Committee on Health Statistics, PAHO, Washington, D.C., December 6-10, 1971.

V. RECOMMENDED ACTIONS IN UTILIZATION OF RESULTS

Working Groups formulated several principles and recommendations which resulted from the experience gained during the course of the Inter-American Investigation of Mortality in Childhood. These are given in the following five sections of this report.

A. Quality of Registration of Vital Events and Vital Statistics

On the basis of the experience acquired in the Investigation on quality of the registration of vital events, the group considers of highest priority and urgency that the countries develop programs designed to improve and maintain the quality of registration of births and deaths in early life so that more complete and accurate vital statistics may be available for the countries. To this end, the following recommendations are formulated.

1. Registration

1.1. The definitions* of live birth and fetal death of the World Health Organization should be disseminated widely for universal application. The physicians, obstetricians and pediatricians, as well as hospital administrators, midwives, nurses, and others attending births should know these definitions in order to collaborate efficiently in their uniform application. The group believes that periodic studies should be conducted for verification of the extent to which these definitions are respected.

1.2. The governments should adopt measures and legislation to facilitate the prompt registration of all vital events. An example of such measures is the establishment of offices or agents of Civil Registration in hospitals in order to insure that all the births and deaths are registered.

1.3. The officials of Civil Registration should insure that the birth of each child who dies at less than one year of age is included in the registry of births as well as in the registry of deaths and that the services of Civil Registration establish procedures for the control of the quality and completeness of registration.

1.4. The institutions and persons who provide health services can contribute efficiently to improvement of the quality of vital statistics. The education of the parents during prenatal care and following delivery on the importance of registration and the requirement of registration for obtaining health services (care of the well child, etc.) are examples of the mechanisms which can be utilized. In the case of deliveries attended by professionals (physician or midwife) a certificate should be prepared for the family to present for registration. This will improve the quality of the registered information as well as facilitate the procedure.

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* Definitions in Appendix III.

2. Data on Certificates and Reports

2.1. The principal users of the information should be consulted regarding the types of data to be included as a minimum in reports on births and deaths. Such data ought to be applicable to all the country but for the development of special programs and of research certain additional data could be incorporated in specified periods and regions.

2.2. For consideration of items to be included on birth and death certificates, those listed in Principles for a Vital Statistics System of the United Nations are recommended as a minimum. In addition to the minimal data on births, that is date of birth, date of registration, type of birth, sex, legitimacy and person who attended the delivery, the group suggests adding hour of occurrence, weight at birth and order of birth. In addition to the minimal data regarding characteristics of the mother, that is date of birth or age, number of previous deliveries to the mother divided into fetal deaths, live births currently living and live births that are dead, place of usual residence of the mother, the group recommends adding education and occupation of the parents.

The minimal data for deaths include date of death, date of registration, date of birth or age of decedent, place of occurrence, causes of death, person who certified the death, place of usual residence and sex. The group recommends the following additional data for infant deaths (less than one year of age): for the infant exact age at death and weight at birth; age, occupation and education of the parents and the number of previous deliveries to the mother divided into fetal deaths, live births currently living and live births that are dead.

For the data on fetal deaths, early or late or both in accordance with the requirements, the minimal and additional data would be similar to that for infant deaths.

3. Vital Statistics

In order to improve the quality of vital statistics, educational programs, studies and tabulations are recommended.

3.1. Schools of medicine, public health and others in the health sciences should teach students the correct utilization of vital statistics in order to improve the health services for the population and that teaching be introduced into the curriculum of students of medicine and in postgraduate programs; correct use of the international model of the medical certificate of cause of death including the concept of the underlying cause of death and the correct form of completing the certificate. Also, personnel responsible for coding causes of death should be taught the use of the rules of selection and classification of the underlying cause of death of the World Health Organization.

3.2. The tabulations recommended in the International Classification of Diseases of WHO will be made for deaths and those of the Principles for a Vital Statistics System of UN for live births. For neonatal and infant deaths additional tabulations are needed by age of mother, birth order and weight at birth.

3.3. The health services should make prospective studies through periodic visits to the homes of samples of the population to record the occurrence of vital events with subsequent verification in the offices of Civil Registration and samples should be taken of children attending public health clinics to verify the registration of their birth.

3.4. Deaths in hospitals should be studied by age with emphasis on the death rate in the first 24 hours of life, neonatal deaths, etc. The inclusion of neonatal deaths should be checked using sampling of clinical records and deaths with autopsies to insure the registration of all. In addition, maternities and emergency services should use a record (card for example) for recording minimum data regarding all products of conception and these records could be sent periodically to the offices of Civil Registration in order to improve registration.

4. Multiple Causes of Death

The group recommends that selected areas begin coding multiple causes of death using the medical certificates of cause of death or special forms. For deaths of children under 5 years of age, uniform tabulations should be made, especially those which have proven valuable in the Inter-American Investigation of Mortality in Childhood. The value of utilizing multiple causes in the study of morbidity and mortality should be taught in courses in schools of medicine and public health.

B. Hospital Records, Procedures and Statistics

On the basis of identification of difficulties encountered in the Investigation in hospital procedures with records of live births and deaths occurring in those institutions, recommendations are given regarding certain aspects of the records, procedures and hospital statistics, including education and training, with special emphasis on births and infant deaths.

1. Records and Procedures Regarding Births and Infant Deaths

In order that information is recorded and available for these vital events, principles are given for four types of records.

1.1. Admission Information

The admission record provides the name of the patient and his address in sufficient detail so that the home may be reached if necessary. In addition, this record indicates the socio-economic status, that is, the classification for the social service department when there is one in the hospital. If prenatal and postnatal care are provided in an outpatient service, suitable notations are needed for coordination of these services.

1.2. Clinical Obstetrical Record

This clinical record provides the evolution of the pregnancy, the delivery and the puerperium, lactation, conditions and characteristics of the product of conception with the number of the corresponding clinical record. Again it is important to establish on the record the exact address with reference to the patient.

1.3. Clinical Record of Newborn

This basic clinical record requires the application of the definition* of WHO for a live birth. The following are essential data for inclusion:

- For the mother, her name, age, exact address, prenatal care and number of her clinical record.
- Sex of the infant, date and exact time (hour and minute) of the birth. If a multiple birth occurs, a clinical record is required for each product with clear indication of the order of birth.
- Weight and length at birth.
- Number and order of the previous pregnancies with additions for multiple births.
- Clinical data including condition at birth, breast feeding, evolution, congenital anomalies.
- If death occurs, day and exact time (hour and minute), underlying and associated causes of death and whether an autopsy was performed.

1.4. Individual Card or Sheet for Each Infant Death and Fetal Death

This card or sheet includes the identifying data with adequate information regarding the mother, her address and the underlying and associated causes of death.

1.5. Manual of Procedures and Rules

Each hospital develops and places in use a manual which serves to guide the routine activities in respect to records and procedures. A team of hospital staff, responsible and trained, collects and records data on these clinical records which are to be preserved for at least one year after death.

2. Hospital Statistics

It is important that the hospital administrators have at all times exact knowledge of births and deaths in the hospital. Specifically, the hospital administrators should receive information daily, weekly and monthly on live births, fetal deaths and deaths by age with a periodic evaluation of mortality.

* Definition in Appendix III.

Each hospital ought to prepare and issue certificates of birth, fetal death and death for the prompt registration of these events in the office of Civil Registration. It is advisable that the office or an official of Civil Registration works within the hospital in coordination with the health personnel in order to carry out effectively this task. When conditions permit, it is advisable that the hospital be responsible for the inscriptions in the office of Civil Registration.

3. Education and Training

The effective conduct of actions on hospital records requires the satisfactory preparation of responsible personnel. This includes training in several fields and the first is the training of the professionals and students in health sciences at the pre- and postgraduate levels, including the administrative personnel. Emphasis is recommended on concepts of multiple causes of death (underlying and associated) and completion of death certificates with utilization of the data in statistical analyses and in research. Inservice training is indicated of personnel in charge of the record system with attention to procedures, clinical records and reports. The training of auxiliary personnel is likewise important for their future responsibilities in the system.

Other groups for training are the technical personnel in statistics, voluntary workers assisting in activities in the hospital and officials of Civil Registration. Also the education of the mothers is important, especially regarding the value and benefits of registration.

It is most important to use various methods of dissemination of information in order to establish communication with persons of all levels of the community.

C. Maternal and Child Health and Nutrition

The Inter-American Investigation of Mortality in Childhood is providing the most exact measurement possible of the magnitude of problems of child health in the study areas. Knowledge of the size of the death rates, of the causes and factors which determine the excessive mortality in the areas of the Investigation is indicating the need for development of actions for solving the high priority problems within an integrated and coordinated context of maternal and child health.

The group of principal collaborators considers that the information obtained is, in general, applicable to the situation of Latin America and thus the findings of the Investigation should be considered in the determination and programing of activities in maternal and child health.

The group considers of greatest importance the following general principles in the planning of a program of maternal and child health:

1. It is absolutely necessary to rely on information of quality for evaluation of the programs and to develop research programs leading to the knowledge of the magnitude of the high priority problems and the most appropriate mechanisms of solutions.

2. A program of medical attention to the mother and child ought to have clearly defined objectives. The results of the Investigation indicate the need for promoting optimal nutrition in children and in pregnant and lactating women. They also indicate the need for prevention of infectious diseases and for promotion of adequate patterns of reproduction as high priority goals in order to reach optimal levels of growth and development.

3. The planning and conduct of a program of maternal and child health care ought to have a multidisciplinary and intersectorial approach. The services ought to take into account the concept of risk at the level of the community, family and individual for establishing a better distribution of resources.

4. The total program of maternal and child health ought to be an integral part of a general health plan. The establishment of goals of coverage of the components of the program and the establishment of operational procedures for the development of activities are considered important. Also it is necessary that in each central level in the health services there are personnel highly qualified in the field of maternal and child health.

5. The scarcity of resources as well as the size of the vulnerable groups and the urgent need for extension of health services to the rural areas require the maximum use of personnel and the active participation of the community with the focus on well supervised, delegated and simplified medicine. On the other hand, the services of maternal and child health ought to be continuous, that is, with coordination of prenatal, delivery and postpartum and postnatal care.

6. The adequate orientation, the efficient conduct and the readjustment of programs require operational research and continuous inservice training of personnel.

Recommendations

On the basis of the previous fundamental principles, the following specified recommendations are made:

1. The prevention and recuperation from nutritional deficiency in mothers and children are considered by the group as activities of the highest priority. The following actions are recommended:

1.1. Intensive promotion of breast feeding, insisting with the students of medicine, nursing and public health on the advantages of breast milk and developing massive programs of community education including the schools.

1.2. Development of effective programs of health and nutrition education particularly using practical methods and means accesible to the vulnerable population. Such programs may or may not include components of recuperation and supplementary feeding of the groups of high risk (mothers and children) and ought to include aspects of hygiene and of adequate techniques of preparation of food.

1.3. The prevention of malnutrition and its recuperation require effective control of infective and parasitic diseases. The prevention of infant diarrhea and diseases as measles are obligatory.

1.4. Orientation and education in aspects of reproduction such as concept of high risk of very young mothers and the older mothers is an essential component for optimal health for mothers and their products.

1.5. Because of the seriousness of malnutrition in rural areas, the group recommends the extension of programs of prevention and recuperation in nutrition to the suburban and rural areas.

2. In order to seek an increase in the coverage of services of maternal and child health, the group recommends the application of three basic principles of health administration.

2.1. Regionalization of health services with the criteria of establishment of graduated levels of medical attention with a double flow of service and advisory services.

2.2. Integration of preventive and curative services in a functional and programed manner, and not only by physical linkage of services, in such a way that there is continuous care to mothers and children.

2.3. Medical attention delegated to auxiliary personnel with elementary preparation in order to extend at least in a minimal level the health care to all the maternal and child population.

It is undeniable that the promotion of maternal and child health in the community especially at the level of the groups at high risk is also an essential reason for increasing the demand for timely services.

3. The group recommends that the schools of medicine and public health and other schools of health sciences conduct research and also give advice on research (in coordination with health services) oriented to knowledge of high priority problems of groups of the population at great risk for defining of the most effective methods of application of resources for the solution of the problems. Equally, it is highly recommended that teaching institutions participate in inservice training programs of all components of the health group and in integrated programs and community education.

4. The Workshop on Pediatric Pathology promoted by the Investigation was very successful and the group recommends that a training program in this important discipline be developed in one or more centers.

5. The high mortality due to measles indicates the need that all countries carry out the recommendation already made of the meeting of the Ministers of Health in Buenos Aires (1968) in the development of programs of vaccination against this disease.

6. The group considers of great importance the extension of services of environmental health particularly of piped water to all sectors of the population including rural areas. This measure is an indispensable component in the control of gastrointestinal diseases.

D. Education in Health Sciences

On the basis of the experience during the Inter-American Investigation of Mortality in Childhood, the group considers important the establishment of the following principles and recommendations:

1. The universities and especially the faculties of medicine and sections of health sciences in general are valuable instruments of change among which the principal objectives are to stimulate community development.

Toward this end, teaching and research combine their objectives and procedures, constituting an inseparable whole whose influence on the attitude of the student will be reflected in the future in the quality and extension of the provision of services. To consolidate this gain, the action ought to include all personnel in the health team, placing particular emphasis on types of personnel insufficient in number and training. In some areas it will be necessary to diversify the types of professions, creating, for example, groups of technicians in such fields as electronic computation, which is indispensable for the requirements of our programs in the immediate future. The training of health manpower to provide services in the rural areas is a clear necessity in our countries.

Biosocial research, conducted with similar methodology and principles used in this Investigation, contributes to the diagnosis of the health situation in a region or country. Such research is valuable to orient policies; it is useful in the development of health plans and programs. Furthermore, it allows universities to design and adapt curricula and plans of studies in the area of health, according to the needs and real problems of a population. The contribution of the results obtained are particularly important in emphasizing the coordination which should exist between obstetrics and pediatrics, and also in demonstrating its methodology as a useful tool for general application.

2. The preparation of students in health sciences requires their full knowledge and utilization of the scientific method in order for them to acquire a sound and critical judgment and an investigative attitude. For the foregoing a focus is needed on statistical methods which provide in practice quantitative medicine and epidemiology as an indispensable foundation in education in the field of health. The physician, as the principal producer of data, ought to have knowledge of their handling, utilization and significance and to know with precision the principles of the natural history of disease and the multiplicity of causation. This last will enable him to understand the real contribution of causes of death, on the basis of the concept of association including the role of biological, social and environmental elements inseparable from certain morbid conditions. Through the use of the concept of multiple causation, the application of integrated medicine with emphasis on prevention can be obtained.

3. The limiting concept of the "patient-physician" relationship has been transformed into the broader one of "community-health team". The preparation of health personnel ought to be such as to maintain community medicine, with training of auxiliary personnel capable of performing adequately their delegated functions and broadening the health services progressively to all segments of the population.

4. For satisfactory utilization of resources, it is necessary that the medical student receive training in basic principles of health planning and administration.

5. In order to obtain team approach, the health sciences faculties within the universities ought to be coordinated.

6. The relationships between universities and health services should become closer and to this end the following three mechanisms are recommended. First, the students of health sciences ought to use for instruction not only the university hospital but also the regional hospitals and health centers and posts. In this way the student will know the type of medical attention which he will have to provide later. Second, the members of the health services ought to perform teaching functions and members of the university should be members of the sectional councils and technical committees of the health services. Third, the results of research and studies carried out by the universities in the community favor coordination for the utilization of this information by the members of the health services for the development of concrete actions for the benefit of the population.

7. Adequate continuation of the efforts undertaken by the different participating teams in the Inter-American Investigation of Mortality in Childhood should be gained through the creation of teaching centers in the different schools and faculties in which knowledge of the instruments and procedures utilized during this Investigation is projected and multiplied by all means possible. All the experiences, including the negative ones which were encountered, are useful to accelerate knowledge of the solutions to health problems of the population. The possibilities of developing an active interchange of undergraduate students and professionals through fellowships and programs with adequate assistance ought to be studied.

E. Conclusions and Recommendations for Future Research Programs

The Inter-American Investigation of Mortality in Childhood is pointing out important health problems such as the excessive mortality in nearly all the areas, the serious deficiencies in the systems of health statistics and the important role of the various social, biological and environmental factors which are related to health problems.

Many of the conditions described and the problems revealed need to be characterized more completely and it is also necessary to find adequate solutions in order to attain the greatest efficiency with the existing resources.

The group of collaborators considers that future research on various aspects of community health should have high priority and that development of such research would constitute one of the most important results of this Investigation. The following principles were pointed out to serve as the basis for a research policy for the future.

1. Coordinated epidemiological research of the collaborative type carried out in the Inter-American Investigation of Mortality in Childhood ought to be stimulated widely since it leads to the discovery and measurement of health problems in different regions and thus enables comparison of their relative magnitude and greater comprehension of these problems. In view of the fact that the factors which affect the health of mothers and children are multiple and complex and thus require a multisectorial and multidisciplinary approach for solution, it is advisable that the health agencies, both national and international, and the respective universities exercise joint responsibility. Emphasis is given to the important role of the Pan American Health Organization as the agency for promotion and coordination of research in the Americas.

2. Research of an operational type oriented to the search for effective solutions to the most serious health problems ought to receive the highest priority. In general, agencies such as the Pan American Health Organization ought to promote the type of epidemiological research which can benefit more than one area and, ideally, more than one country. Similar data can be obtained from studies in several areas which will benefit entire countries and even regions; in other words, knowledge acquired at one site can often be applied in other areas. The value of these additional investigations depends largely on the efforts exerted and the success in obtaining data of the highest quality. Since one of the most common problems is the lack of quality in basic data for health planning and other uses, it is necessary to establish various types of mechanisms for obtaining improvements in the quality of the information in both demographic and health aspects.

3. It is considered indispensable that all coordinated research of a collaborative type include a phase of careful planning with a stage of pilot testing. The aspects related to determination of samples, methods and procedures, plans for processing and analysis of results, administration, financing and training of personnel ought to be carefully planned before initiation of the principal phase of an investigation. The experience acquired in these community centered research programs ought to be made known and utilized for the best direction and management of future epidemiological investigations.

4. The Inter-American Investigation of Mortality in Childhood and the similar investigation of mortality of adults have demonstrated that studies of community health of high quality can be conducted in Latin America. Due to the great impact that this type of research can have on teaching of the health sciences and in the orientation of programs, it is highly desirable that

future studies be conducted through coordinated efforts of the universities and health services. Furthermore, the group considers it of major importance that the countries and the Pan American Health Organization establish programs for the preparation of personnel for development of epidemiological research.

Recommendations

Based on the previous principles as well as on the contributions which the two continental investigations of mortality in adults and childhood have made, the following recommendations are formulated:

1. The group of principal collaborators recommends that the Pan American Health Organization exercise as a high priority and permanent function not only the promotion but also the conduct and coordination of research of the collaborative type in basic health aspects of the community so that the results of such research may serve for guidance for specific measures. In this connection, the group requests that the principles and recommendations on research which were agreed on in this meeting be transmitted for consideration by the Advisory Committee on Medical Research of the Pan American Health Organization.

2. The group recommends the creation of a center or program for training of personnel in epidemiological research. Likewise, it recommends that the important component of training in research on community health be introduced. The creation of a system of fellowships for training personnel who would participate in the development of the several stages of a research program such as the present one would be a highly effective mechanism for the promotion of epidemiological research.

3. On the basis of the provisional results of the Investigation, the group considers the following broad fields to have high priority for future research especially as related to maternal and child health.

3.1. Operational Community Studies on Provision of Health Services in Maternal and Child Health.

Within this field the following aspects of research are recommended to be studied either separately or combined:

- Identification and stratification of the population groups of high risk (mothers, children, families, etc.), taking into account biological, socio-cultural and environmental factors.

- Measurement of the coverage and quality of health services at the prenatal, delivery and postpartum levels as well as of those related with infant health control.

- Determination and evaluation of systems for extension of health services to suburban and rural areas.

3.2. Community Centered Research Oriented to Improvement of Nutritional Status.

- Studies of factors which determine the patterns of breast feeding with emphasis on causes of early weaning, taking into account the nutritional status of the mother, her reproductive history and other biological and social factors.

- Studies of methods of developing integrated and efficient programs in applied nutrition which include health education in general and nutrition education in particular and supplementary feeding.

- Study of the causes and characteristics of malnutrition in young children taking into account factors such as nutritional status of the mother, birth weight, breast feeding, morbidity, environmental and socio-cultural factors.

- Comparative basic studies on the patterns of births by birth weight and on the causes of differences, considering biological and environmental factors. Such studies should lead into comparative studies on growth and development.

3.3. Epidemiological Research in the Field of Human Reproduction.

- Studies, ideally of longitudinal type, on the outcome of pregnancies taking into account biological factors in the mother as age, nutritional status, reproductive history, practices of family planning as well as social and environmental factors. Studies of this type can provide information on the factors which determine differences in the patterns of reproduction apparent in the provisional results of the Investigation and also for implementation of programs oriented to optimal health of mothers and children.

- Studies on knowledge and attitudes of the parents in relation to aspects of reproduction, such as the size of the family, the acceptance of pregnancies and spacing, utilization of methods of family planning, etc., and evaluation of programs involving human reproduction.

4. The group recommends that each collaborator describe the solutions applied to operational difficulties encountered in the development of his project. The experiences could be combined and edited with the addition of recommendations on organization and administration of this type of community centered research. Such a document would aid greatly in the development of future epidemiological studies and in the training of research staff.

VI. FUTURE PLANS

In considering future plans, reference was made first to actions recommended by the PAHO Regional Advisory Committee on Health Statistics which met on December 6-10, 1971. A strategy was recommended for the rapid improvement of vital and health statistics in the Americas. As background, the administrative problems in the countries were pointed out as well as the deficiencies in the preliminary findings in the Inter-American Investigation of Mortality in Childhood - especially in lack of registration and unsatisfactory procedures in hospitals regarding deaths in early life. The Committee recommended an intensive program - a crash program - to stimulate the countries to solve the deficiencies.

The principal collaborators in the Investigation can be of great assistance in the new intensive program by pointing out the difficulties encountered and the recommended solutions to the problems. Also they can be of assistance in the program in several other ways, for example, in training programs.

The publication of reports from the Inter-American Investigation of Mortality in Childhood was discussed briefly with emphasis on coordination between the central office and the projects in order to utilize the same bases for rates and to release the same findings. In addition to the publication of the overall comprehensive report in English and Spanish which must be completed as soon as possible, other special publications would follow. Excerpts from the first report could be published, as was done in the adult study, which could be utilized for wider distribution of the findings and for use with students. Each principal collaborator was asked to contribute a report utilizing the material of his project.

For adequate distribution of the reports within the countries, the principal collaborators are the ones to assist through recommendations and local distributions.

The ultimate success of the Inter-American Investigation of Mortality in Childhood depends on the resulting actions, especially for the health of children throughout the Continent, which requires the combined efforts of principal collaborators, health authorities and educators.

APPENDICES:
I. List of Participants
II. Working Groups for Formulation of Recommendations
III. Definitions

HS-R
February 7, 1972

APPENDIX I

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Meeting of Principal Collaborators

Washington, D.C., 24-28 January 1972

LIST OF PARTICIPANTS

Principal Collaborators of Field Projects:

Cali, Colombia:	Dr. Francisco Villadiego*
Cartagena, Colombia:	Dr. Abel Dueñas
	Dr. José Rojas, Medical interviewer
Chaco Province, Argentina:	Dr. Rubén A. Castro
Kingston Area, Jamaica:	Dr. Kenneth Standard*
	Dr. Halmond Dyer, Associate
La Paz Area, Bolivia:	Dr. Gregorio Mendizábal
Medellín, Colombia:	Dr. Julio León Trejos
Monterrey, Mexico:	Dr. Dionisio Aceves
Recife, Brazil:	Dr. Fernando Figueira
	Dr. Roberto Nunes, Medical coordinator
Ribeirão Prêto Area, Brazil:	Dr. José Romero Teruel
San Francisco Area, U.S.A.:	Dr. Helen M. Wallace
	Dr. Hyman Goldstein, Associate
	Dr. Ethel Barnoon, Associate
San Juan Province, Argentina:	Dr. Valois Martínez
San Salvador Area, El Salvador:	Dr. Eduardo Suárez
Santiago Area, Chile:	Dr. Adela Legarreta
São Paulo, Brazil:	Dr. Ruy Laurenti
Sherbrooke Area, Canada:	Mr. Louis Munan
	Dr. Anthéa Kelly, Associate

Agency for International Development, U.S.A.:

Dr. Joe Davis
Mr. Alfred J. Davidson

World Health Organization:

Dr. Harold Hansluwka

Pan American Health Organization:

Dr. Hans Bruch
Mary H. Burke
Ann Dillon
Dr. Ruth R. Puffer
Dr. Carlos V. Serrano

*Unable to attend.

APPENDIX II

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Meeting of Principal Collaborators

Washington, D.C., 24-28 January 1972

WORKING GROUPS FOR FORMULATION OF RECOMMENDATIONS

Wednesday, January 26, 2:00 PM

A. Birth and Death Registration and Vital Statistics

Dr. Ruy Laurenti, Coordinator
Dr. Rubén A. Castro
Dr. Halmond Dyer
Dr. Anthéa Kelly
Dr. Adela Legarreta, Rapporteur
Dr. Harold Hansluwka

B. Hospital Records, Procedures and Statistics

Dr. Valois Martínez, Coordinator
Dr. Abel Dueñas, Rapporteur
Dr. Gregorio Mendizábal
Mr. Louis Munan
Dr. José Romero Teruel

C. Maternal and Child Health and Nutrition

Dr. Fernando Figueira, Coordinator
Dr. Dionisio Aceves
Dr. Roberto Nunes
Dr. Eduardo Suárez, Rapporteur
Dr. Julio León Trejos
Dr. Helen M. Wallace
Dr. Ethel Barnoon

Friday, January 28, 9:00 AM

D. Education in Health Sciences

Dr. Abel Dueñas, Coordinator
Dr. Dionisio Aceves, Rapporteur
Dr. Rubén A. Castro
Dr. Halmond Dyer
Dr. Fernando Figueira
Dr. Gregorio Mendizábal
Mr. Louis Munan
Dr. Eduardo Suárez
Dr. Helen M. Wallace

E. Research Programs

Dr. José Romero Teruel, Coordinator
Dr. Ethel Barnoon
Dr. Hyman Goldstein
Dr. Anthéa Kelly
Dr. Ruy Laurenti
Dr. Adela Legarreta
Dr. Valois Martínez
Dr. Roberto Nunes
Dr. Julio León Trejos, Rapporteur

DEFINITIONS*

The following definitions have been adopted by the World Health Assembly under Article 23 of the Constitution of the World Health Organization (Off. Rec. Wld Hlth Org., 1950, 28, 17 and 1967, 160 11 and Annex 18).

1. Live birth

"Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born."

2. Foetal deaths

"Foetal death is death prior to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation the foetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles."

3. Causes of death

"The causes of death to be entered on the medical certificate of cause of death are all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries."

4. Underlying cause of death

"The underlying cause of death is (a) the disease or injury which initiated the train of events, leading directly to death, or (b) the circumstances of the accident or violence which produced the fatal injury."

*International Classification of Diseases, 1965 Revision, World Health Organization, Geneva, 1967, Vol. 1, p. 469.

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

FIRST YEAR OF INVESTIGATION

PROVISIONAL REPORT
September 1971

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau - Regional Office of the
WORLD HEALTH ORGANIZATION
Washington, D.C., U.S.A.

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

FIRST YEAR OF INVESTIGATION

PROVISIONAL REPORT
September 1971

PAN AMERICAN HEALTH ORGANIZATION
Pan American Sanitary Bureau - Regional Office of the
WORLD HEALTH ORGANIZATION
Washington, D.C., U.S.A.

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD*

Provisional Report of First Year

Ruth R. Puffer, Dr.P.H., Principal Investigator
Carlos V. Serrano, M.D., Co-Principal Investigator
Ann Dillon, M.S.P.H., Statistician

Principal Collaborators of Field Projects

ARGENTINA	
Chaco Province Resistencia	Dr. Rubén A. Castro, Professor of Hygiene and Social Medicine, University of the Northeast (Corrientes)
San Juan Province San Juan	Dr. Valois Martínez C., former Director of Health of the Province of San Juan
BOLIVIA	
La Paz	Dr. Gregorio Mendizábal, Professor of Preventive and Social Medicine, School of Medicine, San Andres University
BRAZIL	
Recife	Dr. Fernando Figueira, Professor of Pediatrics, School of Medicine, Federal University of Pernambuco
Ribeirão Prêto	Dr. José Romero Teruel, Department of Preventive Medicine, School of Medicine of Ribeirão Prêto, University of São Paulo
São Paulo	Dr. Ruy Laurenti, Department of Epidemiology, School of Public Health, University of São Paulo
CANADA	
Sherbrooke	Mr. Louis Munan, Professor of Epidemiology, School of Medicine, University of Sherbrooke
CHILE	
Santiago	Dr. Adela Legarreta, Department of Public Health and Social Medicine, School of Medicine, University of Chile
COLOMBIA	
Cali	Dr. Francisco Villadiego, Department of Preventive Medicine and Public Health, School of Medicine, University of Valle
Cartagena	Dr. Abel Dueñas, Dean of the Division of Health Sciences, University of Cartagena
Medellín	Dr. Julio León Trejos, School of Public Health, University of Antioquia
EL SALVADOR	
San Salvador	Dr. Eduardo Suárez M., Professor of Pediatrics, School of Medicine, University of El Salvador
JAMAICA	
Kingston	Dr. Kenneth Standard, Professor of Social and Preventive Medicine, University of the West Indies
MEXICO	
Monterrey	Dr. Dionisio Aceves S., Department of Preventive and Social Medicine, School of Medicine, University of Nuevo Leon
UNITED STATES	
San Francisco	Dr. Ira Gabrielson, Division of Maternal and Child Health, School of Public Health, University of California (Berkeley)

*This research project was made possible by a contract with the Agency for International Development of the United States of America to the Pan American Health Organization

Assistance in classification of medical data and multiple causes of death has been rendered by the following:

Dr. Darío Curiel, Professor of Hygiene and Social Medicine, Razetti School of the Faculty of Medicine, Central University of Venezuela;

Dr. Ruy Laurenti, principal collaborator of São Paulo, Brazil;

Dr. Roberto Nunes, associate collaborator of Recife, Brazil;

Dr. Valois Martínez C., principal collaborator of San Juan, Argentina; and,

Dr. Carlos A. Sagastume, associate collaborator of San Salvador, El Salvador.

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Explanation of symbols

Quantity zero ..... -

Quantity more than zero but less than 0.05 ... 0.0

INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Provisional Report of First Year

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INTER-AMERICAN INVESTIGATION OF MORTALITY IN CHILDHOOD

Provisional Report of First Year

The development of continental, coordinated research on mortality in childhood in selected, widely separated areas of the Americas was a recommendation from the earlier research on mortality in adults[1] as a satisfactory method of gaining greater understanding of the health problems in infancy and early childhood. Such knowledge was considered essential for reaching goals such as the one contained in the Charter of Punta del Este of reducing the mortality of children under 5 years of age by 50 per cent within a period of 10 years[2]

The current Investigation of Mortality in Childhood[3] was planned and is being developed with the overall objective of determining death rates in infancy and early childhood which are as accurate and comparable as possible. Other specific objectives are defined as follows:

- To investigate the effect of nutritional, socio-biological and environmental factors on mortality under 5 years of age.
- To analyze the multiple causes of death (underlying and associated causes) of children under 5 years of age and to study interrelationships such as those existing between infectious diseases, nutritional deficiency states and socio-biological factors.
- To study biologic and sociologic differences in children who die in infancy and early childhood and in those who live.
- To provide sound material for improvement of maternal and child health programs and for use in teaching programs of schools of medicine and of public health.

The field work of data collection in each project has been developed along three main lines of activity carried out simultaneously, utilizing standard definitions and uniform procedures. The three types of data collected are 1) deaths of children under 5 years of age who were residents of the areas; 2) a probability sample of households and living children under 5 years of age; and 3) records of births to residents of the area.

For the study of deaths the starting point was the detection of all such vital events by the team of the Investigation, using all the official and non-official sources available in each area. A home visit was made to the family by a public health nurse or a social worker with the purpose of obtaining information on environmental conditions, family composition, previous deaths in the household, reproductive history of the mother of the study child, age, education and occupation of the parents, nutritional history and summary of medical attention provided to the study child from birth

to death. A physician interviewer collected all pertinent medical information available from hospitals, clinics, private physicians and autopsy records as well as from the family of the dead child when considered necessary. The medical part of the official death certificate was transcribed and the questionnaire was completed with a final summary and a statement of the multiple causes. The phase of data collection of deaths extended over a period of 24 consecutive months.

For the study of households and living children in the area data were obtained from a pre-selected sample, collected in monthly portions during the same 24 months as the study of deaths. Applicable information was obtained for each family by a public health nurse or a social worker, similar to that collected for the families of dead children, as well as data related to the medical and nutritional history of each living child under 5 years of age.

Information regarding births was obtained from hospitals and clinics as well as from official vital statistics reports in order to determine as accurately as possible the number of births to residents of the area during the study period. Such information is indispensable for calculation of death rates in infancy.

Insuring the necessary high quality of information in the various aspects and levels of the phase of data collection has presented challenging problems which will be discussed in the section on quality of the information. The intensive efforts necessary to solve such problems, especially with regard to completeness of the collection process for deaths, have resulted in unavoidable delays in the termination of this phase of the Investigation.

The approach of comprehensive analysis including determination of the multiple causes and related factors involved in mortality constitutes an outstanding feature of this Investigation. It enables a detailed and full description of the morbid conditions leading to death in childhood and the recognition of high risk groups. This knowledge will make possible sound recommendations for actions needed to reduce mortality and improve the condition of survivors.

The comparison between urban, suburban and rural communities included in the Investigation is revealing important differences that will contribute to a better understanding of the causes and factors determining the patterns of mortality. These data indicate higher mortality in rural areas than in cities and the need for extension of health programs into rural areas.

Since data are practically complete for nearly all areas for the first year, preliminary analyses have been made and provisional results are presented. The purpose of this report is to review the tabulations and analyses to ensure that the data are as complete and accurate as possible, as well as to promote the utilization of the results in local, national and international health programs. Thus, the data presented are provisional; additional deaths may be discovered and included in the final report; the presentation of results of the projects may be improved; and other changes as well as additional analyses are planned for the final report. Already the Investigation has stimulated

improvements in local procedures. However, it is hoped that this report will serve as the basis for many actions, especially in the fields of maternal and child health and vital and hospital statistics. Also, this report indicates fields for additional research leading to the determination of practical methods for prevention of the serious problems revealed by the Investigation, of which nutritional deficiency states seem to be the most outstanding and the one requiring highest priority.

I. FIFTEEN PROJECTS IN THE AMERICAS

Fifteen projects, widely separated in 10 countries of the Americas, have been developed in which the standard protocol and procedures of the Inter-American Investigation of Mortality in Childhood have been followed. The locations of these projects are shown on a map of the Americas (Figure 1). Six of the projects are limited to cities, in four of which only a sample of the deaths under 5 years of age were studied. The six cities and the corresponding selection of deaths of residents for study in the first year of the Investigation are as follows:

Cali, Colombia	-	Sample of 1 in 2 deaths
Cartagena, Colombia	-	All deaths
Medellín, Colombia	-	Sample of 1 in 3 deaths
Monterrey, Mexico	-	All deaths
Recife, Brazil	-	All deaths of three districts, Beberibe, Casa Amarela, Encruzilhada
São Paulo, Brazil	-	Sample of 1 in 4.25 deaths

The projects in Colombia were selected to provide data for the three distinctly different regions of the country, the Pacific, Caribbean and Central regions. Because of the values in teaching, involvement of the Faculties of Medicine in Cali and Cartagena and the Faculty of the School of Public Health in Medellín through relatively small projects seemed preferable to one large project in Colombia.

The other nine projects include, in addition to the central city, suburban communities and rural areas in which deaths of all residents are studied; the subdivisions of these projects are as follows:

Chaco Province, Argentina

- Resistencia (San Fernando Department)
- Six rural departments (Comandante Fernández, General Donovan, Libertad, Presidencia de la Plaza, 1o. de Mayo, Quitilipi)

Kingston Area, Jamaica

- Kingston and St. Andrew Parish, urban
- St. Andrew Parish, rural

La Paz Area, Bolivia

- La Paz
- Viacha (small community on Altiplano)

Ribeirão Prêto Area, Brazil

- Ribeirão Prêto
- Franca (small community)
- Five rural communities (Batatais, Brodosqui, Cravinhos, Jardinópolis, Sertãozinho)

San Francisco Area, United States

San Francisco
Suburban area (parts of three counties, Alameda, Contra Costa, San Mateo)

San Juan Province, Argentina

San Juan (Capital Department)
Suburban departments (Chimbas, Rawson, Rivadavia, Santa Lucía)
Rural departments (Rest of Province)

San Salvador Area, El Salvador

San Salvador
Rural communities (Apopa, Nejapa, Quezaltepeque)

Santiago Area, Chile

Santiago - sample of 1 in 5 deaths for first 8 months and 1 in 3 deaths for last 4 months
Suburban communities (Colina, Lampa, Quilicura, Til-Til)

Sherbrooke Area, Canada

Sherbrooke
Designated area of Eastern Townships

The 15 central cities vary in population from slightly over one hundred thousand to over 5 million. Likewise, the 11 other areas vary in size from the small community of Viacha, Bolivia, of 10,000 population to larger suburban and rural areas in the projects in Argentina, Canada and the United States. The numbers of live births for the year and the estimated populations for the mid-period are needed for these other areas as well as for the central cities. In those areas in which a sample of deaths was taken the size of the population and the number of live births have been reduced proportionally to that of the sample. For example, the sample for Cali is one in two deaths and thus the population base is one-half the estimated population and the number of live births is one-half the births in the year.

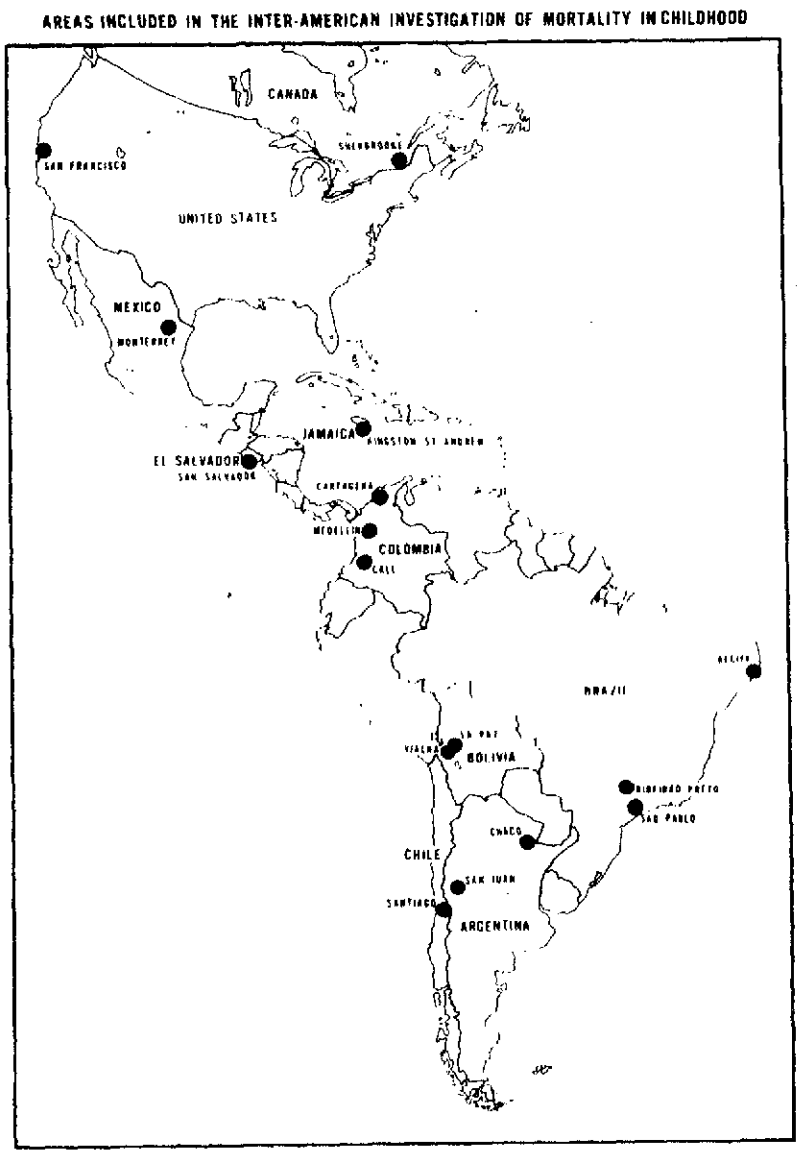
The 13 projects in Latin America were started in 1968 in the following months: 2 projects in June, 7 in July, 3 in August and 1 project in September. The San Francisco project was initiated in June 1969 and the Sherbrooke project in January 1970. At this time complete data for the first year of the latter two projects are not available for analysis. Table 1 contains data for the 13 Latin American projects regarding the area, the selection of deaths and the time period, as well as the estimated bases for the calculation of death rates and the provisional numbers of deaths for the first year. The population estimates and numbers of live births are subject to revision on the basis of the censuses taken in the 1970 census period and on additional information on live births in the areas of the projects.

Table 1. Deaths under Five Years of Age, Method of Selection, Time Period, Estimated Population and Live Births for First Year of Investigation in 13 Projects with Division into Central Cities and Other Areas

Project, central city and other area	Deaths of residents included		Time period	Estimated population base				Live births
	Number	Selection		Under 5 years	1-4 years			
					Total	1 year	2-4 years	
Cali, Colombia	964	Sample 1 in 2	1 July 1968-30 June 1969	61,000	49,100	12,300	36,800	12,400
Cartagena, Colombia	621	All	1 July 1968-30 June 1969	44,900	35,900	8,900	27,000	9,400
Chaco Province, Argentina								
Resistencia (San Fernando Department)	452	All	1 Aug. 1968-31 July 1969	21,100	16,500	4,500	12,000	5,000
Rural departments (Comandante Fernández, General Donovan, Libertad, Presidencia de la Plaza, lo. de Mayo, Quitilipi)	433	All	1 Aug. 1968-31 July 1969	17,200	13,600	3,400	10,200	3,900
Kingston Area, Jamaica								
Kingston and St. Andrew Parish, urban	920	All	1 June 1968-31 May 1969	82,800	64,900	17,600	47,300	18,500
St. Andrew Parish, rural	83	All	1 June 1968-31 May 1969	7,800	6,200	1,600	4,600	1,700
La Paz Area, Bolivia								
La Paz	1,913	All	1 July 1968-30 June 1969	80,000	64,000	16,000	48,000	17,000
Viacha	69	All	1 July 1968-30 June 1969	1,700	1,330	320	1,010	400
Medellín, Colombia	692	Sample 1 in 3	1 July 1968-30 June 1969	48,300	38,700	9,600	29,100	10,000
Monterrey, Mexico	2,321	All	1 Aug. 1968-31 July 1969	138,000	106,400	31,000	75,400	33,100
Recife, Brazil (3 districts, Beberibe, Casa Amarela, Encruzilhada)	2,035	All	1 July 1968-30 June 1969	68,000	53,200	14,000	39,200	16,400
Ribeirão Prêto Area, Brazil								
Ribeirão Prêto	251	All	1 July 1968-30 June 1969	20,880	16,680	4,170	12,510	4,500
Franca	257	All	1 July 1968-30 June 1969	9,430	7,160	2,000	5,160	2,530
Rural communities (Batatais, Brodosqui, Cravinhos, Jardinópolis, Sertãozinho)	107	All	1 July 1968-30 June 1969	7,730	6,060	1,600	4,460	1,820
San Juan Province, Argentina								
San Juan (Capital Department)	133	All	1 Aug. 1968-31 July 1969	12,900	10,200	2,600	7,600	2,860
Suburban departments (Chimbas, Rawson, Rivadavia, Santa Lucía)	360	All	1 Aug. 1968-31 July 1969	17,100	13,400	3,400	10,000	3,800
Rural departments (Rest of Province)	546	All	1 Aug. 1968-31 July 1969	20,600	16,000	4,000	12,000	4,580
San Salvador Area, El Salvador								
San Salvador	1,334	All	1 Sept.1968-31 Aug. 1969	62,200	49,900	12,700	37,200	13,300
Rural communities (Apopa, Nejapa, Quezaltepeque)	486	All	1 Sept.1968-31 Aug. 1969	11,300	8,800	2,400	6,400	2,800
Santiago Area, Chile								
Santiago	915	Sample 1 in 5 Sample 1 in 3	1 July 1968-28 Feb. 1969 1 Mar. 1969-30 June 1969	79,070	63,800	15,200	48,600	15,800
Suburban communities (Colina, Lampa, Quilicura, Til-Til)	103	All	1 July 1968-30 June 1969	7,120	5,800	1,450	4,350	1,420
São Paulo, Brazil	2,203	Sample 1 in 4.25	1 June 1968-31 May 1969	129,900	103,500	25,800	77,700	27,800

For the 13 projects in Latin America, questionnaires for 17,198 deaths have been processed for this provisional report for the first year of the Investigation. The desired number of deaths to be studied for the two-year period was 35,000. Thus with the addition of approximately 1,000 deaths from the San Francisco Area in the United States and the Sherbrooke Area of Canada for the first year, it is likely that the number will be in excess of 18,000 for the first year and at least 35,000 for the two-year period.

Figure 1



II. QUALITY OF THE INFORMATION

To attain the goal of death rates in infancy and childhood as accurate and comparable as possible requires information on all deaths under 5 years of age in each area. This has proved to be a far greater challenge than originally visualized. Many deaths in the first few hours and days of life are not registered and are difficult to find. In several projects the principal collaborators have been and are continuing to search for missing deaths. Early in the Investigation one principal collaborator realized that he had not found all the deaths in early life; he thought that there must be a clandestine cemetery in his area. To his surprise he discovered that the "clandestine cemetery" was in the central hospital, where unregistered deaths were found through reviewing notations in the delivery book. Another principal collaborator was amazed to learn, after the Investigation was practically complete, that the obstetric nurse maintained her own book of vital events. This book contained information about deaths occurring soon after birth which were not included in the hospital statistics nor in the Investigation. These searches for unregistered deaths have necessitated delays in processing and analyzing the material. However, this emphasis on quality is a required component of research, and if additional deaths can be found, they will be included in the final report.* Comparisons of results among the projects indicate certain deficiencies in completeness of the data in a few projects which are apparent in the interpretation of the material.

Although the primary source of information regarding the occurrence of a death was the death certificate, in the planning phase it was recognized that some of the deaths would not be registered and that other means of knowing about them should be incorporated into the local procedures. Registration of deaths was believed to be nearly complete in cities but less complete in rural areas. However, it was soon discovered that deaths in early life without registration either as births or deaths were occurring in hospitals in the cities, even in university hospitals. Tabulations from the probability sample of households of their members (the population) and the vital events in the 12 months prior to the household interview proved useful in estimating birth and death rates in the population and, thus, for judging the accuracy of death rates in the Investigation. Also, another useful measure was the level of the death rate in the first 24 hours of life. In the United States this death rate has been reduced from a higher level to approximately 10 deaths per 1,000 live births and has remained at this level for several years.(4) Actions already taken in this field are described in the note prepared for the WHO Consultation on Fetal, Infant and Childhood Mortality.(5)

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*Since the tabulations were prepared for this report, 9 additional questionnaires have been received for deaths in the first year in Medellín, mainly deaths without registration. In San Juan, the principal collaborator has obtained information indicating 35 additional deaths in the first year.

In all projects search for all deaths under 5 years of age was recommended. Although the WHO definition* of a live birth was to be used irrespective of local laws and practice, the registration as a fetal death of a liveborn child who died shortly after birth was a possible source of a missing neonatal death. In several areas investigations were made of fetal deaths to determine if, in fact, any of those deaths were actually deaths of liveborn children which should be included in the Investigation. This was done routinely in La Paz and on a sample basis in Santiago, São Paulo and Cali. In all of these projects, unregistered deaths of liveborn children were discovered from this activity, with La Paz being more productive than the other areas.

Other sources of checking for unregistered deaths were the records of the Investigation, the questionnaires for the deaths and for the sample of households. For example, each death of a liveborn product of a multiple pregnancy should have been included in the file of deaths from which the deaths to be investigated (all in some areas and only a sample in others) were drawn. Often, however, although both twins may have died only one death certificate had been filed. From the reproductive histories of the mothers and from the section on deaths in the past year, information was available for deaths eligible to be included in the Investigation. Also, deaths under 5 years of age reported in the sample of households as having occurred during the time period of the Investigation were checked against the death file and a few such deaths were added from this source, notably in Recife and La Paz.

Careful checking to assure inclusion of all deaths under 5 years of age during the period of the Investigation was encouraged in all of the projects. The extent and intensity of the checking varied with the projects. In those cities in which the deaths were selected by sampling, as in Cali, Medellín, Santiago and São Paulo, search for deaths without registration proved complicated and the results cannot be measured as well as in the other projects.

Special mention must be made of the Kingston project. There deaths in hospitals were reported immediately to the local staff and were the source of information for the home visits by nurses. The completed questionnaires were matched with death certificates in the final phase of the Investigation. Some death certificates in Jamaica are filed many months after the death, due

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*"Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born."(6)

at times to completion of the inquest and recording of autopsy findings. In order to obtain information on deaths in early life, procedures for distinguishing live births and fetal deaths in accordance with the WHO definition were established in the planning phase in Jamaica. Previously products under 2 pounds were considered nonviable and all were recorded as fetal deaths.

Data are provided in Table 2 regarding the deaths which have been included without registration in 9 projects. The other four projects, Cali, Ribeirão Prêto, Santiago and São Paulo, are excluded since additional efforts to find missing deaths were concentrated only on the study of fetal deaths. The proportions of the deaths found in the first year without registration vary among the projects due in part to the type and quality of the registration systems in operation, as well as to the intensity of the efforts of the principal collaborators. In Cartagena and in the La Paz Area, such deaths constituted high proportions, 20.5 per cent in Cartagena and 13.2 per cent in La Paz (Figure 2). In San Juan Province 9.3 per cent and in the Kingston Area 9.2 per cent of the deaths were not registered.

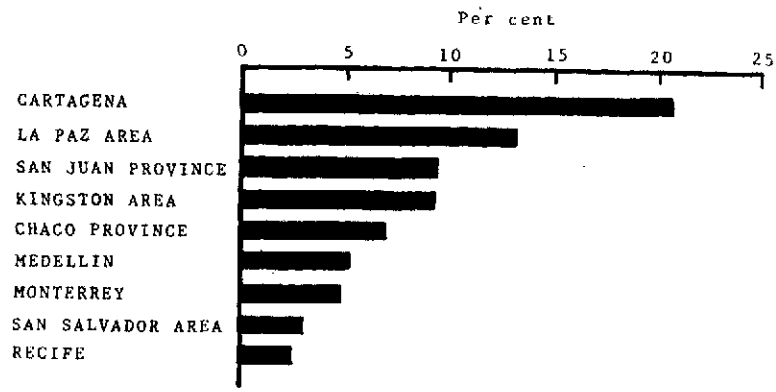
Table 2. Number and Percentage of Deaths Under 5 Years Without Registration in 9 Projects, First Year of Investigation

Project	Total deaths	Without registration	
		Number	Per cent
Cartagena	621	127	20.5
Chaco Province	885	60	6.8
Kingston Area	1,003	92	9.2
La Paz Area	1,982	261	13.2
Medellín	692	35	5.1
Monterrey	2,321	110	4.7
Recife	2,035	48	2.4
San Juan Province	1,039	97	9.3
San Salvador Area	1,820	52	2.9

In all but two of these areas deaths without registration usually occurred in early life, that is in the neonatal period (first 28 days of life) (Table 3). For this age period nearly half of the deaths in Cartagena were not registered, in La Paz 22 per cent and in San Juan Province 20 per cent. In San Salvador, soon after the initiation of the project, many deaths in early life in the central hospital were discovered to be without registration. The staff of the project took the necessary actions for registration at that time and the data received on the completed questionnaires indicated that death certificates had been completed. Actually the official infant

Figure 2

DEATHS UNDER 5 YEARS WITHOUT REGISTRATION IN 9 PROJECTS,
FIRST YEAR OF INVESTIGATION



death rate has increased in El Salvador from 59.2 in 1968 to 63.3 in 1969 and 66.8 in 1970 and it is not known whether registration of deaths, especially of prematures in hospitals, has accounted for some of the increase.(7) Later when the rates for the San Salvador project are presented, it will be clear that the rates for the country should be much higher.

As expected, high proportions of deaths in the first 24 hours of life were not registered. Figure 3 shows the percentage of deaths in the first 24 hours of life and in the remainder of the neonatal period (1-27 days) without registration. In Cartagena over 60 per cent of the deaths in the first 24 hours of life were found through search of books of obstetric and pediatric services. The search for these deaths which was organized by the principal collaborator was successful. However, no such search can be made easily for deaths in homes in this or other projects and there is no doubt that there are some deaths in homes without registration.

Figure 3

NEONATAL DEATHS WITHOUT REGISTRATION FOR TWO AGE GROUPS IN 9 PROJECTS,
FIRST YEAR OF INVESTIGATION

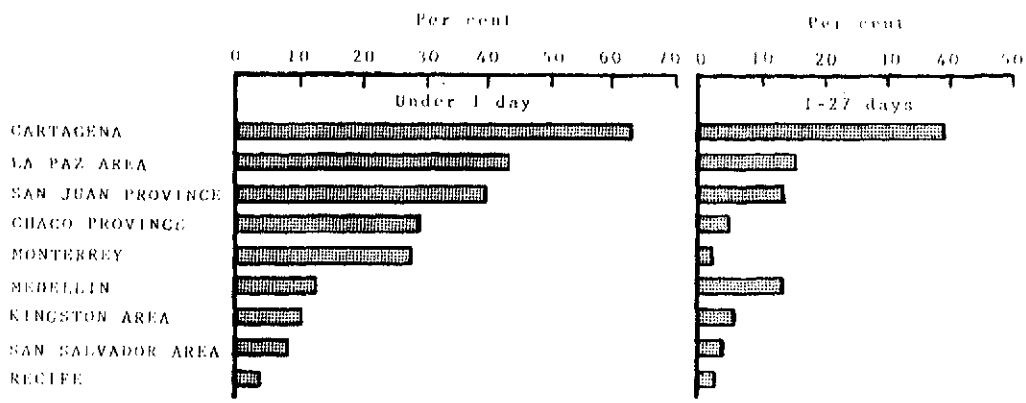


Table 3. Number and Percentage of Deaths Under 5 Years Without Registration by Age Group in 9 Projects, First Year of Investigation

Age Group	Total deaths	Without registration		Total deaths	Without registration		Total deaths	Without registration	
		Number	Per cent		Number	Per cent		Number	Per cent
	CARTAGENA			CHACO PROVINCE			KINGSTON AREA		
Deaths under 5 years	621	127	20.5	885	60	6.8	1,003	92	9.2
Infant deaths	451	118	26.2	710	54	7.6	833	74	8.9
Neonatal	218	106	48.6	269	36	13.4	534	33	6.2
Under 1 day	87	55	63.2	102	29	28.4	166	16	9.6
1-27 days	131	51	38.9	167	7	4.2	368	17	4.6
Postneonatal	233	12	5.3	441	18	4.1	299	41	13.7
Deaths, 1-4 years	170	9	5.3	175	6	3.4	170	18	10.6
	LA PAZ AREA			MEDELLIN			MONTERREY		
Deaths under 5 years	1,982	261	13.2	692	35	5.1	2,321	110	4.7
Infant deaths	1,341	198	14.8	463	29	6.3	1,909	110	5.8
Neonatal	569	127	22.3	191	24	12.6	856	105	12.3
Under 1 day	150	64	42.7	73	9	12.3	360	97	26.9
1-27 days	419	63	15.0	118	15	12.7	496	8	1.6
Postneonatal	772	71	9.2	272	5	1.8	1,053	5	0.5
Deaths, 1-4 years	641	63	9.8	229	6	2.6	412	-	
	RECIFE			SAN JUAN PROVINCE			SAN SALVADOR AREA		
Deaths under 5 years	2,035	48	2.4	1,039	97	9.3	1,820	52	2.9
Infant deaths	1,500	34	2.3	988	96	9.7	1,304	40	3.1
Neonatal	564	11	2.0	410	82	20.1	455	22	4.8
Under 1 day	169	5	3.9	109	43	39.4	155	12	7.7
1-27 days	395	6	1.5	301	39	13.0	300	10	3.3
Postneonatal	936	23	2.5	478	14	2.9	849	18	2.1
Deaths, 1-4 years	535	14	2.6	151	1	0.7	516	12	2.3

In nearly all the projects high proportions of births occur in hospitals as shown by preliminary counts from the sample. In Recife, for instance, 76 per cent of the births in the first year occurred in hospitals and 24 per cent in homes. Later when analyses are completed of data from the sample and for the two years of deaths comparisons will assist in the interpretation of the completeness of these data on mortality. However, at this time the findings should be viewed by each principal collaborator in terms of possibilities of additional searches and completion of questionnaires for the deaths found in order that death rates in his final report may be as accurate and complete as possible.

The study of other data such as those on birth weights will contribute to measuring indirectly the problem of registration as well as leading to a better understanding of the differences in the role of factors influencing mortality in early life. The differences in the distribution of deaths by birth weight are so puzzling that much more needs to be known about reproduction, birth weight and mortality in early life. If registration of deaths is incomplete, registration of births will likewise be incomplete especially of births of low birth weight. Thus, even if data on live births were available in all of these areas, their completeness and quality need improvement.

The proportion of deaths in which home interviews were conducted varied widely in the projects and depended on the completeness and accuracy of the address given on the death certificate or hospital record. Also, the late discovery of unregistered deaths after the field work was thought to be completed, and several months after the death had occurred, resulted in serious handicaps for carrying out home interviews. This was especially true in projects of Cartagena, La Paz, Medellín and Monterrey.

Finally, the quality of information, especially the clinical data, depends on the place of birth and of death. The place of birth was usually obtained in the family interview. However, when the death occurred in the hospital soon after birth, the clinical records in the hospital provided the place of birth as well as the place of death. Data regarding the place of birth and the place of death are given in a later section of this report. Also, the source of medical data for the assignment of multiple causes is provided in the section on causes of mortality. Thus, throughout this report the quality of the basic information is considered in relation to the results of the Investigation.

III. MORTALITY IN CHILDREN UNDER 5 YEARS OF AGE

The 13 projects in Latin America vary widely not only in size, but also in social and cultural characteristics. Six projects are strictly of urban populations while seven have suburban and/or rural populations also. The presentation of the material on mortality in this report will be principally for the 13 central cities and for the suburban and rural areas whenever possible. Four of the suburban and rural areas are small and, thus, data for the two years are needed for detailed analyses. In this chapter, mortality by age group is considered first followed by mortality by causes. The section on causes of mortality treats separately infant and neonatal mortality and mortality in early childhood. Due to the importance of infectious diseases and nutritional deficiencies, individual sections are devoted to these subjects. For certain groups of causes, such as congenital anomalies and the infectious diseases, data for the cities and the other areas are combined for presentation. Likewise, neonatal mortality is analyzed for the 13 projects.

Mortality by Age Group

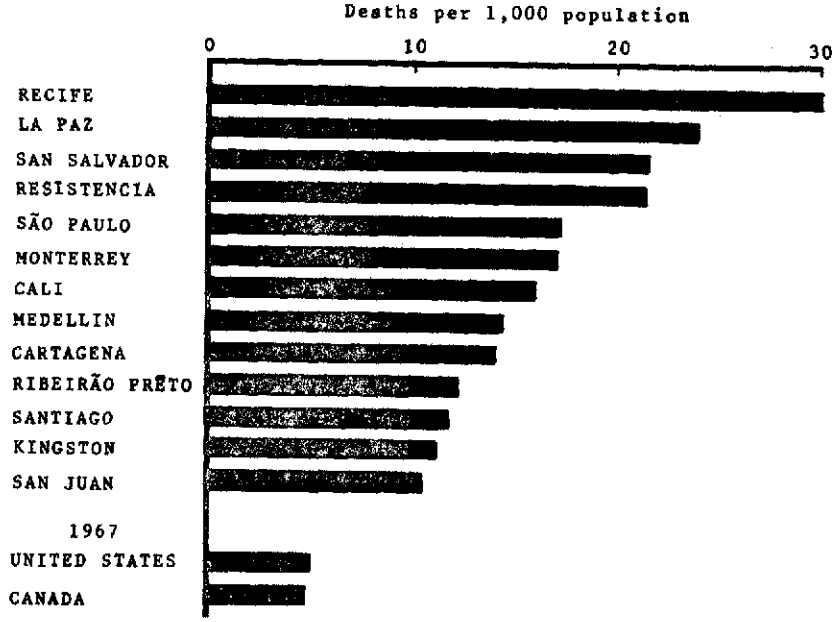
Death rates under 5 years of age for the projects are presented in Table 4 for an overall view of mortality in the central cities and in the suburban and rural areas and the rates in the 13 cities are shown in Figure 4.

Table 4. Deaths under 5 Years with Rates per 1,000 Population for 13 Projects with Subdivision into Central Cities and Other Areas, First Year of Investigation

Project	Number	Rate	Project	Number	Rate
Cali	964	15.8	Ribeirão Prêto Area	615	16.2
Cartagena	621	13.8	Ribeirão Prêto	251	12.0
			Franca	257	27.2
Chaco Province	885	23.1	Rural communities	107	13.8
Resistencia	452	21.4			
Rural	433	25.2	San Juan Province	1,039	20.5
			San Juan	133	10.3
Kingston Area	1,003	11.1	Suburban departments	360	21.1
Kingston	920	11.1	Rural departments	546	26.5
St. Andrew, rural	83	10.6			
			San Salvador Area	1,820	24.8
La Paz Area	1,982	24.3	San Salvador	1,334	21.4
La Paz	1,913	23.9	Rural communities	486	43.0
Viacha	69	40.6			
			Santiago Area	1,018	11.8
Medellín	692	14.3	Santiago	915	11.6
			Suburban communities	103	14.5
Monterrey	2,321	16.8			
			São Paulo	2,203	17.0
Recife	2,035	29.9			

Figure 4

MORTALITY UNDER 5 YEARS IN CENTRAL CITIES,
FIRST YEAR OF INVESTIGATION

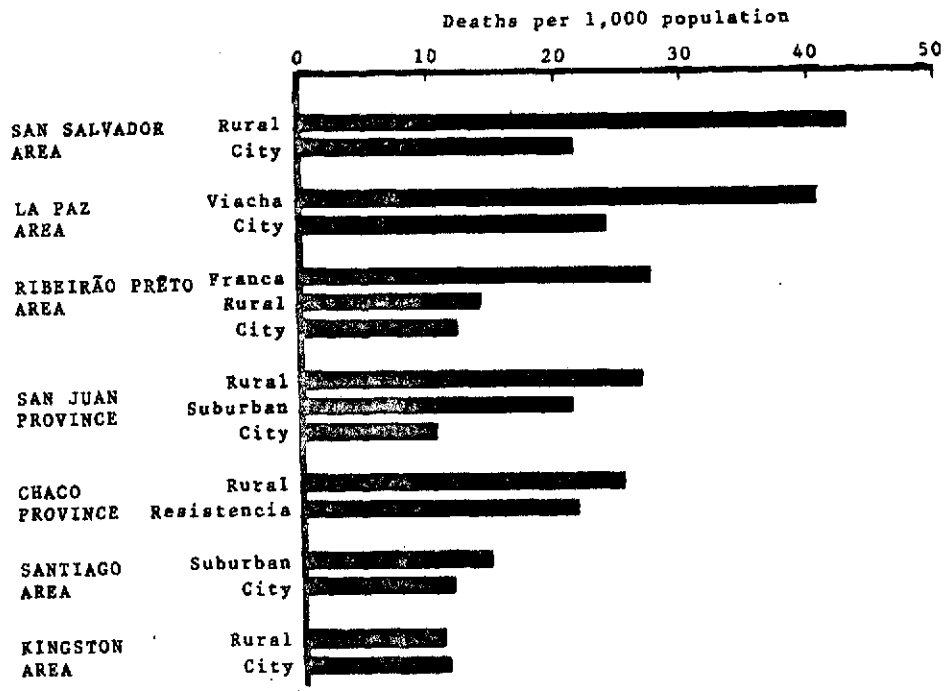


Four cities had high rates exceeding 20 deaths per 1,000 population (Recife, La Paz, San Salvador and Resistencia), four cities had relatively low rates of 10-12 (San Juan, Kingston, Santiago and Ribierão Prêto) and five had death rates of intermediate size. Even the lowest rates were more than double those in Canada and the United States (4.6 and 4.8 respectively) and thus, the factors responsible for these high rates, even in cities with medical facilities, require critical evaluation.

The suburban and rural areas included in this Investigation are in relatively close proximity to the central cities and thus, do not necessarily represent rural areas in the Americas. However, analysis of mortality in these areas serves to indicate the approximate size of problems and certain factors that have direct relationship to them. In Figure 5 the death rates under 5 years of age are shown for the suburban and rural areas of 7 projects with the rates for the corresponding cities also shown for comparison. The projects have been ranked according to the death rates in the rural areas. In San Salvador, the three rural communities near the city had a death rate of 43.0, which was over twice as high as that of the city of San Salvador, 21.4 per 1,000 population. Likewise, in the La Paz project, although the city had the high rate of 23.9 per 1,000 population, the small community of Viacha had a rate almost twice as high, 40.6. In the two areas of Chaco Province, however, the difference between the rate of 21.4 for the city of Resistencia and that for the rural departments of 25.2 was small. In the

Figure 5

MORTALITY UNDER 5 YEARS IN 7 PROJECTS WITH URBAN AND RURAL AREAS, FIRST YEAR OF INVESTIGATION



Ribierão Prêto project, the death rate for Franca, a community in the interior, was over twice as high as that for the city of Ribeirão Prêto. For the five rural communities near Ribeirão Prêto, the number of deaths was small and data for the two years will assist in evaluating the death rate. Only slight differences were noted in the two parts of the Kingston and Santiago projects, and in both instances data for two years will be preferable for consideration of differences. San Juan Province in Argentina has a large rural area as well as a large suburban area while the city is small. The city of San Juan has the lowest death rate of the central cities and the rate in the rural departments of San Juan Province is over twice that in the city.

The numbers of deaths with rates are given for the cities and for the other areas by age group in Table 5. Since four of the areas other than the central cities are small, analyses of the findings in these areas are limited in this report. The four are Viacha, the rural communities of Ribeirão Prêto, the suburban area of Santiago and rural St. Andrew. However, the five projects with larger rural and suburban areas are included in analyses and discussion which follow. In presentation of some of the material, the projects are treated as a whole.

Mortality in infancy (under 1 year of age) has been divided into the neonatal and postneonatal periods (Figures 6 and 7). Also, the death rate in the neonatal period is given for the first day of life and for the remainder of the neonatal period, 1-27 days. Although variations in neonatal death rates reflect to some extent the completeness of information, the postneonatal death rates indicate the size of health problems to be solved. The factors responsible for excessive postneonatal mortality will be clarified as material is analyzed and results presented.

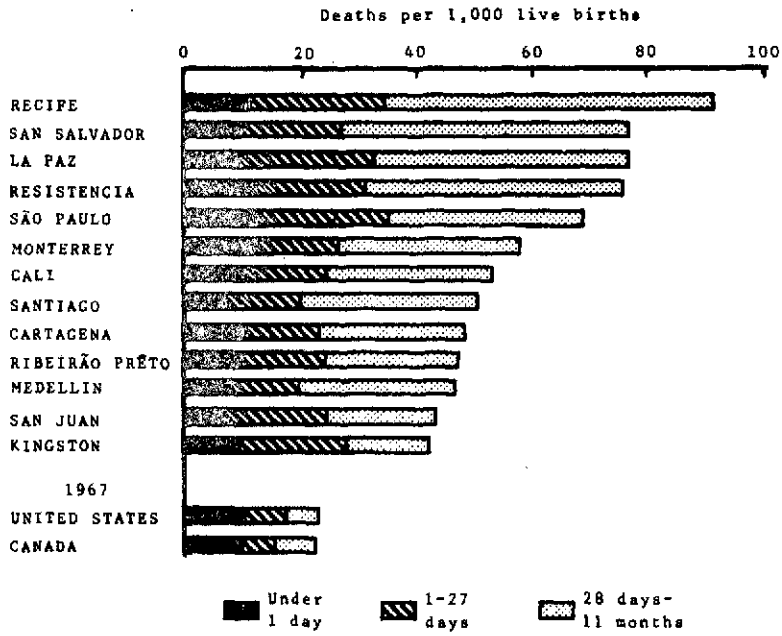
Table 5. Deaths and Death Rates* under 5 Years by Age Group in Central Cities and Other Areas, First Year of Investigation

Age group	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
	Cali		Cartagena		Kingston		La Paz		Medellín		Monterrey		Recife	
Deaths under 5 years	964	15.8	621	13.8	920	11.1	1,913	23.9	692	14.3	2,321	16.8	2,035	29.9
Infant deaths	659	53.1	451	48.0	776	41.9	1,297	76.3	463	46.3	1,909	57.7	1,500	91.5
Under 1 day	106	8.5	87	9.3	159	8.6	143	8.4	73	7.3	360	10.9	169	10.3
1-27 days	191	15.4	131	13.9	348	18.8	404	23.8	118	11.8	496	15.0	395	24.1
28 days-5 months	198	16.0	115	12.2	136	7.4	430	25.3	151	15.1	727	22.0	599	36.5
6-11 months	164	13.2	118	12.6	133	7.2	320	18.8	121	12.1	326	9.8	337	20.5
Deaths, 1-4 years	305	6.2	170	4.7	144	2.2	616	9.6	229	5.9	412	3.9	535	10.1
1 year	166	13.5	112	12.6	74	4.2	390	24.4	131	13.6	229	7.4	313	22.4
2-4 years	139	3.8	58	2.1	70	1.5	226	4.7	98	3.4	183	2.4	222	5.7
	Resistencia		Ribeirão Prêto		San Juan		San Salvador		Santiago		São Paulo			
Deaths under 5 years	452	21.4	251	12.0	133	10.3	1,334	21.4	915	11.6	2,203	17.0		
Infant deaths	380	76.0	211	46.9	122	42.7	1,020	76.7	798	50.5	1,917	69.0		
Under 1 day	58	11.6	41	9.1	17	5.9	125	9.4	98	6.2	320	11.5		
1-27 days	96	19.2	67	14.9	51	17.8	236	17.7	211	13.3	648	23.3		
28 days-5 months	153	30.6	73	16.2	45	15.7	411	30.9	380	24.0	720	25.9		
6-11 months	73	14.6	30	6.7	9	3.1	248	18.6	109	6.9	229	8.2		
Deaths, 1-4 years	72	4.4	40	2.4	11	1.1	314	6.3	117	1.8	286	2.8		
1 year	50	11.1	21	5.0	6	2.4	193	15.2	69	4.5	140	5.4		
2-4 years	22	1.8	19	1.5	5	0.7	121	3.3	48	1.0	146	1.9		
Other area	Chaco, rural		França		Ribeirão Prêto, rural		San Juan, suburban		San Juan, rural					
Deaths under 5 years	433	25.2	257	27.2	107	13.8	360	21.1	546	26.5				
Infant deaths	330	84.6	213	84.2	88	48.4	317	83.4	449	98.0				
Under 1 day	44	11.3	31	12.2	15	8.2	47	12.4	45	9.8				
1-27 days	71	18.2	85	33.6	30	16.5	106	27.9	144	31.4				
28 days-5 months	149	38.2	72	28.4	33	18.1	115	30.3	197	43.0				
6-11 months	66	16.9	25	9.9	10	5.5	49	12.9	63	13.8				
Deaths, 1-4 years	103	7.6	44	6.1	19	3.1	43	3.2	97	6.1				
1 year	65	19.1	20	10.0	8	5.0	28	8.2	58	14.5				
2-4 years	38	3.7	24	4.6	5	2.5	15	1.5	39	3.2				
	San Salvador rural		Santiago suburban		St. Andrew, rural		Viacha							
Deaths under 5 years	486	43.0	103	14.5	83	10.6	69	40.6						
Infant deaths	284	101.4	93	65.3	57	33.5	44	110.0						
Under 1 day	30	10.7	7	4.9	7	4.1	7	17.5						
1-27 days	64	22.9	21	14.7	20	11.8	15	37.5						
28 days-5 months	100	35.7	44	30.9	17	10.0	12	30.0						
6-11 months	90	32.1	21	14.7	13	7.6	10	25.0						
Deaths, 1-4 years	202	23.0	10	1.7	26	4.2	25	18.8						
1 year	104	43.3	6	4.1	12	7.5	19	59.4						
2-4 years	98	15.3	4	0.9	14	3.0	6	5.9						

*Rate per 1,000 live births for deaths under 1 year and per 1,000 population for other age groups.

Figure 6

INFANT MORTALITY BY AGE GROUP IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



The infant death rates in these 13 cities vary from 41.9 in Kingston and 42.7 in San Juan to 91.5 in Recife (Figure 6). Even the lower rates are excessive when compared with those in the United States and Canada which are shown for reference in Figure 6. Infant mortality was generally higher in the rural and suburban portions of the projects (Figure 7). An exception is noted in the Kingston project where the infant death rate was slightly lower in rural St. Andrew than in the city.

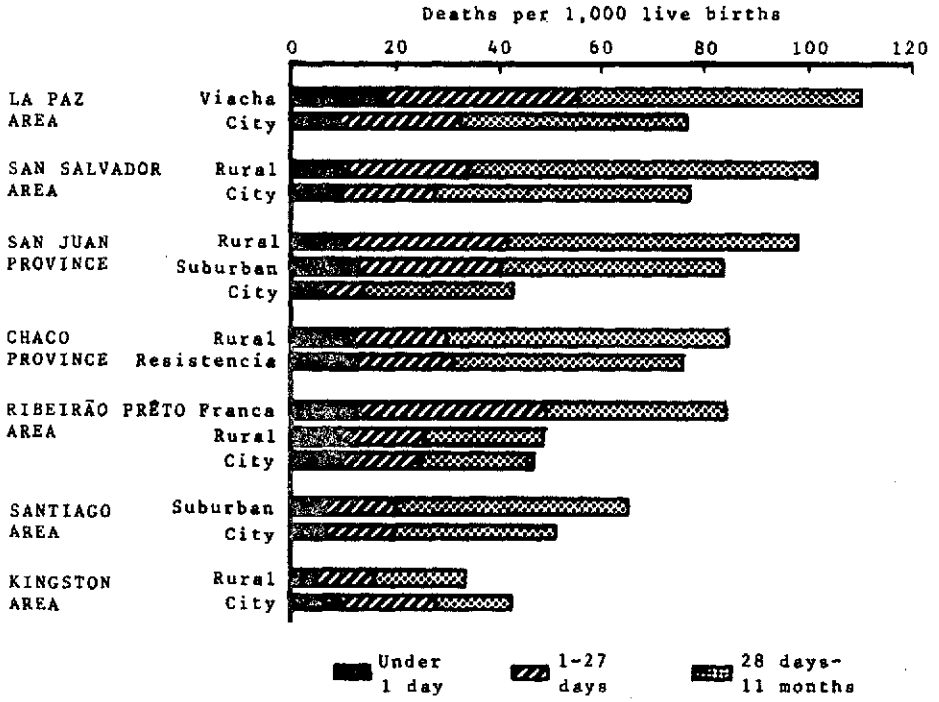
Although the standard being used for mortality in the first day of life is 10 deaths per 1,000 live births, in only four cities are the death rates as high as this standard; Monterrey, 10.9; Resistencia, 11.6; Recife 10.3; and São Paulo, 11.5. In three others, the rates nearly reached the standard; 9.3 in Cartagena, 9.1 in Ribeirão Prêto, and 9.4 in San Salvador. The lower rates in the other cities probably indicate some missing deaths; namely, 8.5 in Cali, 8.6 in Kingston, 7.3 in Medellín, 8.4 in La Paz, 5.9 in San Juan, and 6.2 in Santiago. At least, in these cities further search is advisable to prove or disprove the suitability of this standard.* Although the WHO definition of a live birth was to be followed in this Investigation, some obstetricians and midwives may not have been aware of the definition, and the information on hospital charts did not permit the distinction between a fetal death and a live birth. For example, a hospital in one of the cities had an unusually high fetal death rate and very few live births with

*It is expected that the death rate in the city of San Juan will be increased by the inclusion of the additional deaths already found there, and, thus, will meet the standard of 10 deaths per 1,000 live births in the first day of life.

low birth weights, while another hospital in the same city had a low fetal death rate and many live births with low birth weights. The principal collaborator reviewed the information in the first hospital and was able to identify several deaths, but usually the data were not sufficient for reclassification even if some of the fetal deaths were in fact live births and neonatal deaths.

Figure 7

INFANT MORTALITY BY AGE GROUP IN 7 PROJECTS WITH URBAN AND RURAL AREAS, FIRST YEAR OF INVESTIGATION



Another indicator used to evaluate completeness is a neonatal death rate of around 30 per 1,000 live births for areas with infant death rates of at least 50. Such a figure is in accordance with the relationship of neonatal and infant death rates in the United States when the latter were of the order of 50 per 1,000 live births. For infant death rates of 40-49, the neonatal death rate should probably be at least 25. However, as pointed out by Shapiro, et al,[4] it may be that some of the pregnancies that are destined to end in a neonatal or first-week death in the United States terminate in fetal deaths in other countries. On the basis of these assumptions, the five cities and four other areas which may have complete or nearly complete neonatal death rates are as follows:

Cities		Other areas	
Kingston	27.4	Franca	45.8
La Paz	32.2	San Juan, suburban	40.3
Recife	34.4	San Juan, rural	41.3
Resistencia	30.8	San Salvador, rural	33.6
São Paulo	34.8		

In the rural departments of Chaco Province, the neonatal death rate was 29.5 per 1,000 live births, indicating only a possible slight deficit. The four small rural and suburban areas are excluded from this discussion since the numbers of deaths may be low due to chance.

For eight cities in which the neonatal death rates were too low in accordance with these standards, the numbers of neonatal deaths and of deaths under 5 years of age expected and obtained are given in Table 6.

Table 6. Neonatal Deaths and Deaths Under 5 Years Expected* and Obtained in Selected Cities, First Year of Investigation

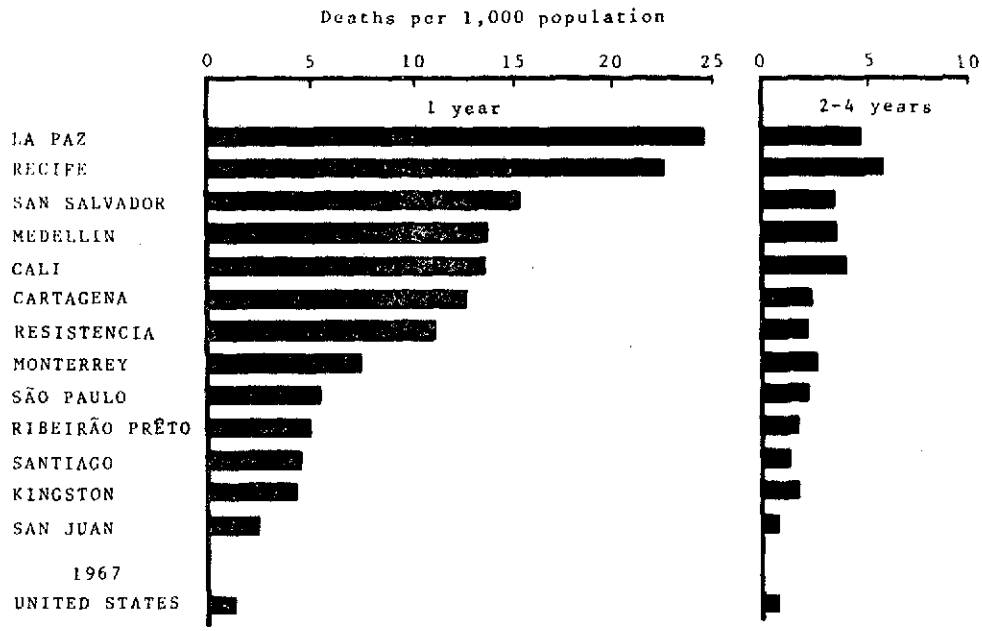
City	Neonatal deaths			Deaths under 5 years		
	Expected	Obtained		Expected	Obtained	
		Number	Per cent		Number	Per cent
Cali	372	297	79.8	1039	964	92.8
Cartagena	235	218	92.8	638	621	97.3
Medellín	250	191	76.4	751	692	92.1
Monterrey	993	856	86.2	2458	2321	94.4
Ribeirão Prêto	112	108	96.4	255	251	98.4
San Juan	72	68	94.4	137	133	97.1
San Salvador	399	361	90.5	1378	1334	96.8
Santiago	474	309	65.2	1080	915	84.7

*Based on 30 neonatal deaths expected per 1,000 live births in cities with infant death rates of 50 or over and 25 neonatal deaths per 1,000 live births in cities with infant death rates of less than 50.

Using the stated assumptions, deficits of 35 and 20 per cent are noted in the numbers of neonatal deaths in Santiago and Cali. However, based on all deaths under 5 years, the deficits are less than 10 per cent in all except Santiago. Since some of the numbers are small and variations due to chance are expected, the data for the two years are needed. In some areas,

Figure 8

MORTALITY OF CHILDREN 1 YEAR AND 2-4 YEARS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

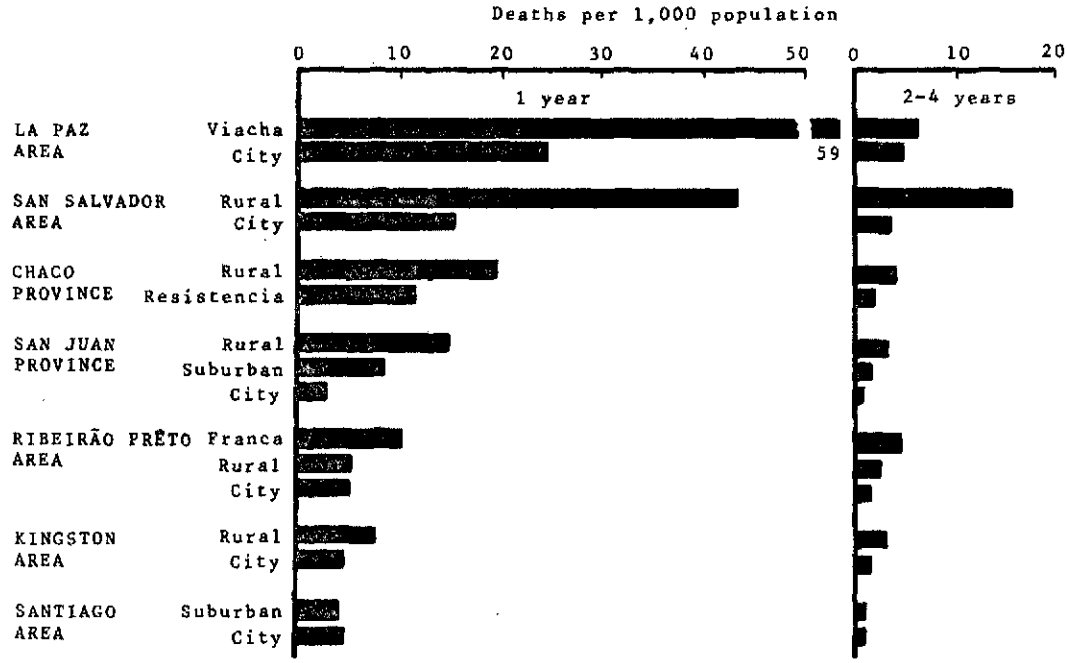


the procedures were revised during the Investigation and registration improved in the second year. However, searches are advisable at once to obtain additional deaths and to insure that the efforts are thorough in all areas. These are minimum standards and the neonatal death rates in excess of 30 per 1,000 live births in several areas indicate the probability that neonatal death rates in most of these areas would not be as low as 25 or 30 per 1,000 live births. Also, there may be deaths in other age groups which are not registered or not known. The bases for the calculation of these rates, the estimated numbers of live births, may be too high in certain areas. However, the data at this time serve to point out possible problems and indicate the need for searches locally in order to insure that the differences in neonatal death rates are real and not due to local procedures. The assessment of the completeness of data in the neonatal period is a challenging problem that warrants further study.

Although variations are evident in the neonatal death rates, they are much smaller than the variations in the postneonatal rates. For example, the postneonatal death rate in Recife of 57.0 per 1,000 live births is nearly four times the rate in Kingston and eight times that in the United States. Reduction in infant mortality will be effected principally in the postneonatal period and the important role of nutritional, environmental, and other factors will be clarified in the sections which follow.

Figure 9

MORTALITY OF CHILDREN 1 YEAR AND 2-4 YEARS IN URBAN AND RURAL AREAS OF 7 PROJECTS, FIRST YEAR OF INVESTIGATION



In the four-year age group, 1-4 years, in each area usually over half of the deaths were of children in the second year of life, that is, one year of age. The death rates for children one year of age and for those 2-4 years of age are shown for cities in Figure 8. For those one year of age, the variation in the cities is from 2.4 in San Juan to 24.4 per 1,000 population in La Paz, and for those 2-4 years from 0.7 in San Juan to 5.7 in Recife. Thus, death rates in early childhood continue to be high in La Paz and Recife and low in San Juan. However, of the deaths under 5 years in La Paz and Recife, 88 and 89 per cent, respectively, occurred in the first 2 years of life, and, thus, prevention of excessive mortality should be centered principally in infancy and the second year of life.

In the suburban and rural areas shown for seven projects in Figure 9, the death rate of children 1 year of age, that is, in the second year of life, was very high in rural areas of the projects of La Paz and San Salvador. The death rate in the small community of Viacha of 59.4 in the second year of life was exceedingly high and nearly two and one-half times the rate in La Paz. Also, in the San Salvador project, the rate of 43.4 per 1,000 population for the rural communities was nearly three times the rate of 15.2 in the city of San Salvador. In Chaco Province, Ribierão Prêto Area and San Juan Province, the rates in the rural areas were higher than in the central cities. The death rate was also relatively high in the rural communities near San Salvador in the 2-4 year age group.

The section on mortality by age group has indicated excessive mortality in infancy and in the second year of life in several cities and especially in rural areas of projects of La Paz and San Salvador. In the following sections the principal causes of these high death rates will be analyzed.

Mortality by Causes

Efforts have been made to obtain a complete record of the past history and fatal illness of the child, results of laboratory and other examinations and autopsy findings in order to determine the multiple causes of death. This approach is permitting the establishment of important interrelationships as well as a precise measurement of high risk conditions such as immaturity and nutritional deficiencies.

All pertinent information collected in the study of each death is considered in the assignment of causes of death. The starting point is selection of the underlying cause for which the international rules of selection and modification of the International Classification of Diseases[8] are followed. The associated causes are assigned next in accordance with rules and coding procedures developed in the Investigation and presented in a previous document.[9] The International Classification of Diseases is being used to classify the causes of death and the groupings and nomenclature used throughout this analysis are based on that official document.

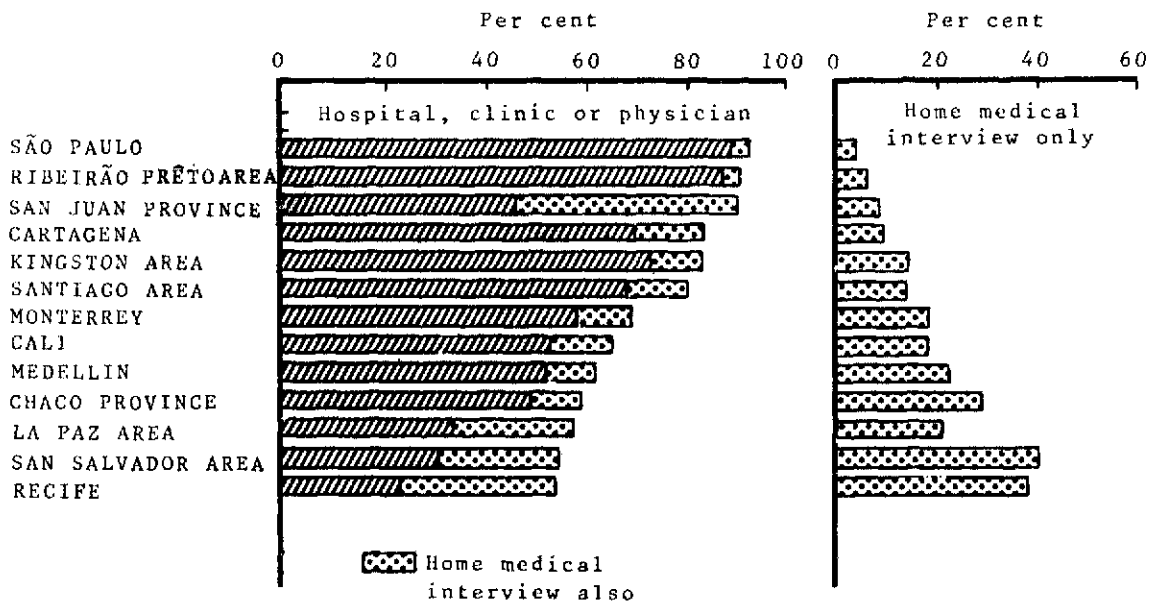
The various points discussed in the chapter on quality of data have obvious implications for knowledge of causes and for determining factors of death. The place of birth and of death, as well as the qualitative and quantitative aspects of the sources of information such as clinical and autopsy records, medical interviews and medical certification of causes of death, are decisive for accurate knowledge of the causes of death.

Table 7. Source of Medical Information for Deaths under 5 Years in 13 Projects, First Year of Investigation

Project	Total	Hospital, clinic or physician						Home medical interview only		No additional information	
		Total		With medical interview		Without medical interview					
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	964	630	65.4	116	12.0	514	53.3	170	17.6	164	17.0
Cartagena	621	522	84.1	86	13.8	436	70.2	57	9.2	42	6.8
Chaco Province	885	534	60.3	103	11.6	431	48.7	253	28.6	98	11.1
Kingston Area	1,003	836	83.4	106	10.6	730	72.8	139	13.9	28	2.8
La Paz Area	1,982	1,140	57.5	476	24.0	664	33.5	411	20.7	431	21.7
Medellín	692	431	62.3	68	9.8	363	52.5	152	22.0	109	15.8
Monterrey	2,321	1 630	70.2	270	11.6	1,360	58.6	416	17.9	275	11.8
Recife	2,035	1,108	54.4	646	31.7	462	22.7	772	37.9	155	7.6
Ribeirão Prêto Area	615	561	91.2	21	3.4	540	87.8	35	5.7	19	3.1
San Juan Province	1,039	942	90.7	466	44.9	476	45.8	88	8.5	9	0.9
San Salvador Area	1,820	1,005	55.2	439	24.1	566	31.1	736	40.4	79	4.3
Santiago Area	1,018	826	81.1	134	13.2	692	68.0	139	13.7	53	5.2
São Paulo	2,203	2,045	92.8	67	3.0	1,978	89.8	80	3.6	78	3.5

Figure 10

SOURCE OF MEDICAL INFORMATION FOR DEATHS UNDER 5 YEARS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



The medical interviewers obtained information from hospitals, clinics, private physicians and, if no medical attention was provided or if no satisfactory record was available, a visit was made to the family to obtain pertinent data leading to reconstruction of the medical history of the deceased child. Table 7 gives the number and percentage of deaths in which medical information was available in hospitals, clinics, private physicians' offices, and in medical interviews of the families and of those deaths in which the only source available was essentially the death certificate. Figure 10 shows in the left hand section the percentages in which hospitals, clinics, and physicians were the source of information. In São Paulo, 93 per cent of the deaths had medical information available from these sources including 3 per cent with medical interviews of families also. In San Juan Province, 91 per cent of the deaths had medical information with 45 per cent having medical interviews of the families also, the highest percentage to have medical information from the family as well as clinical information. The projects in Recife and San Salvador had the lowest percentages of deaths with clinical information, 54 and 55 per cent respectively . However, they had high percentages of deaths in which medical interviews were made in addition to hospital and clinic visits as well as the two highest percentages in which the only source of data was the medical interview (shown also in Figure 10). In rural San Salvador, 62 per cent of the deaths had family interviews by the physician as the only source of information. La Paz, Cali,and Medellín had the highest percentages of deaths in which the death certificate was the only source of data, 22, 17 and 16 per cent respectively.

In the planning phase as well as during the Investigation, emphasis was placed on the great value of pediatric pathology and autopsies. The quality and quantity of these improved markedly during development of the study in several projects. In fact, in San Juan Province, Argentina, the increase was from 23 autopsies in the first 6 months to 146 in the second six months, that is, from 4 per cent to 32 per cent of the deaths. Table 8 gives the number and percentage of deaths with autopsies for the 13 projects. The percentages vary from 3 in Monterrey and the La Paz Area to 47 in the Kingston Area. In the city of Ribeirão Prêto, 46 per cent of the deaths had autopsies. However, this percentage is reduced to 22 when the whole project is considered (Appendix Table VIII). The percentages of deaths with autopsies are shown in Figure 11.

Table 8. Frequency of Autopsies of Deaths Under 5 Years in 13 Projects, First Year of Investigation

Project	Deaths	With autopsies	
		Number	Per cent
Cali	964	100	10.4
Cartagena	621	186	30.0
Chaco Province	885	90	10.2
Kingston Area	1,003	475	47.4
La Paz Area	1,982	61	3.1
Medellín	692	50	7.2
Monterrey	2,321	65	2.8
Recife	2,035	566	27.8
Ribeirão Prêto Area	615	136	22.1
San Juan Province	1,039	169	16.3
San Salvador Area	1,820	95	5.2
Santiago Area	1,018	184	18.1
São Paulo	2,203	434	19.7

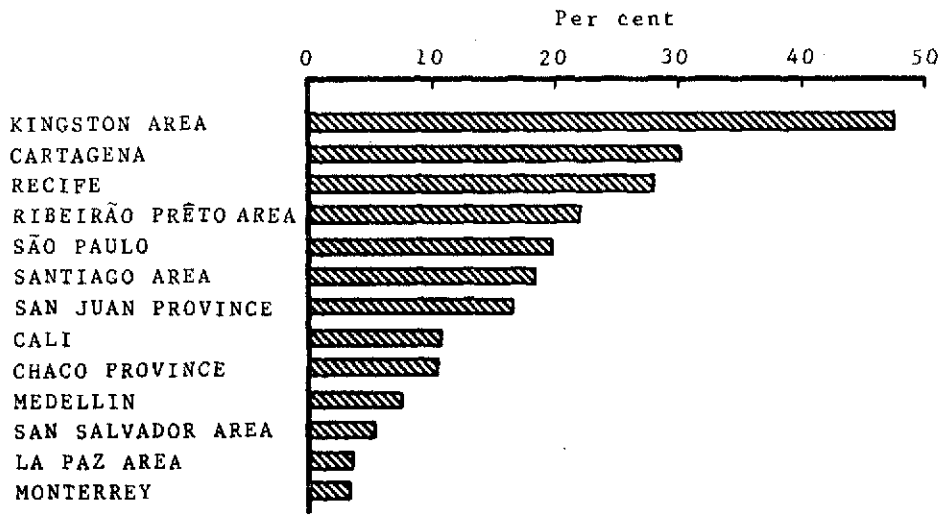
Since the number of autopsies increased during the Investigation, the contribution of pathology findings will be greater in the second than in the first year. Also, in the second year a working group on pediatric pathology was held in order to standardize procedures as well as to plan for developments for improvement and extension of pediatric pathology in Latin America.

The quality and quantity of clinical and autopsy data affect to an important extent the accuracy of certain diagnoses, such as some of the internal congenital anomalies. Such limitations have to be taken into account when specific rates are compared. However, the completeness and quality of the data which follow are undoubtedly far more reliable than would be obtained from routine, official sources of information.

Appendix Table I gives the numbers of underlying and associated causes of deaths for five age groups for the 13 central cities and 9 other areas in these 13 Latin American projects. For presentation of the material in this report, the underlying and associated causes are considered first within age groups and then certain specific causes of importance are discussed.

Figure 11

FREQUENCY OF AUTOPSIES OF DEATHS UNDER 5 YEARS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Infant Mortality

The underlying and also the associated causes of death are being analyzed in order to understand the interrelationships of diseases and conditions responsible for deaths. Appendix Table II provides data for underlying and associated causes of infant deaths with rates per 1,000 live births. In Table 9 and Figures 12 and 13, causes are given in broad groups to indicate the problems and the geographic variations in infant mortality. Figure 12 gives the underlying and associated causes in six broad groups for nine cities, and Figure 13 gives similar data for urban and rural areas of four projects. For four other areas, i.e., suburban communities near Santiago, rural St. Andrew, rural communities near Ribeirão Prêto, and Viacha, less than 100 infant deaths were recorded, and, thus, subdivision by cause is not justified for the first year.

The underlying causes of infant mortality in broad groups are considered first. Certain causes of perinatal mortality (760-778) as the underlying cause accounted for 13-27 deaths per 1,000 live births in these areas. The variation in mortality from these causes which are present at birth or result from maternal conditions and, therefore, act mainly in the neonatal period is less than that observed in death rates from causes influenced by the environment

Table 9. Underlying and Associated Causes of Infant Deaths in Broad Groups with Rates per 1,000 Live Births in Central Cities and Other Areas*, First Year of Investigation

Central city and other area and type of cause	All causes		Infectious diseases		Nutritional deficiency		Respiratory diseases		Certain perinatal causes				Other causes	
									Immaturity		Other			
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali														
Underlying	659	53.1	261	21.0	37	3.0	86	6.9	7	0.6	194	15.6	74	6.0
Associated	1055	85.1	139	11.2	148	11.9	191	15.4	171	13.8	164	13.2	242	19.5
Cartagena														
Underlying	451	48.0	162	17.2	29	3.1	48	5.1	11	1.2	137	14.6	64	6.8
Associated	833	88.6	132	14.0	108	11.5	120	12.8	128	13.6	112	11.9	233	24.8
Chaco, Resistencia														
Underlying	380	76.0	164	32.8	11	2.2	46	9.2	12	2.4	101	20.2	46	9.2
Associated	505	101.0	44	8.8	135	27.0	74	14.8	83	16.6	42	8.4	127	25.4
Chaco, rural														
Underlying	330	84.6	144	36.9	5	1.3	68	17.4	13	3.3	49	12.6	51	13.1
Associated	302	77.4	35	9.0	98	25.1	38	9.7	39	10.0	21	5.4	71	18.2
Kingston														
Underlying	776	41.9	211	11.4	12	0.6	59	3.2	23	1.2	329	17.8	142	7.7
Associated	1324	71.6	157	8.5	92	5.0	117	6.3	360	19.5	310	16.8	288	15.6
La Paz														
Underlying	1297	76.3	391	23.0	26	1.5	452	26.6	22	1.3	270	15.9	136	8.0
Associated	1423	83.7	108	6.4	309	18.2	292	17.2	243	14.3	168	9.9	303	17.8
Medellín														
Underlying	463	46.3	176	17.6	15	1.5	50	5.0	4	0.4	137	13.7	81	8.1
Associated	830	83.0	91	9.1	140	14.0	123	12.3	124	12.4	144	14.4	208	20.8
Monterrey														
Underlying	1909	57.7	757	22.9	31	0.9	311	9.4	40	1.2	468	14.1	302	9.1
Associated	3476	105.0	432	13.1	540	16.3	551	16.6	411	12.4	489	14.8	1053	31.8
Recife														
Underlying	1500	91.5	745	45.4	31	1.9	192	11.7	32	2.0	345	21.0	155	9.5
Associated	2932	178.8	457	27.9	577	35.2	529	32.3	356	21.7	247	15.1	766	46.7
Ribeirão Prêto, city														
Underlying	211	46.9	82	18.2	1	0.2	22	4.9	1	0.2	77	17.1	28	6.2
Associated	443	98.4	35	7.8	70	15.6	75	16.7	78	17.3	58	12.9	127	28.2
Ribeirão Prêto, Franca														
Underlying	213	84.2	86	34.0	8	3.2	22	8.7	-		69	27.3	28	11.1
Associated	391	154.5	27	10.7	53	20.9	37	14.6	77	30.4	66	26.1	131	51.8
San Juan, city														
Underlying	122	42.7	37	12.9	2	0.7	16	5.6	1	0.3	50	17.5	16	5.6
Associated	268	93.7	43	15.0	23	8.0	32	11.2	40	14.0	65	22.7	65	22.7
San Juan, suburban														
Underlying	317	83.4	96	25.3	17	4.5	58	15.3	1	0.3	103	27.1	42	11.1
Associated	692	182.1	106	27.9	73	19.2	94	24.7	96	25.3	122	32.1	201	52.9
San Juan, rural														
Underlying	449	98.0	159	34.7	26	5.7	100	21.8	3	0.7	115	25.1	46	10.0
Associated	885	193.2	139	30.3	113	24.7	127	27.7	119	26.0	121	26.4	266	58.1
San Salvador, city														
Underlying	1020	76.7	517	38.9	20	1.5	153	11.5	2	0.2	222	16.7	106	8.0
Associated	1765	132.7	192	14.4	250	18.8	294	22.1	231	17.4	187	14.1	611	45.9
San Salvador, rural														
Underlying	284	101.4	169	60.4	9	3.2	38	13.6	1	0.4	40	14.3	27	9.6
Associated	406	145.0	64	22.9	79	28.2	68	24.3	33	11.8	21	7.5	141	50.4
Santiago, city														
Underlying	798	50.5	202	12.8	28	1.8	202	12.8	1	0.1	207	13.1	158	10.0
Associated	1453	92.0	194	12.3	203	12.8	220	13.9	193	12.2	252	15.9	391	24.7
São Paulo														
Underlying	1917	69.0	673	24.2	44	1.6	337	12.1	30	1.1	516	18.6	317	11.4
Associated	3818	137.3	535	19.2	516	18.6	506	18.2	560	20.1	473	17.0	1228	44.2

*Excluding 4 areas with insufficient deaths for analysis at this time.

which are more important in the postneonatal period. The death rates from these perinatal causes may be seriously affected by registration practices and the failure to include deaths of infants of low birth weight. The perinatal causes will be analyzed in greater detail in a section devoted to neonatal mortality.

Figure 12

UNDERLYING AND ASSOCIATED CAUSES OF INFANT DEATHS BY BROAD GROUPS IN 9 CITIES, FIRST YEAR OF INVESTIGATION

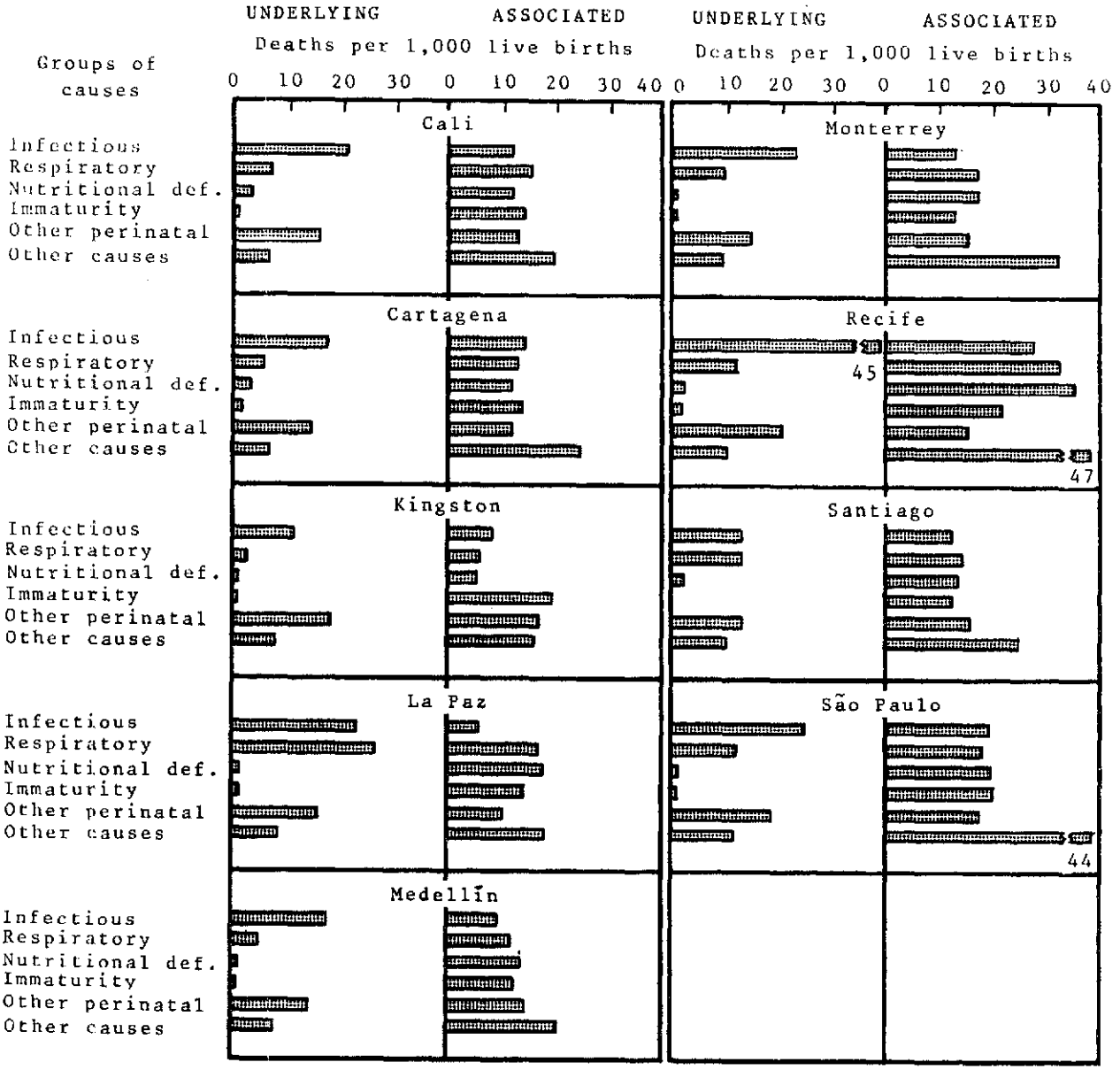
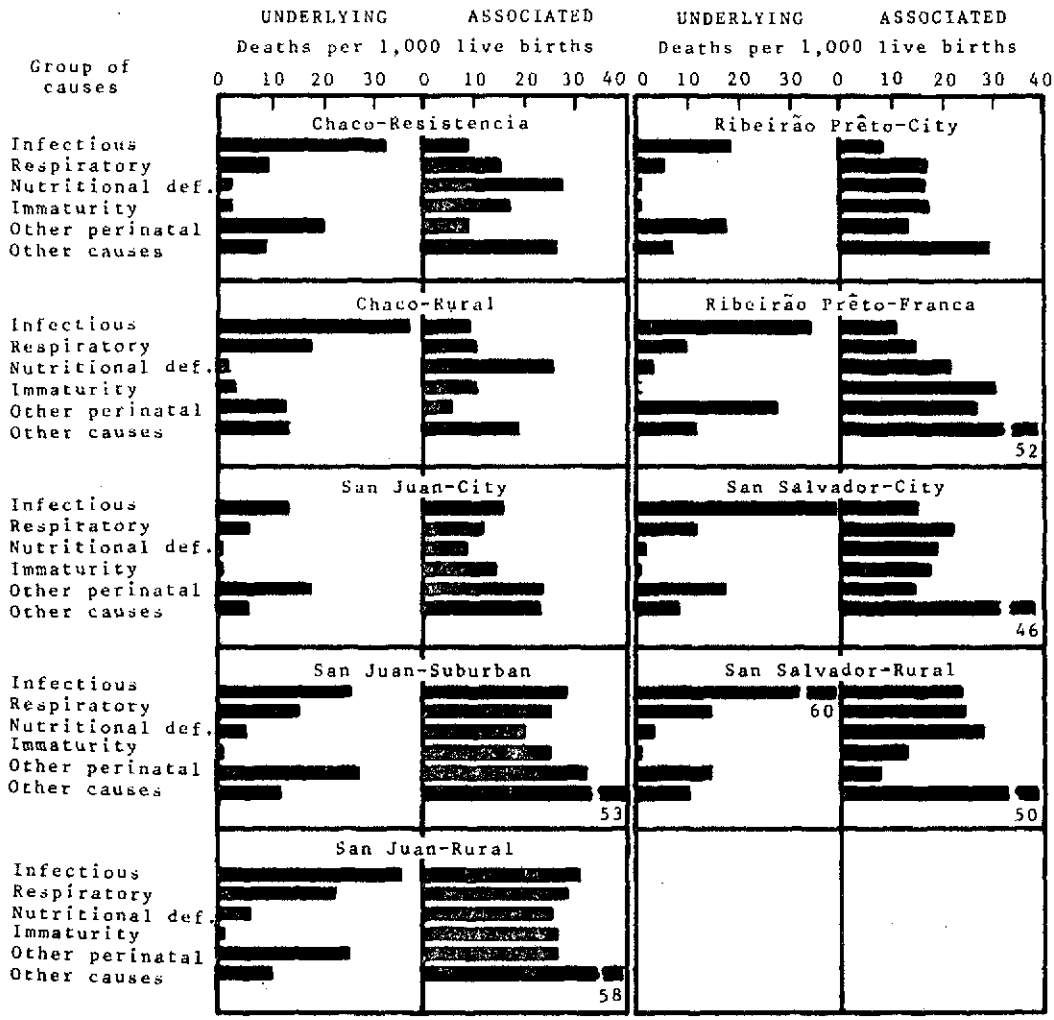


Figure 13

UNDERLYING AND ASSOCIATED CAUSES OF INFANT DEATHS BY BROAD GROUPS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



The infective and parasitic diseases constitute another important group of causes of infant deaths. Since at this age this group is composed almost entirely of infectious diseases, it is so designated in this section. The death rate from this group varied from the low rate of 11.4 per 1,000 live births in Kingston, to the high rates of 45.4 in Recife and 60.4 in the rural communities of San Salvador. In these rural communities, 60 per cent of the infant deaths were in this group and in Recife, one-half of the infant deaths were attributed to infectious diseases.

The third important group was diseases of the respiratory system with relatively high rates in the city of La Paz and in the rural areas of Chaco and San Juan Provinces.

The associated as well as the underlying causes of death contribute to our knowledge of factors responsible for excessive mortality. The associated causes of death have a markedly different distribution than the underlying causes (as shown in Table 9 and Figures 12 and 13). According to the rules of the International Classification, immaturity as an underlying cause is "not to be used if any other cause of perinatal mortality is reported." Thus, usually, immaturity is coded as an associated cause of death. The sum of deaths due to immaturity as an underlying or associated cause gives the total deaths in which immaturity contributed directly or indirectly to mortality. In Recife, for example, immaturity was assigned as a cause for 388 deaths which gave a rate of 23.7 per 1,000 live births.

Another important cause responsible directly or indirectly for high infant death rates in developing countries is nutritional deficiency. The role of this cause in mortality has not been revealed in the past, principally because infectious diseases are usually assigned as underlying causes and also because in the previous Revision of the International Classification of Diseases,[10] deaths attributed to nutritional deficiency were coded in two sections. Often in the 1955 Revision of the Classification they were coded to the category of nutritional maladjustment (772) in the group of Other Diseases Peculiar to Early Infancy. Some deaths would have been coded in the section for Avitaminoses and Other Metabolic Diseases.

In the 1965 Revision of the Classification in use at the present time, nutritional deficiencies are brought together in one group entitled Avitaminoses and Other Nutritional Deficiency (260-269). Since deaths are rarely due to a specific avitaminosis in developing countries, in the reports of the Investigation the term nutritional deficiency is used for this group. In this report, thus, the term nutritional deficiency is essentially equivalent to the group of conditions referred to as protein-calorie malnutrition.

As with immaturity, nutritional deficiency is usually assigned as an associated cause. For example, in the city of San Salvador, nutritional deficiency was assigned as the underlying cause of 20 infant deaths and as associated cause of 250 deaths. As can be observed in Figures 12 and 13, nutritional deficiencies and immaturity appear as important associated causes and not as underlying causes of death. This is in marked contrast to the infections and to the other causes of perinatal mortality. Likewise, the death rates from diseases of the respiratory system are usually higher as associated than as underlying causes. Thus, the real magnitude of these health problems is measured by the use of the multiple causes approach.

Both immaturity and nutritional deficiency indicate a deficiency in weight and development of a child. If immaturity, 777, is assigned, a code for nutritional deficiency is not needed to describe the deficiency state of the child. In areas where birth weights are not obtained and clinical data are incomplete, the distinction between an immature baby and one with nutritional deficiency is difficult. Such deaths would be assigned to a nutritional deficiency category. Thus, the rules of the Investigation have been established to eliminate duplication and permit addition of these causes to

show their direct or indirect role in mortality. Table 10 gives the numbers of deaths with rates from these two causes, separately and combined. Also, the rates are shown in Figures 14 and 15.

Table 10. Immaturity and Nutritional Deficiency as Associated Causes of Infant Deaths with Rates per 1,000 Live Births in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total infant deaths		Underlying or associated cause					
			Immaturity or nutritional deficiency		Immaturity		Nutritional deficiency	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	659	53.1	363	29.3	178	14.4	185	14.9
Cartagena	451	48.0	276	29.4	139	14.8	137	14.6
Kingston	776	41.9	487	26.3	383	20.7	104	5.6
La Paz	1297	76.3	600	35.3	265	15.6	335	19.7
Medellín	463	46.3	283	28.3	128	12.8	155	15.5
Monterrey	1909	57.7	1022	30.9	451	13.6	571	17.3
Recife	1500	91.5	996	60.7	388	23.7	608	37.1
Resistencia	380	76.0	241	48.2	95	19.0	146	29.2
Ribeirão Prêto	211	46.9	150	33.3	79	17.6	71	15.8
San Juan	122	42.7	66	23.1	41	14.3	25	8.7
San Salvador	1020	76.7	503	37.8	233	17.5	270	20.3
Santiago	798	50.5	424	26.8	194	12.3	230	14.6
São Paulo	1917	69.0	1149	41.3	590	21.2	559	20.1
Other area*								
Chaco, rural	330	84.6	155	39.7	52	13.3	103	26.4
Franca	213	84.2	138	54.5	77	30.4	61	24.1
San Juan, suburban	317	83.4	187	49.2	97	25.5	90	23.7
San Juan, rural	449	98.0	261	57.0	122	26.6	139	30.3
San Salvador, rural	284	101.4	122	43.6	34	12.1	88	31.4

*Excluding 4 areas with insufficient deaths for analysis.

In the areas with high infant death rates such as Recife, rural San Salvador, and rural San Juan, the death rates from nutritional deficiency are high and account for a sizeable portion of the total death rate. The variation in the death rates from nutritional deficiency from 5.6 in Kingston to 37.1 in Recife is greater than the variation in the rates due to immaturity as an underlying or associated cause, from 12.1 in rural communities of San Salvador to 30.4 per 1,000 live births in Franca. Although the underlying cause of many of these deaths may be diarrheal disease or other infectious disease, preventive actions against these contributory causes may be as important or even more important than those directed toward the underlying cause. These immature and nutritionally deficient infants are highly susceptible to environmental hazards, mainly to infectious diseases. A significant reduction of infant mortality would thus require both the reduction of deaths in the highly vulnerable groups, immaturity and nutritional deficiency, as well as an efficient control of infective and parasitic diseases. The interrelationship of these causes will be presented in a later section.

Figure 14

INFANT MORTALITY WITH IMMATURITY AND NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSES IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

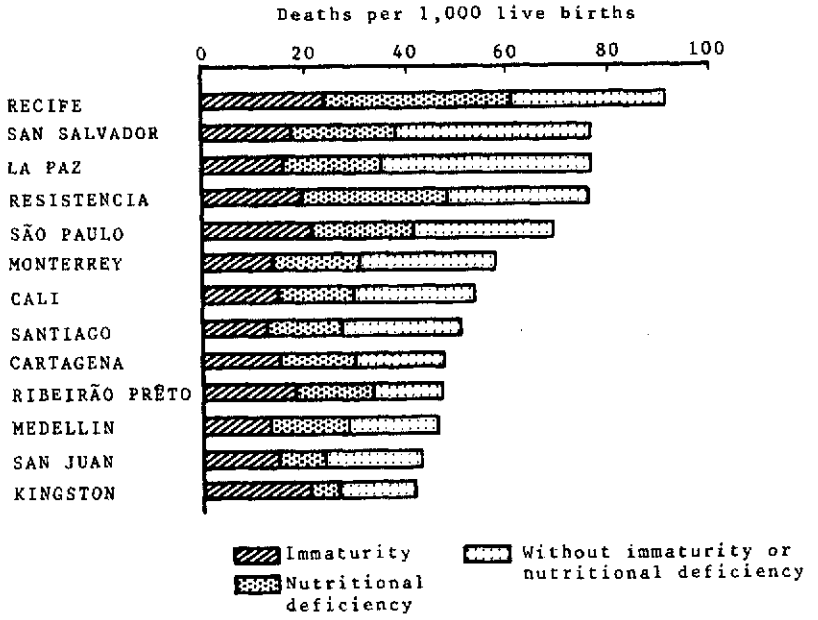
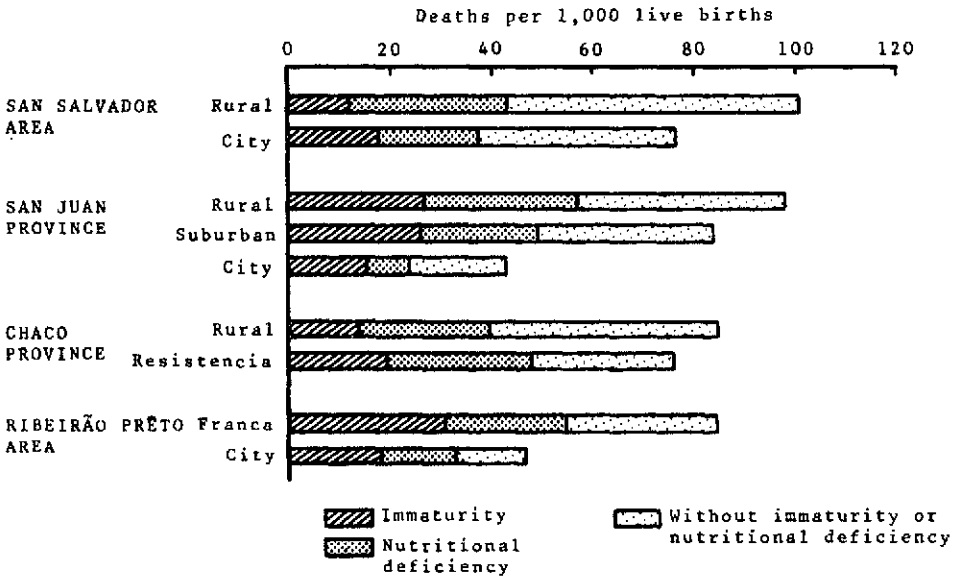


Figure 15

INFANT MORTALITY WITH IMMATURITY AND NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSES IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



The underlying causes of neonatal and postneonatal mortality differ markedly as given in Table 11. The postneonatal death rates were higher than the neonatal rates in all of the cities except Kingston, San Juan and Ribeirão Prêto, which had the lowest infant death rates. The death rates from infectious diseases in the neonatal and postneonatal periods are shown in Figures 16 and 17. Diarrheal disease, which is shown in the figures, constitutes a high proportion of the deaths from infectious diseases in both age groups.

Table 11. Underlying Causes of Neonatal and Postneonatal Deaths with Rates per 1,000 Live Births in Central Cities and Other Areas*, First Year of Investigation

Underlying cause	Neonatal		Post-neonatal		Neonatal		Post-neonatal		Neonatal		Post-neonatal		Neonatal		Post-neonatal		Neonatal		Post-neonatal	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
	Cali				Cartagena				Chaco-Resistencia				Chaco-Rural				Kingston			
All causes	297	24.0	362	29.2	218	23.2	233	24.8	154	30.8	226	45.2	115	29.5	215	55.1	507	27.4	269	14.5
Infective and parasitic diseases...000-136	40	3.2	221	17.8	35	3.7	127	13.5	19	3.8	145	29.0	21	5.4	123	31.5	74	4.0	137	7.4
Diarrheal disease.....009	19	1.5	192	15.5	12	1.3	96	10.2	12	2.4	125	25.0	8	2.1	102	26.2	30	1.6	121	6.5
Measles.....055	-		9	0.7	-		4	0.4	-		9	1.8	-		11	2.8	-		2	0.1
Other.....Rest of 000-136	21	1.7	20	1.6	23	2.4	27	2.9	7	1.4	11	2.2	13	3.3	2	0.5	44	2.4	14	0.8
Nutritional deficiency.....260-269	-		37	3.0	-		29	3.1	-		11	2.2	-		5	1.3	-		12	0.6
Diseases of respiratory system.....460-519	27	2.2	59	4.8	9	1.0	39	4.1	8	1.6	38	7.6	13	3.3	55	14.1	19	1.0	40	2.2
Congenital anomalies.....740-759	17	1.4	12	1.0	13	1.4	13	1.4	6	1.2	10	2.0	6	1.5	2	0.5	38	2.1	30	1.6
Certain perinatal causes.....760-778	199	16.0	2	0.2	148	15.7	-		113	22.6	-		61	15.6	1	0.3	349	18.9	3	0.2
All other causes.....	14	1.1	31	2.5	13	1.4	25	2.7	7	1.4	22	4.4	14	3.6	29	7.4	27	1.5	47	2.5
	La Paz				Medellín				Monterrey				Recife				Ribeirão Prêto-City			
All causes.....	547	32.2	750	44.1	191	19.1	272	27.2	856	25.9	1053	31.8	564	34.4	936	57.1	108	24.0	103	22.9
Infective and parasitic diseases...000-136	60	3.5	331	19.5	20	2.0	156	15.6	139	4.2	618	18.7	95	5.8	650	39.6	15	3.3	67	14.9
Diarrheal disease.....009	43	2.5	223	13.1	12	1.2	136	13.6	76	2.3	441	13.3	75	4.6	500	30.5	11	2.4	40	8.9
Measles.....055	-		66	3.9	-		5	0.5	-	-	57	1.7	-		100	6.1	-		8	1.8
Other.....Rest of 000-136	17	1.0	42	2.5	8	0.8	15	1.5	63	1.9	120	3.6	20	1.2	50	3.0	4	0.9	19	4.0
Nutritional deficiency.....260-269	-		26	1.5	-		15	1.5	1	0.0	30	0.9	-		31	1.9	-		1	0.2
Diseases of respiratory system.....460-519	150	8.8	312	18.4	7	0.7	43	4.3	86	2.6	225	6.8	37	2.3	155	9.5	5	1.1	10	2.2
Congenital anomalies.....740-759	11	0.6	11	0.6	15	1.5	21	2.1	68	2.1	64	1.9	28	1.7	19	1.2	7	1.6	5	1.1
Certain perinatal causes.....760-778	288	16.9	4	0.2	140	14.0	1	0.1	502	15.2	6	0.2	375	22.9	2	0.1	78	17.3	-	
All other causes.....	38	2.2	76	4.5	9	0.9	36	3.6	60	1.8	110	3.3	29	1.8	110	6.7	3	0.7	20	4.4
	Ribeirão Prêto-Franca				San Juan-City				San Juan-Suburban				San Juan-Rural				San Salvador-City			
All causes.....	116	45.8	97	38.3	68	23.8	54	18.9	153	40.3	164	43.2	189	41.3	260	56.8	361	27.1	659	49.5
Infective and parasitic diseases...000-136	29	11.5	57	22.5	12	4.2	25	8.7	23	6.1	73	19.2	38	8.3	121	26.4	81	6.1	436	32.8
Diarrheal disease.....009	28	11.1	52	20.6	8	2.8	17	5.9	19	5.0	47	12.4	31	6.8	95	20.7	44	3.3	370	27.8
Measles.....055	-		1	0.4	-		3	1.0	-		13	3.4	-		15	3.3	1	0.1	33	2.5
Other.....Rest of 000-136	1	0.4	4	1.6	4	1.4	4	1.4	4	1.1	13	3.4	7	1.5	11	2.4	36	2.7	33	2.5
Nutritional deficiency.....260-269	-		8	3.2	-		2	0.7	-		17	4.5	2	0.4	24	5.4	-		20	1.5
Diseases of respiratory system.....460-519	7	2.8	15	5.9	4	1.4	12	4.2	10	2.6	48	12.6	22	4.8	77	16.8	22	1.7	131	9.8
Congenital anomalies.....740-759	6	2.4	4	1.6	1	0.3	4	1.4	10	2.6	4	1.1	4	0.9	8	1.7	22	1.7	25	1.9
Certain perinatal causes.....760-778	69	27.3	-		50	17.5	1	0.3	104	27.4	-		118	25.8	-		222	16.7	2	0.2
All other causes.....	5	2.0	13	5.1	1	0.3	10	3.5	6	1.6	22	5.8	5	1.1	30	6.6	14	1.1	45	3.4
	San Salvador-Rural				Santiago				São Paulo											
All causes.....	94	33.6	190	67.9	309	19.6	489	30.9	968	34.8	949	34.1								
Infective and parasitic diseases...000-136	31	11.1	138	49.3	28	1.8	174	11.0	214	7.7	459	16.5								
Diarrheal disease.....009	12	4.3	115	41.1	12	0.8	154	9.7	171	6.2	375	13.5								
Measles.....055	-		11	3.9	-		4	0.3	-		25	0.9								
Other.....Rest of 000-136	29	10.4	12	4.3	16	1.0	16	1.0	43	1.5	59	2.1								
Nutritional deficiency.....260-269	-		9	3.2	-		28	1.8	2	0.1	42	1.5								
Diseases of respiratory system.....460-519	10	3.6	28	10.0	31	2.0	171	10.8	114	4.1	223	8.0								
Congenital anomalies.....740-759	7	2.5	6	2.1	25	1.6	37	2.3	55	2.0	50	1.8								
Certain perinatal causes.....760-778	41	14.6	-		206	13.0	2	0.1	536	19.3	10	0.4								
All other causes.....	5	1.8	9	3.2	19	1.2	77	4.9	47	1.7	165	5.9								

*Excluding 4 areas with insufficient deaths for analysis.

The differences in death rates from these causes are great, especially in the postneonatal period, varying in the cities from 7.4 per 1,000 live births in Kingston to 39.6 in Recife and 49.3 in the rural communities of San Salvador. The causes of neonatal mortality will be considered separately in the following section.

Figure 16

NEONATAL AND POSTNEONATAL MORTALITY DUE TO INFECTIOUS DISEASES AS UNDERLYING CAUSE IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

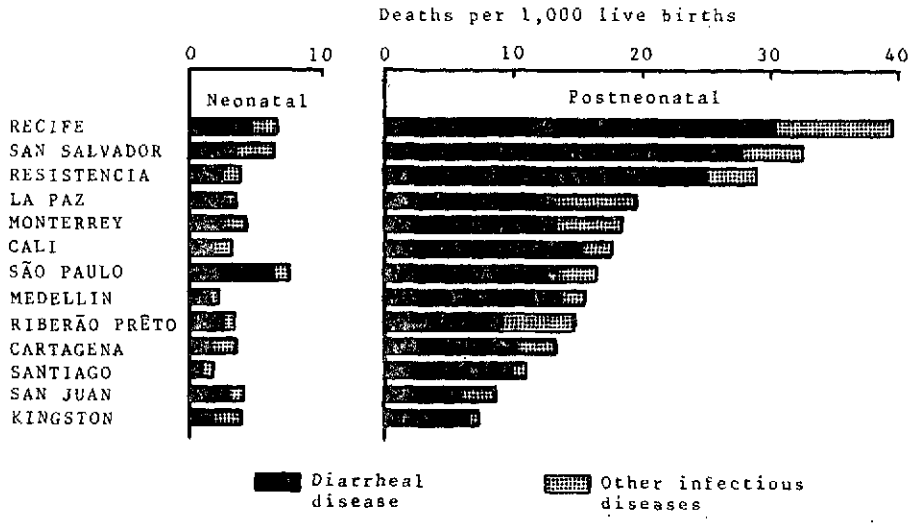
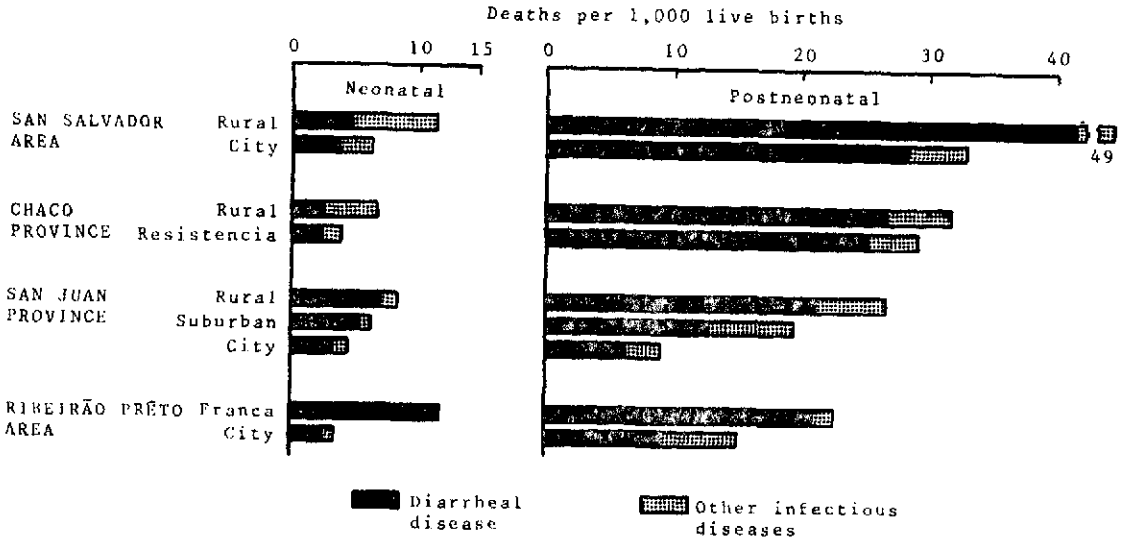


Figure 17

NEONATAL AND POSTNEONATAL MORTALITY DUE TO INFECTIOUS DISEASES AS UNDERLYING CAUSE IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Neonatal Mortality

Neonatal deaths are those occurring within the first 28 days of life. The context of neonatal mortality is very complex since it involves the action of multiple factors that may go back into pregnancy and even earlier, and also because such factors have health implications that go beyond the neonatal period, often throughout a lifetime.

The health status of the mother prior to and during pregnancy as well as the risks of labor and delivery are important determining factors in the health condition of the product of conception. Despite the fact that normality is the rule in the course of pregnancy and delivery, the opportunities for health hazards are numerous and varied in nature. The intricate interrelationships between maternal health and the state of health of the child

Table 12. Underlying Causes of Neonatal Deaths with Rates per 1,000 Live Births for Two Age Groups in 13 Projects, First Year of Investigation

Underlying cause	Under 7 days		7-27 days		Under 7 days		7-27 days		Under 7 days		7-27 days		Under 7 days		7-27 days		Under 7 days		7-27 days	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
	Cali				Cartagena				Chaco Province				Kingston Area				La Paz Area			
All causes	232	18.7	65	5.2	162	17.2	56	6.0	190	21.3	79	8.9	374	18.5	160	7.9	333	19.1	236	13.6
Diarrheal disease 009	2	0.2	17	1.4	-		12	1.3	2	0.2	18	2.0	2	0.1	29	1.4	7	0.4	36	2.1
Other infectious diseases ..... Rest of 000-136	8	0.6	13	1.0	6	0.6	17	1.8	5	0.6	15	1.7	12	0.6	33	1.6	3	0.2	14	0.8
Diseases of respiratory system 460-519	7	0.6	20	1.6	3	0.3	6	0.6	4	0.4	17	1.9	7	0.3	12	0.6	34	2.0	123	7.1
Congenital anomalies 740-759	13	1.0	4	0.3	11	1.2	2	0.2	9	1.0	3	0.3	25	1.2	15	0.7	5	0.3	6	0.3
Certain perinatal causes 760-778	194	15.6	5	0.4	132	14.0	16	1.7	154	17.3	20	2.2	312	15.4	57	2.8	265	15.2	37	2.1
Maternal conditions 760-763	32	2.6	-		17	1.8	2	0.2	12	1.3	1	0.1	47	2.3	18	0.9	28	1.6	5	0.3
Difficult labor, birth injury ... 764-768,772	39	3.1	1	0.1	23	2.4	1	0.1	40	4.5	3	0.3	45	2.2	3	0.1	64	3.7	5	0.3
Conditions of placenta, cord 770-771	11	0.9	-		21	2.2	2	0.2	11	1.2	-		11	0.5	1	0.0	21	1.2	4	0.2
Hemolytic disease 774,775	4	0.3	-		4	0.4	2	0.2	2	0.2	3	0.3	8	0.4	2	0.1	3	0.2	-	
Anoxic, hypoxic conditions 776	69	5.6	-		28	3.0	4	0.4	34	3.8	3	0.3	94	4.7	2	0.1	81	4.7	6	0.3
Immaturity 777	6	0.5	1	0.1	10	1.1	1	0.1	21	2.4	3	0.3	22	1.1	2	0.1	18	1.0	4	0.2
Other perinatal causes 769,778	33	2.7	3	0.2	29	3.1	4	0.4	34	3.8	7	0.8	85	4.2	29	1.4	50	2.9	13	0.7
All other causes	8	0.6	6	0.5	10	1.1	3	0.3	16	1.8	6	0.7	16	0.8	14	0.7	19	1.1	20	1.1
	Medellin				Monterrey				Recife				Ribeirão Prêto Area				San Juan Province			
All causes	150	15.0	41	4.1	606	18.3	250	7.6	397	24.7	167	10.2	192	21.7	77	8.7	252	22.4	158	14.1
Diarrheal disease 009	-	-	12	1.2	5	0.2	71	2.1	4	0.2	71	4.3	3	0.3	39	4.4	6	0.5	52	4.6
Other infectious diseases ... Rest of 000-136	5	0.5	3	0.3	14	0.4	49	1.5	8	0.5	12	0.7	3	0.3	4	0.5	5	0.4	10	0.9
Diseases of respiratory system 460-519	3	0.3	4	0.4	27	0.8	59	1.8	12	0.7	25	1.5	6	0.7	10	1.1	12	1.1	24	2.1
Congenital anomalies 740-759	10	1.0	5	0.5	44	1.3	24	0.7	18	1.1	10	0.6	11	1.3	6	0.7	11	1.0	4	0.4
Certain perinatal causes 760-778	128	12.8	12	1.2	468	14.1	34	1.0	344	21.0	31	1.9	166	18.8	12	1.4	212	18.9	60	5.3
Maternal conditions 760-763	15	1.5	1	0.1	45	1.4	4	0.1	12	0.7	2	0.1	11	1.2	1	0.1	16	1.4	4	0.4
Difficult labor, birth injury 764-768,772	23	2.3	2	0.2	101	3.1	8	0.2	63	3.8	9	0.5	33	3.7	3	0.3	58	5.2	17	1.5
Conditions of placenta, cord 770-771	19	1.9	2	0.2	63	1.9	6	0.2	34	2.1	1	0.1	12	1.4	-		24	2.1	5	0.4
Hemolytic disease 774,775	5	0.5	-		8	0.2	1	0.0	4	0.2	1	0.1	2	0.2	1	0.1	4	0.4	8	0.7
Anoxic, hypoxic conditions 776	30	3.0	1	0.1	85	2.6	5	0.2	136	8.3	8	0.5	61	6.9	3	0.3	53	4.7	10	0.9
Immaturity 777	4	0.4	-		36	1.1	1	0.0	32	2.0	-		-		1	0.1	4	0.4	-	
Other perinatal causes 769,778	32	3.2	6	0.6	130	3.9	9	0.3	63	3.8	10	0.6	47	5.3	3	0.3	53	4.7	16	1.4
All other causes	4	0.4	5	0.5	48	1.5	13	0.4	11	0.7	18	1.1	3	0.3	6	0.7	6	0.5	8	0.7
	San Salvador Area				Santiago Area				São Paulo											
All causes	301	18.7	154	9.6	233	13.5	104	6.0	564	20.3	404	14.5								
Diarrheal disease 009	4	0.2	52	3.2	-		15	0.9	14	0.5	157	5.6								
Other infectious diseases ..... Rest of 000-136	17	1.1	39	2.4	6	0.3	11	0.6	8	0.3	35	1.3								
Diseases of respiratory system 460-519	13	0.8	19	1.2	8	0.5	27	1.6	36	1.3	78	2.8								
Congenital anomalies 740-759	18	1.1	11	0.7	16	0.9	10	0.6	32	1.2	23	0.8								
Certain perinatal causes 760-778	238	14.8	25	1.6	193	11.2	30	1.7	464	16.7	72	2.6								
Maternal conditions 760-763	37	2.3	7	0.4	15	0.9	3	0.2	48	1.7	7	0.3								
Difficult labor, birth injury ... 764-768,772	55	3.4	6	0.4	47	2.7	5	0.3	93	3.3	10	0.4								
Conditions of placenta, cord 770-771	24	1.5	-		24	1.4	-		43	1.5	6	0.2								
Hemolytic disease 774,775	3	0.2	4	0.2	10	0.6	6	0.3	4	0.1	11	0.4								
Anoxic, hypoxic conditions 776	55	3.4	2	0.1	50	2.9	4	0.2	159	5.7	12	0.4								
Immaturity 777	3	0.2	-		2	0.1	-		18	0.6	11	0.4								
Other perinatal causes 769,778	61	3.8	6	0.4	45	2.6	12	0.7	99	3.6	15	0.5								
All other causes	11	0.7	8	0.5	10	0.6	12	0.6	10	0.4	39	1.4								

impose the need for the study of multiple causes of mortality, using a classification of causes that permits linking between maternal morbid conditions and their effect (consequence or nature of the damage) on the product of conception.

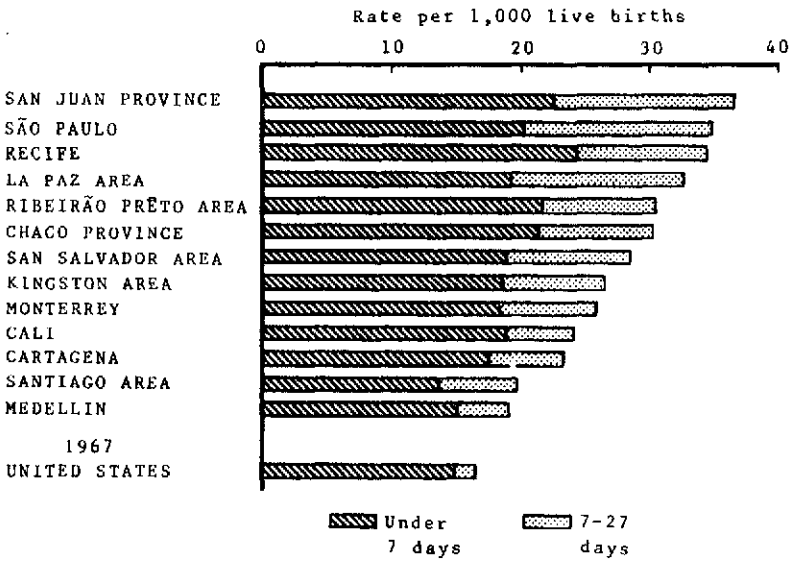
The quality of information on causes of death in the neonatal period, particularly in relation to the so-called certain causes of perinatal mortality, depends in large part on the proportion of births occurring in hospitals and on the completion of clinical records which include information such as weight and the condition of the child at birth.

The data presented and discussed briefly in this section correspond to neonatal deaths in the combined urban and rural areas of the projects. These areas will be analyzed separately in the future if significant differences are indicated.

As pointed out previously, failure in finding all deaths in the first days of life may seriously interfere with measurement of neonatal mortality. Although deaths may have been missed in several projects, it is evident from Table 12 and Figure 18 that neonatal mortality is excessive in most projects in comparison with rates of developed countries. In general, the differences in neonatal mortality among the projects seem to be more important after the first week of life, that is, when environmental factors gain progressive importance. The death rates during the first week of life vary from 13.5 per

Figure 18

NEONATAL MORTALITY FOR TWO AGE GROUPS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION, AND UNITED STATES, 1967

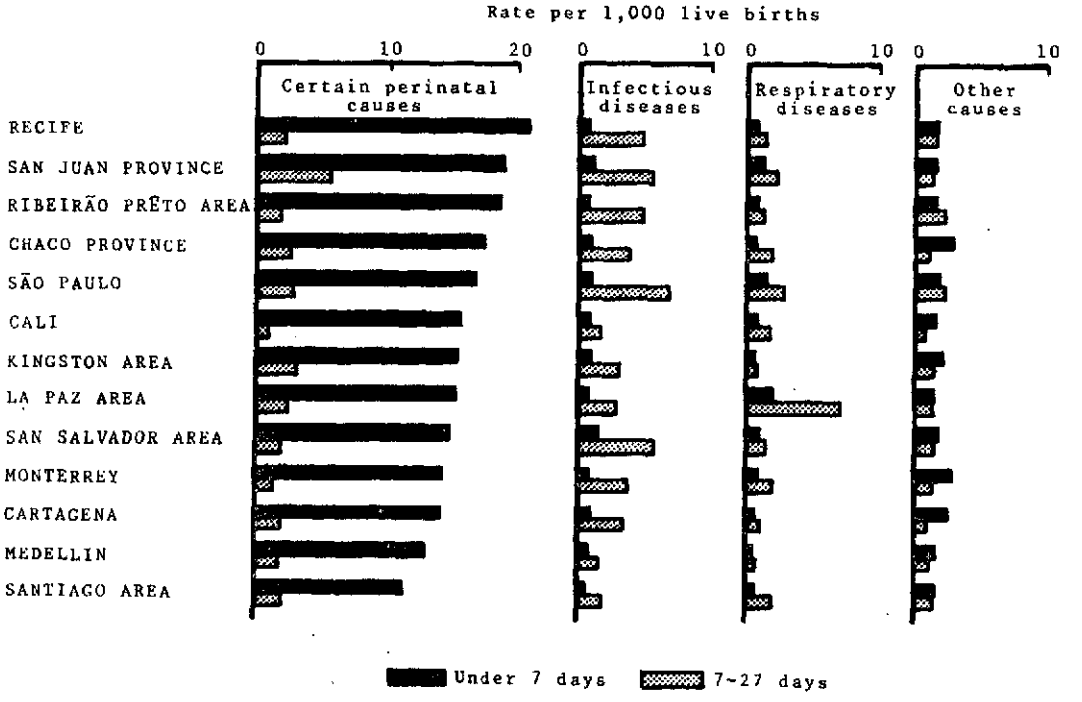


1,000 live births in the Santiago Area to 24.2 in Recife. During the age period 7-27 days, the rates range from 4.1 in Medellín to 14.5 in São Paulo. These rates could be reduced markedly since in developed countries they are low in this age period; for example, in the United States in 1967, the rate was only 1.6 per 1,000 live births.

The study of underlying causes of death in these two age groups of the neonatal period reveals important differences. As expected, the perinatal causes of mortality are found to act as underlying causes to a much greater extent in the first week of life than in the remainder of the period. On the other hand, and also as would be expected, the infectious diseases and the diseases of the respiratory system contribute to mortality mainly after the first week of life. The death rate from the group of diseases of the respiratory system was found to be high in La Paz, when comparison between projects is made. Likewise, mortality from infectious diseases was higher in São Paulo than in the other areas (Table 12 and Figure 19).

Figure 19

BROAD GROUPS OF UNDERLYING CAUSES OF NEONATAL DEATHS FOR TWO AGE GROUPS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



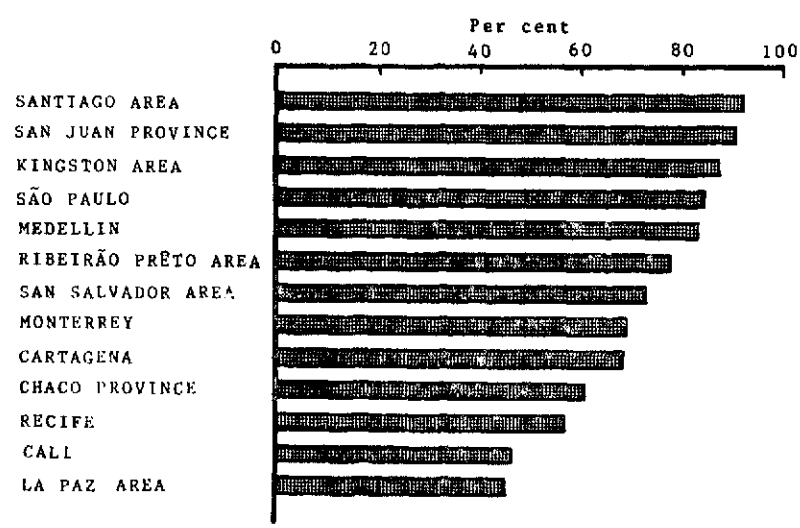
Low birth weight, usually related to premature delivery, is the most important factor of high risk of disease and mortality in the neonatal period. According to the standards of the World Health Organization, any child weighing 2,500 grams or less has been classified a premature, regardless of the duration of pregnancy. Despite its limitations, this concept is useful to define a highly vulnerable group at the community level and is the one adopted in the Investigation. The availability of information on body weight at birth constitutes an important element of evaluation of the state of health of the newborn and should be obtained in all instances of institutional deliveries. Table 13 and Figure 20 provide information on the proportion of infants with birth weight stated who died in the neonatal period. In La Paz only 45 per cent of neonatal deaths had information on birth weight compared to 92 per cent in the Santiago Area.

Table 13. Number and Percentage of Infants Dying in Neonatal Period with Birth Weight Stated in 13 Projects, First Year of Investigation

Project	Total deaths	Weight stated		Project	Total deaths	Weight stated	
		Number	Per cent			Number	Per cent
Cali	297	137	46.1	Recife	564	319	56.6
Cartagena	218	149	68.3	Ribeirão Prêto Area	269	209	77.7
Chaco Province	269	163	60.6	San Juan Province	410	368	89.8
Kingston Area	534	466	87.3	San Salvador Area	455	330	72.5
La Paz Area	549	246	44.8	Santiago Area	337	309	91.7
Medellín	191	158	82.7	São Paulo	968	812	83.9
Monterrey	856	591	69.0				

Figure 20

PERCENTAGE OF NEONATAL DEATHS WITH BIRTH WEIGHT STATED IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Comparative study of the percentage distribution of neonatal deaths in 500-gram units of birth weight has revealed important results which are presented in Table 14 and Figure 21, together with similar data for the United States. The percentage of infants dying in the neonatal period who were born with body weights of 1,000 grams or less varies among the projects from 17.8 in Kingston to 5.2 in Santiago. San Juan Province and Monterrey also had low percentages, 8.2 and 8.5 respectively. The percentage for the United States was 20.5 in a special study on weight at birth and survival of the newborn.(11)

Although the distribution of birth weights for live births is not known in the areas of the Investigation, it seems safe to assume that there is a deficit in inclusion of deaths of neonates with low weight in the areas in which the percentages have been found to be low. On the other hand, the percentages of neonatal deaths of infants born with weights over 2,500 grams also differ among the projects. In the Kingston Area, for example, only 21 per cent of the neonatal deaths belonged to this weight group, compared to 46 per cent in Monterrey and 36 per cent in the United States. Further investigation is needed to explain these different patterns of distribution of deaths by weight at birth.

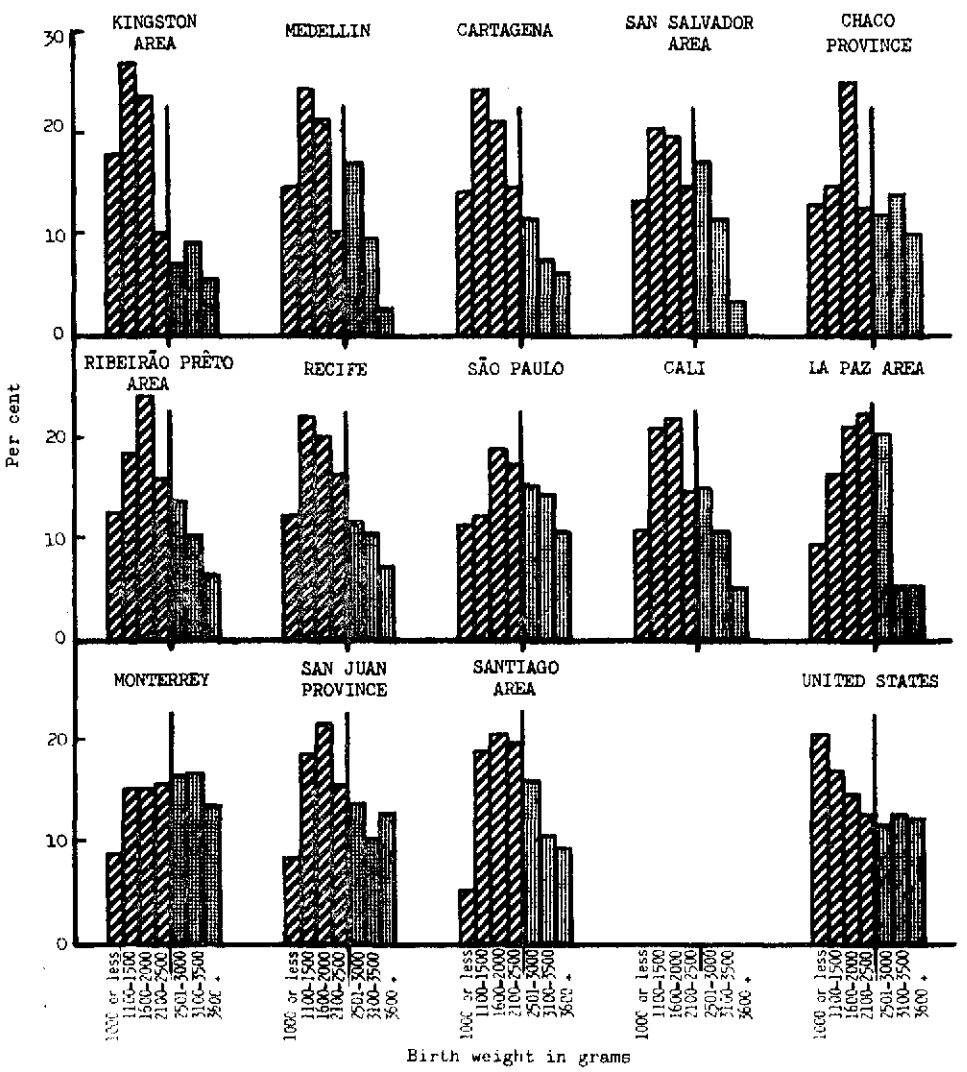
Table 14. Distribution of Infants Dying in Neonatal Period by Weight at Birth in 13 Projects, First Year of Investigation, and United States, 1950

Birth weight in grams*	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
	Cali		Cartagena		Chaco Province		Kingston Area		La Paz Area		Medellín		Monterrey	
Total deaths	297		218		269		534		569		191		856	
Weight stated	137	99.9	149	100.0	163	100.1	466	100.0	246	100.0	158	100.0	591	100.1
1000 or less	15	10.9	21	14.1	21	12.9	83	17.8	23	9.3	23	14.6	50	8.5
1100-1500	29	21.2	36	24.2	24	14.7	126	27.0	40	16.3	39	24.7	89	15.1
1600-2000	30	21.9	33	22.1	41	25.2	110	23.6	52	21.1	34	21.5	89	15.1
2100-2500	20	14.6	22	14.8	20	12.3	46	9.9	55	22.4	16	10.1	91	15.4
2500 or less	94	68.6	112	75.2	106	65.0	365	78.3	170	69.1	112	70.9	319	54.0
2501-3000	21	15.3	17	11.4	19	11.7	32	6.9	50	20.3	27	17.1	96	16.2
3100-3500	15	10.9	11	7.4	22	13.5	43	9.2	13	5.3	15	9.5	98	16.6
3600 and over	7	5.1	9	6.0	16	9.8	26	5.6	13	5.3	4	2.5	78	13.2
	Recife		Ribeirão Prêto Area		San Juan Province		San Salvador Area		Santiago Area		São Paulo		United States** 3 months, 1950	
Total deaths	564		269		410		455		337		968		16741	100.0
Weight stated	319	100.0	209	99.9	368	100.1	330	99.9	309	100.1	812	99.9		
1000 or less	39	12.2	26	12.4	30	8.2	43	13.0	16	5.2	92	11.3	3424	20.5
1100-1500	70	21.9	38	18.2	68	18.5	68	20.6	58	18.8	99	12.2	2801	16.7
1600-2000	64	20.1	50	23.9	80	21.7	65	19.7	64	20.7	152	18.7	2403	14.4
2100-2500	52	16.3	33	15.8	57	15.5	49	14.8	61	19.7	140	17.2	2078	12.4
2500 or less	225	70.5	147	70.3	235	63.9	225	68.2	199	64.4	483	59.5	10706	64.0
2501-3000	37	11.6	28	13.4	50	13.6	56	17.0	49	15.9	127	15.6	1912	11.4
3100-3500	34	10.7	21	10.0	36	9.8	38	11.5	33	10.7	116	14.3	2112	12.6
3600 and over	23	7.2	13	6.2	47	12.8	11	3.3	28	9.1	86	10.6	2011	12.0

*Rounded to hundreds of grams, except 2501-2549 grams.
**Source: National Center for Health Statistics, Washington, PHS Pub. No. 1000, Series 21, No. 3, July, 1965.

Figure 21

PERCENTAGE DISTRIBUTION OF NEONATAL DEATHS* BY BIRTH WEIGHT IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION, AND UNITED STATES, 1950



*Excluding those with weight not stated.

With respect to causes of death, the conditions included in the Section of Certain Causes of Perinatal Mortality in the International Classification of Diseases play the most important role in neonatal mortality and involve relevant interrelationships. This broad group of causes include among others the following conditions:

Maternal conditions, categories 760-763, including those related to the pregnancy state and others independent of gestation.

Difficult labor and injury occurring at birth, categories 764-768 and 772, which provide linkage between the type of distocia or cause and effect on the product of gestation through a fourth digit.

Important complications of pregnancy, category 769, such as premature rupture of membranes, hydramnios, multiple pregnancy, antepartum hemorrhage and others.

Abnormal conditions of placenta and cord, categories 770 and 771.

Hemolytic disease of the newborn, categories 774-775, with or without kernicterus.

Hypoxic and anoxic conditions of unspecified cause, category 776, which includes hyaline membrane disease, respiratory distress syndrome, fetal distress, and others.

Immaturity or prematurity, unqualified, category 777.

Other complications of the newborn, category 778.

Essentially all deaths due to these causes occurred in the neonatal period and constitute more than one-half of the deaths in this period of life.

Among the broad group of infective and parasitic diseases, diarrheal disease is by far the most important underlying cause of death in the neonatal period, as previously shown in Figures 16 and 17. In Cartagena, the Kingston Area, the Ribeirão Prêto Area and San Juan Province, over 60 per cent of these deaths from diarrheal disease occurred in immature neonates. In some areas, the lack of data on immaturity makes it difficult to establish this relationship. In São Paulo, for example, 36 of the 171 neonatal deaths from diarrhea were of infants with clinical evidence of deficient growth which had to be classified in categories of nutritional deficiency because weights at birth or other evidence of immaturity were not available. A similar situation occurred in Recife.

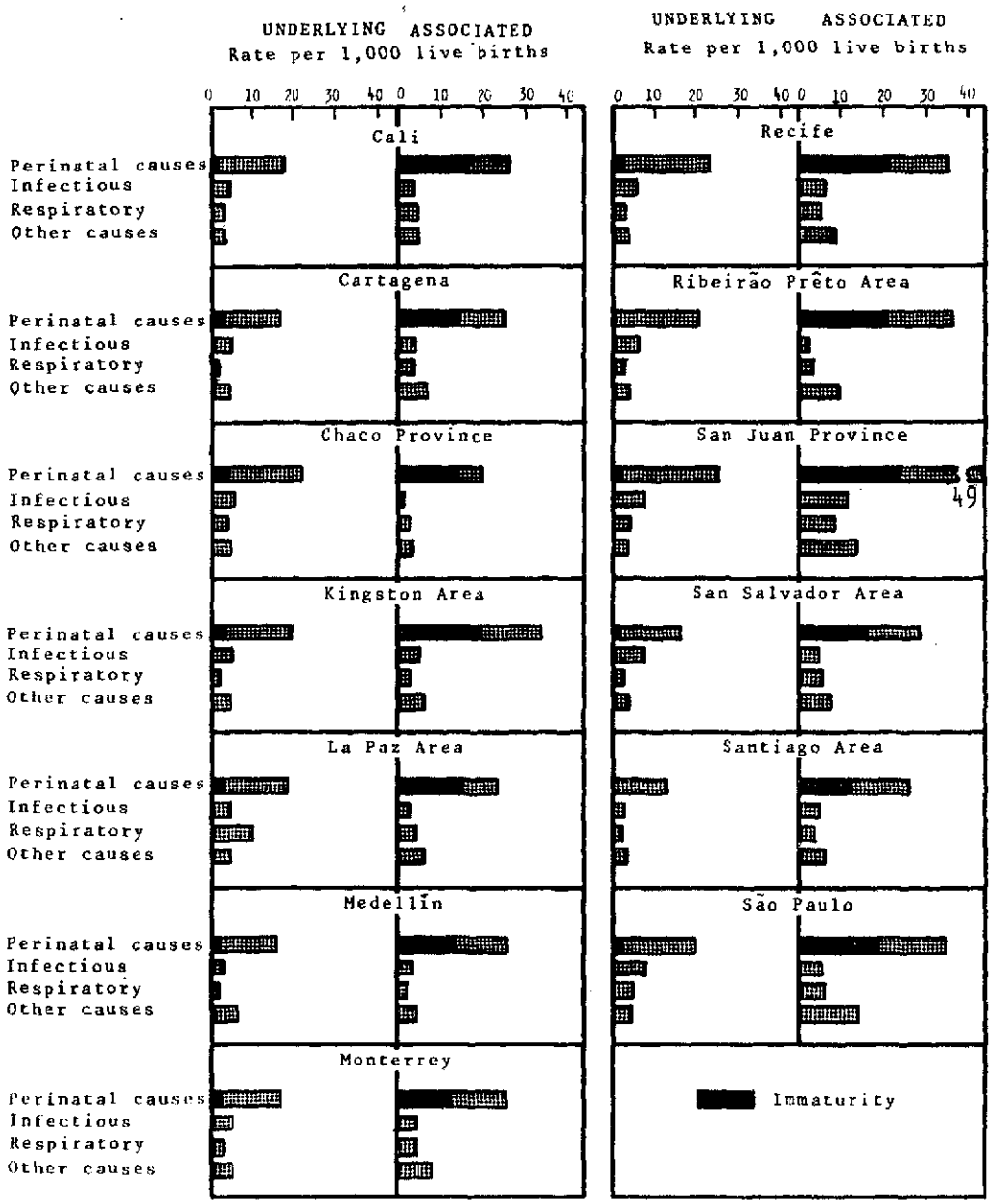
Certain specific infectious diseases act as causes of death principally in the neonatal period. For example, tetanus was the underlying cause of 92 deaths in the neonatal period out of a total of 103 deaths under 5 years of age from tetanus in all projects. Septicemia was the underlying cause of 160 deaths in the neonatal period; the total number of deaths from this cause was 196. Congenital syphilis was the underlying cause of 28 deaths in the neonatal period out of 48 deaths under 5 years of age.

Table 15. Underlying and Associated Causes of Neonatal Deaths in Broad Groups with Rates per 1,000 Live Births in 13 Projects, First Year of Investigation

Project and type of cause	Total neonatal deaths		Certain perinatal causes				Infectious diseases		Respiratory diseases		Other causes	
			Immaturity		Other							
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali												
Underlying	297	24.0	7	0.6	192	15.5	40	3.2	27	2.2	31	2.5
Associated	459	37.0	161	13.0	160	12.9	37	3.0	51	4.1	50	4.0
Cartagena												
Underlying	218	23.2	11	1.2	137	14.6	35	3.7	9	1.0	26	2.8
Associated	356	37.9	123	13.1	112	11.9	28	3.0	31	3.3	62	6.6
Chaco Province												
Underlying	269	30.2	24	2.7	150	16.9	40	4.5	21	2.4	34	3.8
Associated	230	25.8	119	13.4	63	7.1	9	1.0	17	1.9	22	2.5
Kingston Area												
Underlying	534	26.4	24	1.2	345	17.1	76	3.8	19	0.9	70	3.5
Associated	954	47.2	363	18.0	322	15.9	98	4.9	53	2.6	118	5.8
La Paz Area												
Underlying	569	32.7	22	1.3	280	16.1	60	3.4	157	9.0	50	2.9
Associated	610	35.1	243	14.0	169	9.7	31	1.8	68	3.9	99	5.7
Medellín												
Underlying	191	19.1	4	0.4	136	13.6	20	2.0	7	0.7	53	5.3
Associated	340	34.0	116	11.6	139	13.9	27	2.7	21	2.1	37	3.7
Monterrey												
Underlying	856	25.9	37	1.1	465	14.0	139	4.2	86	2.6	129	3.9
Associated	1354	40.9	396	12.0	477	14.4	123	3.7	123	3.7	235	7.1
Recife												
Underlying	564	34.4	32	2.0	343	20.9	95	5.8	37	2.3	57	3.5
Associated	888	54.1	338	20.6	241	14.7	89	5.4	76	4.6	144	8.8
Ribeirão Prêto Area												
Underlying	269	30.4	1	0.1	177	20.0	49	5.5	16	1.8	26	2.9
Associated	443	50.1	176	19.9	141	15.9	15	1.7	30	3.4	81	9.2
San Juan Province												
Underlying	410	36.5	4	0.4	268	23.8	73	6.5	36	3.2	29	2.6
Associated	900	80.1	249	22.2	306	27.2	121	10.8	76	6.8	148	13.2
San Salvador Area												
Underlying	455	28.3	3	0.2	260	16.1	112	7.0	32	2.0	48	3.0
Associated	704	43.7	247	15.3	205	12.7	61	3.8	81	5.0	110	6.8
Santiago Area												
Underlying	337	19.6	2	0.1	221	12.8	32	1.9	35	2.0	47	2.7
Associated	683	39.7	204	11.8	251	14.6	70	4.1	54	3.1	104	6.0
São Paulo												
Underlying	968	34.8	29	1.0	507	18.2	214	7.7	114	4.1	104	3.7
Associated	1672	60.1	521	18.7	462	16.6	137	4.9	158	5.7	394	14.2

Figure 22

UNDERLYING AND ASSOCIATED CAUSES OF NEONATAL DEATHS BY BROAD GROUPS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



In the neonatal period, as in other age groups, the real magnitude of the major problems in mortality can be measured only when both the underlying and associated causes are studied. This is particularly true with regard to the important condition of immaturity. Table 15 and Figure 22 give the underlying and associated causes of death in broad groups. The sum of perinatal causes is more than double the number as underlying causes in all projects when multiple conditions are analyzed, and this increment is mainly due to the fact that immaturity is usually an associated cause. With the exception of four projects, the Kingston Area, Medellín, San Juan Province, and the Santiago Area, the rates for infectious diseases are higher as underlying causes than as associated causes. The reverse is true for the group of diseases of the respiratory system which, with the exception of the La Paz Area and Chaco Province, act more frequently as associated than as underlying causes of death.

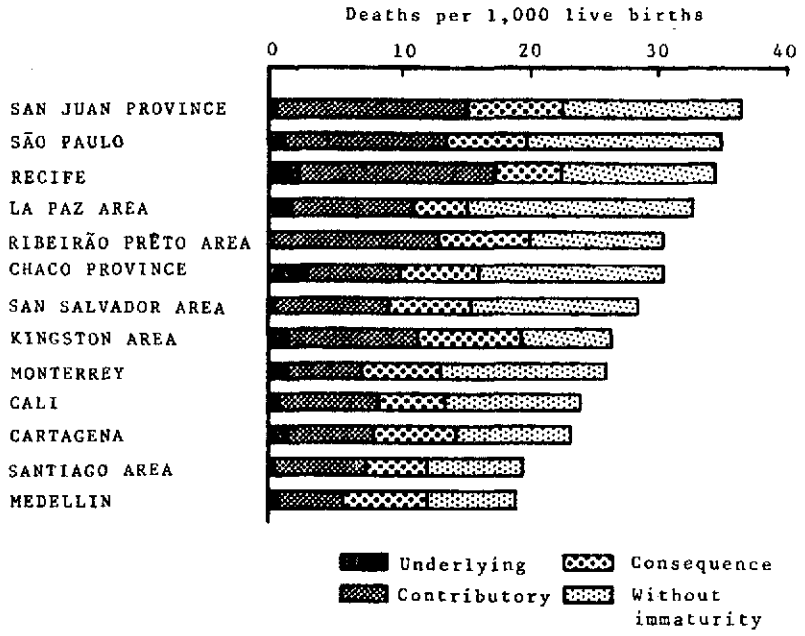
The contribution of prematurity or immaturity to neonatal mortality is presented in Table 16 and Figure 23. Between one-half and two-thirds of all neonatal deaths occur in premature infants. Thus, for a total neonatal death rate of 25.9 in Monterrey, the rate from immaturity was 13.1 and the rates for Ribierão Preto Area were 30.4 and 20.0 per 1,000 live births respectively. The role of immaturity, however, is essentially as an associated cause, either as a consequence of another perinatal (usually maternal) condition or as a contributory cause.

Table 16. Immaturity as Underlying and Associated Causes of Neonatal Deaths with Rates per 1,000 Live Births in 13 Projects, First Year of Investigation

Project	Total neonatal deaths		Total with immaturity		Immaturity							
					Underlying cause		Associated cause					
							Total		Contributory		Consequence	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	297	24.0	168	13.5	7	0.6	161	13.0	97	7.8	64	5.2
Cartagena	218	23.2	134	14.3	11	1.2	123	13.1	62	6.6	61	6.5
Chaco Province	269	30.2	143	16.1	24	2.7	119	13.4	65	7.3	54	6.1
Kingston Area	534	26.4	387	19.2	24	1.2	363	18.0	200	9.9	163	8.1
La Paz Area	569	32.7	265	15.2	22	1.3	243	14.0	167	9.6	76	4.4
Medellín	191	19.1	120	12.0	4	0.4	116	11.6	51	5.1	65	6.5
Monterrey	856	25.9	434	13.1	37	1.1	396	12.0	193	5.8	203	6.1
Recife	564	34.4	370	22.6	32	2.0	338	20.6	251	15.3	87	5.3
Ribeirão Prêto Area	269	30.4	177	20.0	1	0.1	176	19.9	112	12.7	64	7.2
San Juan Province	410	36.5	253	22.5	4	0.4	249	22.2	166	14.8	83	7.4
San Salvador Area	455	28.3	250	15.5	3	0.2	247	15.3	145	9.0	102	6.3
Santiago Area	337	19.6	206	12.0	2	0.1	204	11.8	124	7.2	80	4.6
São Paulo	968	34.8	550	19.8	29	1.0	521	18.7	346	12.4	175	6.3

Figure 23

IMMATURITY AS UNDERLYING AND ASSOCIATED CAUSES OF NEONATAL MORTALITY IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION

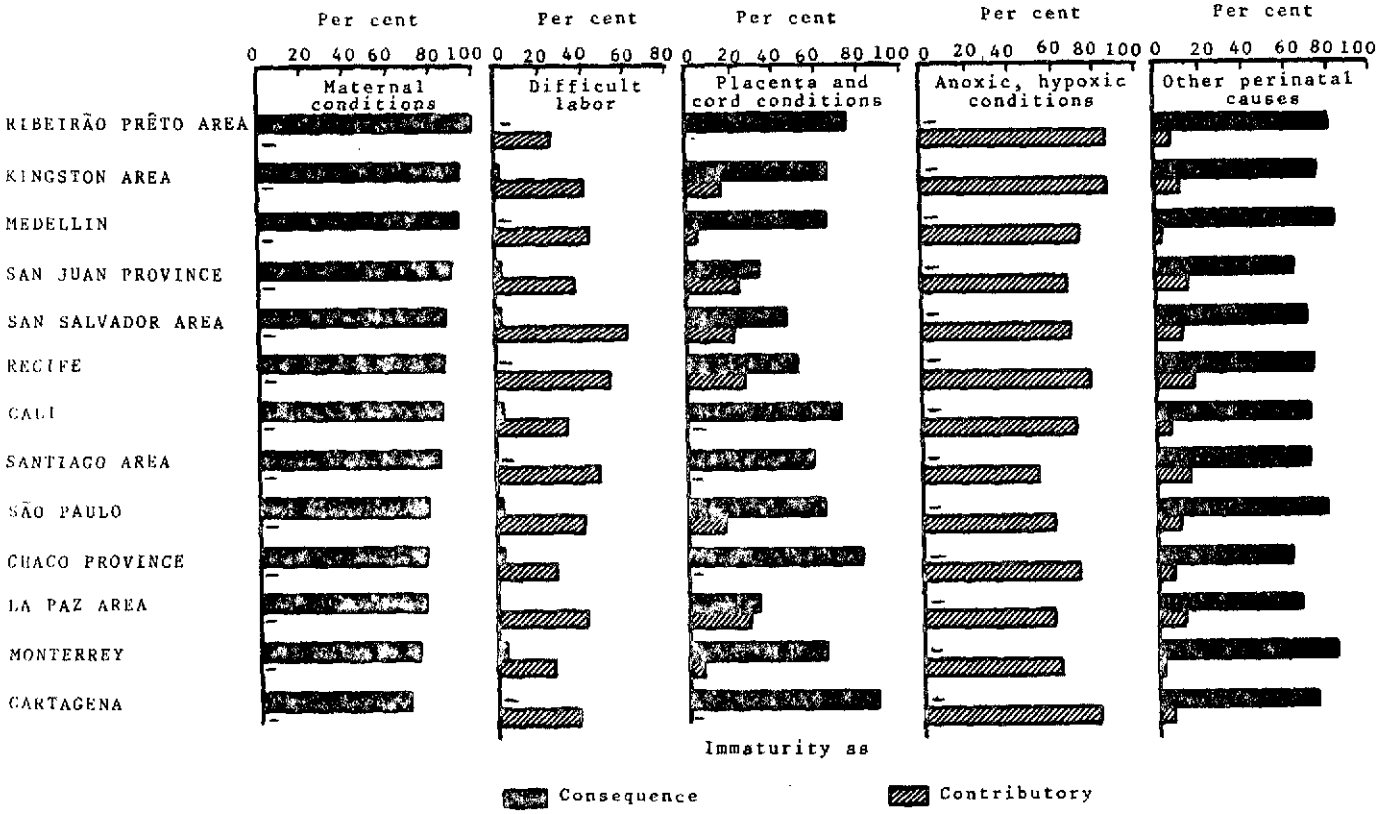


In spite of the difficulties involved, efforts have been made to define some interrelationships between immaturity and other perinatal causes of mortality in the hope that this will assist in finding means of preventing this high risk condition. Appendix Table V gives the percentages of deaths due to maternal conditions, difficult labor, conditions of placenta and cord, hypoxia and other perinatal causes as underlying causes in which immaturity was an associated cause of death. These interrelationships are shown in Figure 24. In all neonatal deaths in which a maternal condition was the underlying cause, immaturity, if present, was always a consequence. Usually, in neonatal deaths of immature babies in which difficult labor was the underlying cause, the immaturity was a contributory cause. In those deaths in which the underlying cause was a condition of the placenta or cord, immaturity, if present, was a consequence (usually of the placental condition) or less frequently a contributory cause (usually of the cord condition). In all deaths found to be due to anoxic or hypoxic conditions, immaturity was a contributory condition, and finally for the rest of the perinatal causes, immaturity was found mos commonly to be a consequence. This latter group includes hemolytic diseases of newborn in which immaturity is usually a contributory cause, other complications of pregnancy and childbirth such as multiple birth and antepartum hemorrhage in which immaturity is a consequence and other conditions of the fetus or newborn in which immaturity is a contributory cause.

Neonatal mortality due to congenital anomalies is relatively minimized by the high death rates from certain perinatal causes and from those conditions dependent on the influences of the extrauterine environment. However, their relevance in infant and childhood mortality is recognized and a separate section is devoted to the presentation of findings on congenital anomalies.

Figure 24

FREQUENCY OF IMMATURITY AS A CONSEQUENCE OR CONTRIBUTORY CAUSE OF CERTAIN PERINATAL CAUSES OF NEONATAL DEATHS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Mortality in Early Childhood

Mortality of children 1-4 years of age shows wide variation in developing countries due to effects of environment and social and cultural factors. With simultaneous improvement of conditions and provision of health services, death rates in this period have become very low, less than 1 per 1,000 population, in some countries.

The death rates from all causes for this age period are given in Table 17 for the cities and other areas and are shown in the left section of Figure

Table 17. Deaths from all Causes and with Nutritional Deficiency as Underlying or Associated Cause for Children 1-4 Years of Age with Rates per 1,000 Population in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Deaths all cause		Deaths with nutritional deficiency		Nutritional deficiency							
					Underlying cause		Associated cause					
							Total		Contributory		Consequence	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	305	6.2	188	3.8	69	1.4	119	2.4	94	1.9	25	0.5
Cartagena	170	4.7	115	3.2	45	1.3	70	1.9	47	1.3	23	0.6
Kingston	144	2.2	56	0.9	14	0.2	42	0.6	29	0.4	13	0.2
La Paz	616	9.6	304	4.8	24	0.4	280	4.4	181	2.8	99	1.5
Medellín	229	5.9	156	4.0	39	1.0	117	3.0	90	2.3	27	0.7
Monterrey	412	3.9	245	2.3	34	0.3	211*	2.0	136	1.3	75	0.7
Recife	535	10.1	376	7.1	53	1.0	323	6.1	279	5.2	44	0.8
Resistencia	72	4.4	45	2.7	9	0.5	36	2.2	27	1.6	9	0.5
Ribeirão Prêto	40	2.4	28	1.7	2	0.1	26	1.6	24	1.4	2	0.1
San Juan	11	1.1	4	0.4	-		4	0.4	2	0.2	2	0.2
San Salvador	314	6.3	208	4.2	38	0.8	170	3.4	123	2.5	47	0.9
Santiago	117	1.8	46	0.7	8	0.1	38*	0.6	27	0.4	11	0.2
São Paulo	286	2.8	135	1.3	30	0.3	105**	1.0	70	0.7	35	0.3
Other area^												
Chaco, rural	103	7.6	61	4.5	4	0.3	57	4.2	44	3.2	13	1.0
Franca	44	6.1	23	3.2	4	0.6	19	2.7	18	2.5	1	0.1
San Juan, suburban	43	3.2	15	1.1	2	0.1	13	1.0	8	0.6	5	0.4
San Juan, rural	97	6.1	41	2.6	5	0.3	36	2.2	27	1.7	9	0.6
San Salvador, rural	202	23.0	145	16.5	47	5.3	98**	11.1	79	9.0	19	2.2

* Excludes 1 associated cause with other type of nutritional deficiency.
^ Excludes 4 other areas with insufficient deaths for analysis.

25 for the 13 cities. These death rates vary widely from the lowest of 1.1 for San Juan city to the highest for Recife and La Paz of 10.1 and 9.6 respectively. For the suburban and rural areas of four projects with sufficient deaths for analysis, marked variation is also seen in the rates, and the level of the rates is higher than that for the corresponding cities (Figure 26). The rural communities in the project of San Salvador exhibited extremely high mortality in this age period.

The underlying and associated causes by broad groups are given in Table 18 and shown in Figure 27. Since the numbers of deaths were less than 50 in several areas, subidivisions into causes were not advisable for such areas, and, thus, data in Table 18 are limited to 11 cities and three rural areas. Additional information on deaths in this age group is given in Appendix Table IV.

Figure 25

MORTALITY FROM ALL CAUSES AND WITH NUTRITIONAL DEFICIENCY OF CHILDREN 1-4 YEARS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

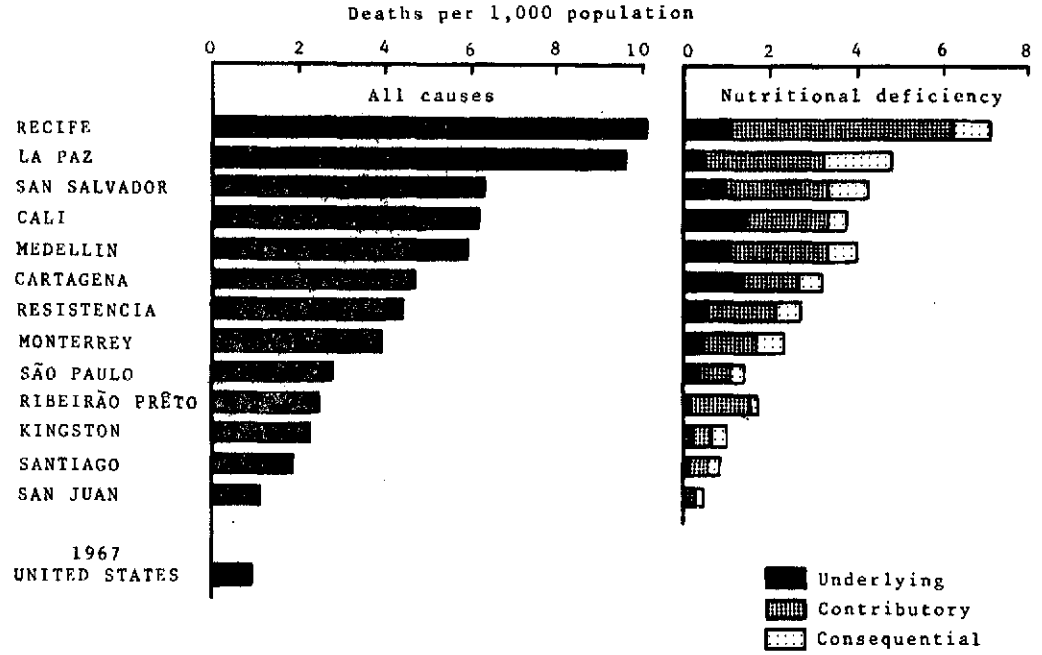


Figure 26

MORTALITY FROM ALL CAUSES AND WITH NUTRITIONAL DEFICIENCY OF CHILDREN 1-4 YEARS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION

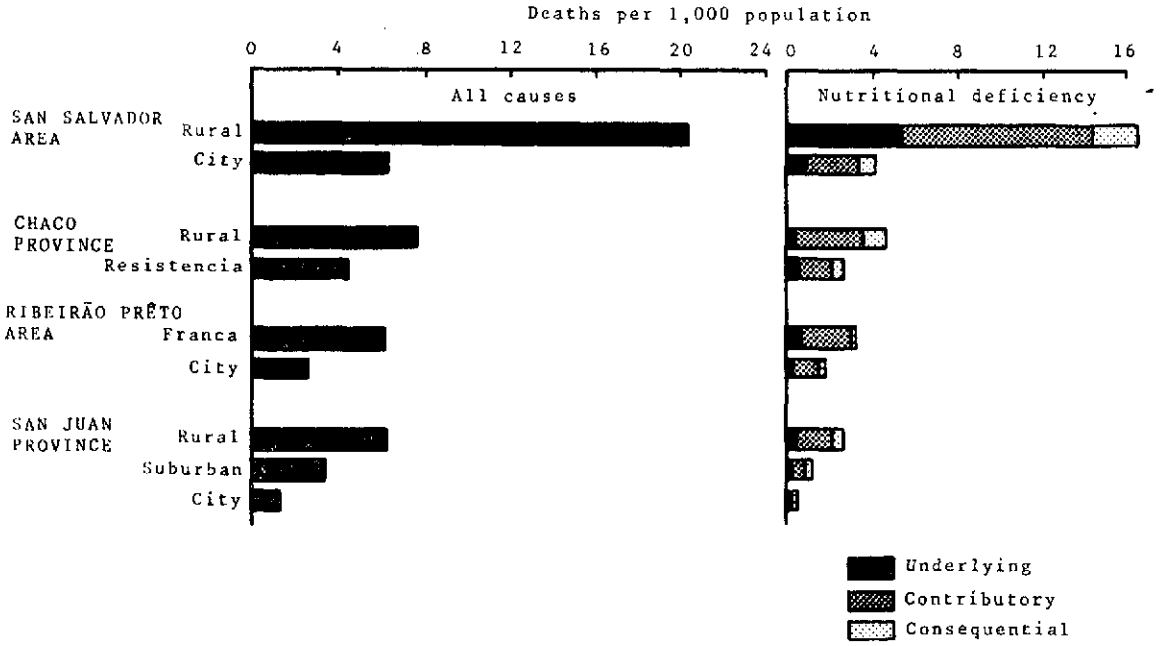


Table 18. Underlying and Associated Causes of Deaths of Children 1-4 Years in Broad Groups with Rates per 1,000 Population in 11 Cities and 3 Other Areas, First Year of Investigation

Central city and other area	Total		Infectious diseases		Respiratory diseases		Nutritional deficiency		Other causes	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali										
Underlying	305	6.2	152	3.1	24	0.5	69	1.4	60	1.2
Associated	533	10.9	148	3.0	136	2.8	119	2.4	130	2.6
Cartagena										
Underlying	170	4.7	64	1.8	22	0.6	45	1.3	39	1.1
Associated	369	10.3	122	3.4	79	2.2	70	1.9	98	2.7
Chaco - Resistencia										
Underlying	72	4.4	40	2.4	8	0.5	9	0.5	15	0.9
Associated	120	7.3	25	1.5	24	1.5	36	2.2	35	2.1
Chaco, rural										
Underlying	103	7.6	60	4.4	17	1.2	4	0.3	22	1.6
Associated	132	9.7	27	2.0	21	1.5	57	4.2	27	2.0
Kingston										
Underlying	144	2.2	34	0.5	23	0.3	14	0.2	73	1.1
Associated	220	3.3	31	0.5	51	0.8	42	0.6	96	1.5
La Paz										
Underlying	616	9.6	391	6.1	121	1.9	24	0.4	80	1.2
Associated	858	13.4	148	2.3	226	3.5	280	4.4	204	3.2
Medellín										
Underlying	229	5.9	127	3.3	12	0.3	39	1.0	51	1.3
Associated	478	12.4	126	3.3	90	2.3	117	3.0	145	3.7
Monterrey										
Underlying	412	3.9	236	2.2	66	0.6	34	0.3	76	0.7
Associated	972	9.1	269	2.5	208	2.0	212	2.0	283	2.7
Recife										
Underlying	535	10.1	343	6.4	77	1.4	53	1.0	62	1.2
Associated	1409	26.5	441	8.3	376	7.1	323	6.1	269	5.1
San Juan, rural										
Underlying	97	6.1	49	3.1	17	1.1	5	0.3	26	1.6
Associated	177	11.1	23	1.4	52	3.2	36	2.2	66	4.1
San Salvador, city										
Underlying	314	6.3	188	3.8	36	0.7	38	0.8	52	1.0
Associated	654	13.1	165	3.3	129	2.6	172	3.4	188	3.8
San Salvador, rural										
Underlying	202	23.0	119	13.5	10	1.1	47	5.3	26	3.0
Associated	406	46.1	155	17.6	67	7.6	100	11.4	84	9.5
Santiago										
Underlying	117	1.8	23	0.4	15	0.2	8	0.1	71	1.1
Associated	184	2.9	19	0.3	40	0.6	39	0.6	86	1.3
São Paulo										
Underlying	286	2.8	109	1.1	50	0.5	30	0.3	97	0.9
Associated	541	5.2	124	1.2	139	1.3	107	1.0	171	1.7

Figure 27a

UNDERLYING AND ASSOCIATED CAUSES OF DEATHS OF CHILDREN 1-4 YEARS BY BROAD GROUPS IN 10 CITIES AND 2 RURAL AREAS, FIRST YEAR OF INVESTIGATION

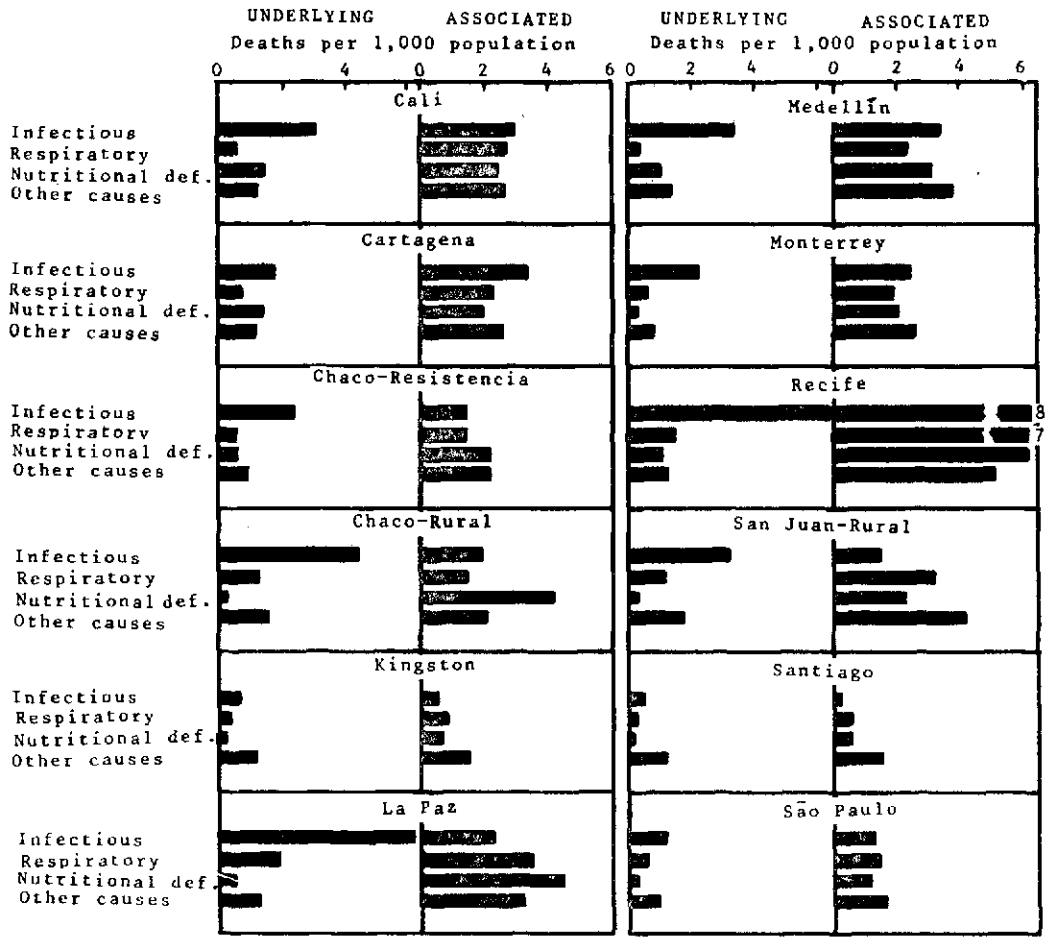
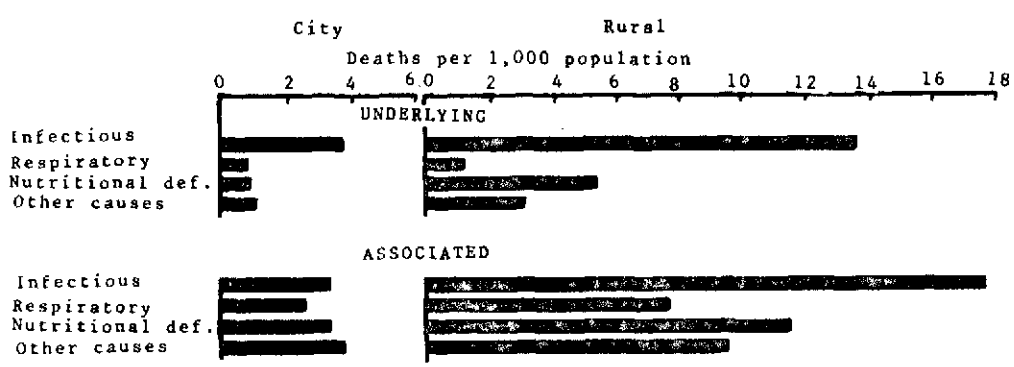


Figure 27b

UNDERLYING AND ASSOCIATED CAUSES OF DEATHS OF CHILDREN 1-4 YEARS BY BROAD GROUPS IN URBAN AND RURAL SAN SALVADOR, FIRST YEAR OF INVESTIGATION



In Recife and La Paz the infectious diseases were the underlying causes of nearly two-thirds of all deaths occurring in early childhood, with measles the largest single cause in Recife. While the role of diarrheal disease in the production of excessive mortality in this age group has been known, the seriousness of measles has not been recognized. In children 1-4 years of age, measles was the underlying cause of more deaths than diarrheal disease in three cities and one rural area; namely, Monterrey, Recife, São Paulo and the rural area of San Juan Province. During the second year of the Investigation, vaccination programs against measles were undertaken in Recife and La Paz, where mortality from this disease was unusually high, and it is hoped that the use of this vaccine on a sustained basis will be made in all countries of the Americas. As a result of early findings in the Investigation, a specific recommendation for such action was made at the Meeting of the Ministers of Health(12)in October 1968.

In the cities of Kingston and Santiago, with favorable death rates from all causes in early childhood, the pattern of underlying causes was distinctly different; in Santiago, for example, external causes became the leading cause of death in this group, with 27 deaths, while all infectious diseases produced only 23 deaths. The broad miscellaneous group of other causes which includes the neoplasms, congenital anomalies, diseases of the central nervous system and others acquires higher status in areas with low death rates. This illustrates the changes in mortality through prevention of infectious diseases.

As in the case of infant mortality, the study of multiple causes of death in early childhood permits measurement of the real size of morbid conditions which is otherwise masked by the use of single cause analyses. The data given in Table 18 and presented in Figure 27 show interesting interrelationships. Thus, the rates from the group of infectious diseases as underlying causes generally exceed those as associated causes, while the opposite is observed with the rates from diseases of the respiratory system, nutritional deficiency and other causes. In the rural communities near San Salvador, it was found that death rates were unusually high from all causes (Figure 27), and the infectious diseases and nutritional deficiency as underlying and associated causes are largely responsible for these excessive death rates.

In considering nutritional deficiency as a cause of death, it is evident that it is a major contributor to mortality in this age group. The deaths from nutritional deficiency as underlying or associated causes have been combined to reveal the true role of this condition in mortality (Table 17). The specific way in which nutritional deficiency operates as underlying or contributory cause or as a consequence of the underlying and other causes is given in the table. The resulting death rates are shown in the right hand side of Figures 25 and 26 to relate to the death rates from all causes which are shown in the left sections. It is evident that the size of the problem of nutritional deficiency in mortality is minimized when only the underlying cause is considered. In Recife and Ribeirão Prêto in the age group 1-4 years, 70 per cent of the deaths occurred in children with nutritional deficiency. In Cali, Cartagena, Medellín and San Salvador, the percentages varied from 62

to 68. In rural communities of El Salvador, nearly three-fourths (72 per cent) of these deceased children had nutritional deficiency as the underlying or an associated cause. Thus, reduction of mortality from all causes in this age period necessitates improvement of the nutritional state of children. Although important infectious diseases such as measles may be prevented through immunization, these children continue to be at great risk of death from other diseases and conditions because of their unfavorable nutritional state.

Sections which follow give additional information regarding the infectious diseases and also nutritional deficiency, since these two groups are responsible for excessive mortality in infancy and in early childhood.

Infectious Diseases

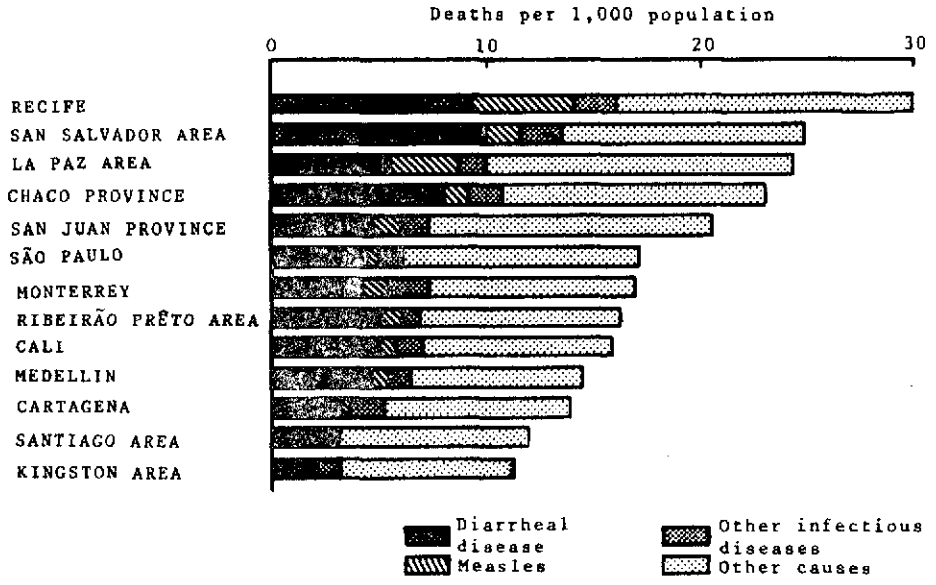
The analysis of causes in this report has been directed principally to broad groups; when data for the two years become available it is expected that specific conditions can be studied in greater detail. At this time, the material available for the first year enables reference to some relevant aspects of specific causes that have revealed major contributions to excessive mortality. It is hoped that, in the future, comparisons of mortality by specific causes between central cities and other areas may be possible; the brief presentation to follow refers to findings in the projects.

The group of infectious diseases is an important cause of mortality under 5 years of age in areas with excessive death rates. In this section, these diseases are considered for the 13 projects and the data are given in Tables 19 and 20. Within this group the two major specific causes are diarrheal disease and measles. Figure 28 shows the death rates from all causes

Figure 28

ROLE OF INFECTIOUS DISEASES IN MORTALITY UNDER 5 YEARS IN 13 PROJECTS

FIRST YEAR OF INVESTIGATION



and also from infectious diseases with the latter divided into rates from diarrheal disease, measles, and other infectious diseases. In the two projects with the highest death rates from all causes, Recife and San Salvador Area, over one-half of all deaths under 5 years of age were due to infectious diseases as underlying causes. Of the 2,035 deaths in Recife, diarrheal disease was responsible for 634 deaths and measles for 327, and combined were responsible for 88 per cent of the 1,088 deaths from infectious diseases. Only 127 deaths were attributed to all other infective and parasitic diseases. Likewise, in San Salvador, 720 deaths were due to diarrheal diseases and 129 to measles, with 144 deaths remaining from all other infectious diseases.

Table 19. Deaths under 5 Years from Specific Infectious Diseases as Underlying Cause with Rates per 100,000 Population in 13 Projects, First Year of Investigation

Project	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
	Total (000-136)		Amebiasis (006)		Diarrheal disease (009)		Other intestinal diseases (Rest 000-009)		Tuberculosis (010-019)		Diphtheria (032)		Whooping cough (033)	
Cali	413	677.0	3	4.9	294	482.0	12	19.7	9	14.8	7	11.5	9	14.8
Cartagena	226	503.3	20	44.5	137	305.1	2	4.5	4	8.9	-		8	17.8
Chaco Province	408	1065.3	-		303	791.1	1	2.6	13	33.9	-		16	41.8
Kingston Area	259	285.9	-		184	203.1	3	3.3	3	3.3	3	3.3	13	14.3
La Paz Area	807	987.8	1	1.2	452	553.2	2	2.4	42	51.4	-		35	42.8
Medellín	303	627.3	10	20.7	212	438.9	8	16.6	10	20.7	1	2.1	1	2.1
Monterrey	993	719.6	93	67.4	573	415.2	33	23.9	42	30.4	2	1.4	17	12.3
Recife	1088	1600.0	-		634	932.4	13	19.1	33	48.5	13	19.1	18	26.5
Ribeirão Prêto Area	257	675.6	-		191	502.1	5	13.1	-		-		5	13.1
San Juan Province	362	715.4	-		234	462.5	3	5.9	7	13.8	-		13	25.7
San Salvador Area	903	1351.0	30	40.8	720	979.6	13	17.7	8	10.9	10	13.6	11	15.0
Santiago Area	253	293.5	-		201	233.2	6	7.0	3	3.5	1	1.2	1	1.2
São Paulo	782	602.0	-		565	434.9	15	11.5	14	10.8	6	4.6	21	16.2
	Tetanus (037)		Septicemia (038)		Measles (055)		Congenital syphilis (090)		Moniliasis (112)		Helminthiasis (120-129)		Other	
Cali	8	13.1	8	13.1	49	80.3	4	6.6	1	1.6	2	3.3	7	11.5
Cartagena	15	33.4	13	29.0	17	37.9	1	2.2	-		5	11.1	4	8.9
Chaco Province	12	31.3	5	13.1	47	122.7	4	10.4	-		1	2.6	6	15.7
Kingston Area	7	7.7	34	37.5	3	3.3	4	4.4	1	1.1	1	1.1	3	3.3
La Paz Area	-		14	17.1	244	298.7	2	2.4	-		1	1.2	14	17.1
Medellín	-		7	14.5	37	76.6	2	4.1	-		5	10.4	10	20.7
Monterrey	12	8.7	42	30.4	151	109.4	1	0.7	3	2.2	5	3.6	19	13.8
Recife	11	16.2	8	11.8	327	480.9	10	14.7	-		9	13.2	12	17.6
Ribeirão Prêto Area	1	2.6	4	10.5	36	94.6	1	2.6	-		-		14	36.8
San Juan Province	2	4.0	12	23.7	70	138.3	3	5.9	1	2.0	-		17	33.6
San Salvador Area	29	39.5	24	32.7	129	175.5	5	6.8	4	5.4	2	2.7	8	10.9
Santiago Area	-		18	20.9	7	8.1	2	2.3	-		-		14	16.2
São Paulo	6	4.6	21	16.2	81	62.4	9	6.9	7	5.4	3	2.3	34	26.2

On the other hand, in those areas with low mortality, such as the Santiago and the Kingston Areas, infectious diseases played a relatively minor role. In fact, in the Kingston Area, of the 1,003 deaths from all causes, only 259 were due to infectious diseases; of these, 184 were diarrheal disease and 3 were measles, with 72 from other diseases of the same group, primarily septicemia.

Specific aspects of these infective and parasitic diseases are discussed in this section.

Table 20. Deaths from other Infective and Parasitic Diseases in 13 Projects, First Year of Investigation

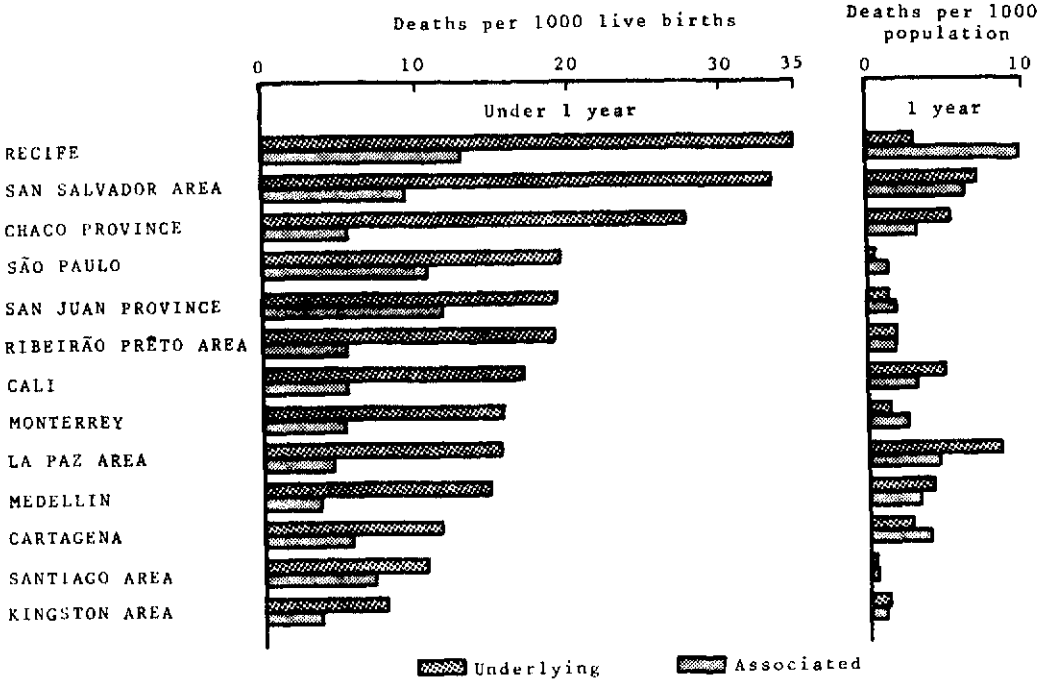
Project	Poliomyelitis (040-046)	Smallpox (050)	Mumps (072)	Infectious hepatitis (070)	Rabies (071)	Chickenpox (052)	Other viral	Toxoplasmosis (130)	Chagas' disease (086)	Meningococcal infection (036)	Other infective and parasitic diseases
Cali	-	-	-	3	1	-	1	1	-	-	1
Cartagena	2	-	-	-	-	-	1	-	-	1	-
Chaco Province	-	-	-	-	-	4	-	1	-	-	1
Kingston Area	-	-	-	1	-	-	2	-	-	-	-
La Paz Area	-	-	-	-	-	3	5	-	-	1	5
Medellín	1	-	-	3	-	3	1	-	-	-	2
Monterrey	2	-	-	5	-	9	1	-	-	-	2
Recife	2	-	-	1	-	4	4	-	-	-	1
Ribeirão Prêto Area	2	3	-	1	-	-	2	3	1	-	2
San Juan Province	-	-	1	1	-	6	5	-	3	1	-
San Salvador Area	-	-	2	2	-	1	1	-	-	-	2
Santiago Area	-	-	-	2	-	1	8	1	1	-	1
São Paulo	1	1	1	5	-	8	1	4	-	7	6

Diarrheal disease

Diarrheal disease, category 009, constitutes the major underlying cause of death within the group of infective and parasitic diseases in children under 5 years of age (Table 19). The death rates per 100,000 population vary from 203 to 980. Mortality due to diarrheal disease as an underlying or associated cause is much more serious in the first year of life than in the remaining age groups under study, as shown in Table 21 and Figure 29. In

Figure 29

DIARRHEAL DISEASE AS UNDERLYING AND ASSOCIATED CAUSES OF DEATHS FOR TWO AGE GROUPS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



infants, the death rates from diarrhea as underlying cause exceeds by far the rates from the same disease as associated cause. During the second year of life, however, not only mortality from diarrheal disease is much lower, but the difference between death rates of underlying and associated causes narrows and even becomes the reverse. During the second year of life, mortality due to diarrhea is higher in those projects in which nutritional deficiency is also high in this age period, such as in San Salvador Area and the three projects in Colombia and in the La Paz Area.

Table 21. Diarrheal Disease as Underlying and Associated Causes of Death for 3 Age Groups in 13 Projects, First Year of Investigation

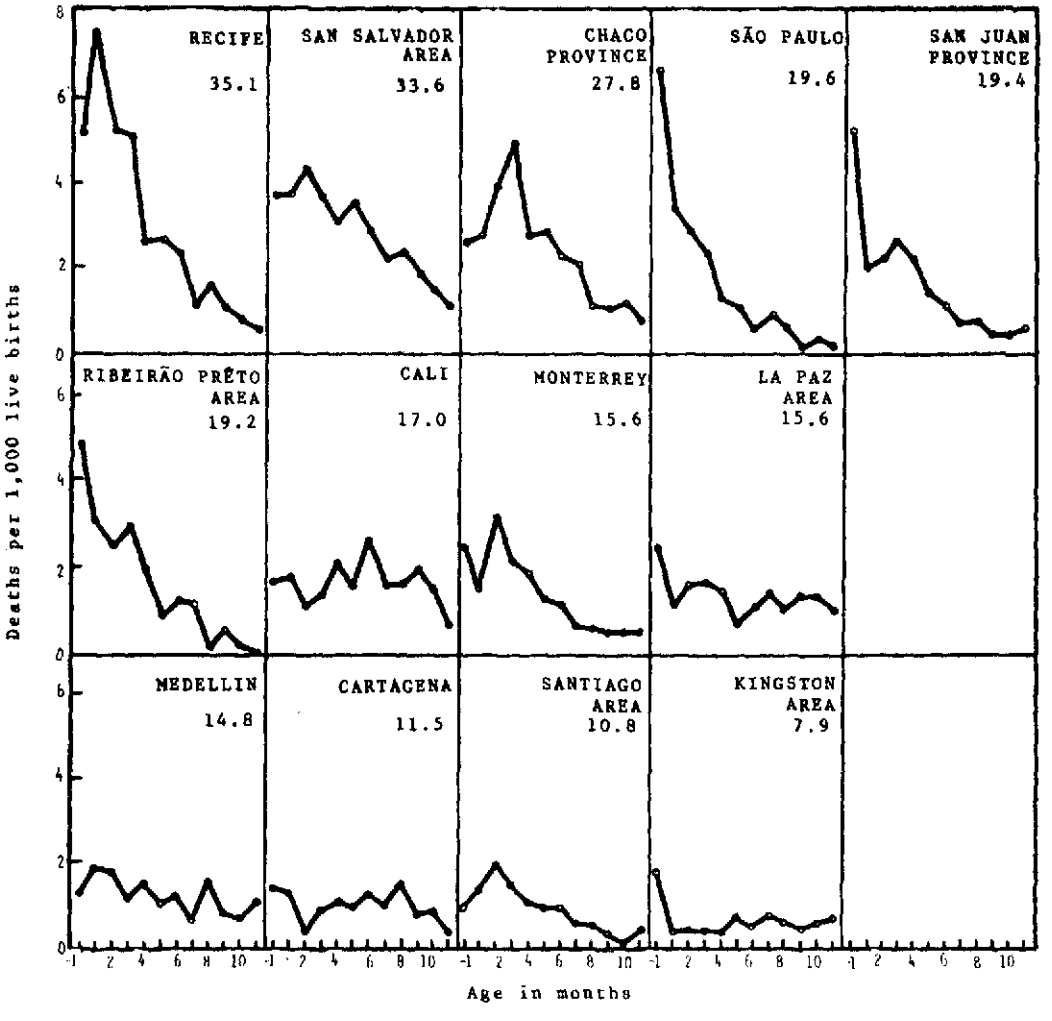
Project and type of cause	Total		Under 1 year		1 year		2-4 years	
	Number	Rate*	Number	Rate*	Number	Rate*	Number	Rate*
Cali								
Underlying	294	4.8	211	17.0	63	5.1	20	0.5
Associated	145	2.4	64	5.2	37	3.0	44	1.2
Cartagena								
Underlying	137	3.1	108	11.5	24	2.7	5	0.2
Associated	105	2.3	54	5.7	35	3.9	16	0.6
Chaco Province								
Underlying	303	7.9	247	27.8	42	5.3	14	0.6
Associated	88	2.3	48	5.4	25	3.2	15	0.7
Kingston Area								
Underlying	184	2.0	159	7.9	22	1.1	3	0.1
Associated	93	1.0	70	3.5	18	0.9	5	0.1
La Paz Area								
Underlying	452	5.5	272	15.6	140	8.6	40	0.8
Associated	196	2.4	79	4.5	76	4.7	41	0.8
Medellín								
Underlying	212	4.4	148	14.8	39	4.1	25	0.9
Associated	88	1.8	34	3.4	32	3.3	22	0.8
Monterrey								
Underlying	573	4.2	517	15.6	34	1.1	22	0.3
Associated	293	2.1	170	5.1	73	2.4	50	0.7
Recife								
Underlying	634	9.3	575	35.1	39	2.8	20	0.5
Associated	458	6.7	214	13.0	141	10.1	103	2.6
Ribeirão Prêto Area								
Underlying	191	5.0	170	19.2	14	1.8	7	0.3
Associated	73	1.9	45	5.1	13	1.7	15	0.7
San Juan Province								
Underlying	234	4.6	218	19.4	12	1.2	4	0.0
Associated	157	3.1	133	11.8	18	1.8	6	0.1
San Salvador Area								
Underlying	720	9.8	541	33.6	109	7.2	70	1.6
Associated	317	4.3	147	9.1	95	6.3	75	1.7
Santiago Area								
Underlying	201	2.3	186	10.8	9	0.5	6	0.1
Associated	134	1.6	120	7.0	10	0.6	4	0.1
São Paulo								
Underlying	565	4.3	546	19.6	11	0.4	8	0.1
Associated	345	2.7	293	10.5	28	1.1	24	0.3

*Under 1 year, rate per 1,000 live births; other rates per 1,000 population.

Mortality from diarrheal disease by month of age differs greatly among the projects as illustrated in Figure 30. In the first six projects shown, the rates from this disease are high and exhibit a marked concentration of deaths in the first six months of life. On the other hand, in the projects in Colombia, La Paz Area, and Kingston Area, the patterns are characterized by a relatively low and even distribution throughout the first year of life. The neonatal death rate from diarrheal disease is exceedingly high in Recife, São Paulo, San Juan Province and in Ribierão Prêto Area. The prevention of this excessive mortality in the neonatal period is, in part, a hospital problem, especially of premature wards. The prevention of mortality from diarrheal disease is obviously a problem that warrants major attention in developing countries.

Figure 30

INFANT MORTALITY FROM DIARRHEAL DISEASE BY MONTH OF AGE IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Measles

During the first year of the Investigation, epidemics of measles occurred in several of the projects. Mortality due to this disease was particularly high in Recife and La Paz, with rates of 481 and 299 per 100,000 population respectively, as shown in Figure 31. Santiago, where a vaccination program against this disease has been underway for several years, experienced very low mortality. Very few deaths occurred in the Kingston Area. In fact, during the period 1965-1968 there were only 4 to 14 deaths from measles in Jamaica.[13]

Study of the distribution of deaths from measles by age groups reveals that nearly all of these deaths occurred in children under 3 years of age with a peak in the 9-11 month or 12-14 month interval. As given in Table 22, in most areas in which measles mortality was excessive, approximately one-third of all deaths from this disease occurred in the first year of life, and of those, approximately one-half occurred in infants below nine months of age. This indicates that prevention of measles by immunization is needed before nine months of age. The monthly distribution of deaths from measles in the first year of the Investigation is shown in Appendix Table VI. The close interaction between measles and nutritional deficiency will be discussed in the section on nutritional deficiency.

Figure 31

MORTALITY UNDER 5 YEARS FROM MEASLES IN 13 PROJECTS,

FIRST YEAR OF INVESTIGATION

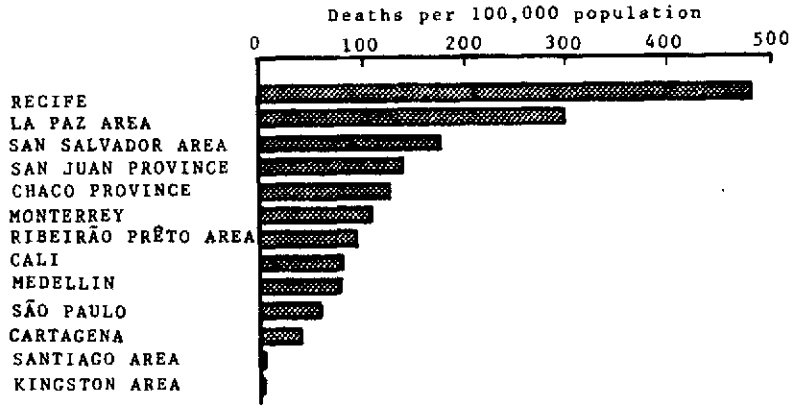


Table 22. Deaths from Measles by Age in 13 Projects, First Year of Investigation

Project	Total deaths	Under 1 year				1 year					2 yrs.	3 yrs.	4 yrs.
		Total	Age in months			Total	Age in months						
			0-5	6-8	9-11		12-14	15-17	18-20	21-23			
Cali	49	9	2	2	5	18	8	3	4	3	14	5	3
Cartagena	17	4	-	-	4	10	6	-	3	1	1	1	1
Chaco Province	47	20	5	10	2	18	7	4	5	1	5	1	3
Kingston Area	3	2	-	-	2	1	-	-	-	1	-	-	-
La Paz Area	244	69	14	21	34	99	39	23	20	17	40	26	10
Medellín	37	5	-	2	3	24	8	5	8	4	5	3	-
Monterrey	151	57	10	18	29	58	15	14	17	12	26	7	3
Recife	327	100	16	35	49	129	40	44	26	19	73	18	7
Ribeirão Prêto Area	36	11	4	3	4	8	3	3	1	1	9	7	1
San Juan Province	70	31	8	8	15	29	12	11	3	3	2	6	2
San Salvador Area	129	45	5	15	25	58	22	16	14	6	13	7	6
Santiago Area	7	4	2	1	1	3	1	1	-	1	-	-	-
São Paulo	81	25	4	11	10	29	13	7	7	2	17	6	4

Diphtheria, Whooping Cough and Tetanus

The numbers of deaths and death rates from diphtheria, whooping cough and tetanus are given in Table 19. During the first year of the Investigation, diphtheria was the underlying cause of 7 deaths in Cali, 13 in Recife and 10 in the San Salvador Area, resulting in rates of 11.5, 19.1 and 13.6 per 100,000 population, respectively. For whooping cough the highest rates were found in the La Paz Area and Chaco Province (42.8 and 41.8, respectively).

Tetanus mortality was greatest in the San Salvador Area, Cartagena and Chaco Province, with respective rates of 39.5, 33.4 and 31.3. Nearly all deaths from tetanus were of the neonatorum type and indicate the need for improvements in care of the newborn at delivery and provide justification for the development of preventive immunization programs for prospective mothers in those places in which significant numbers of deliveries take place at home.

Other Infective and Parasitic Diseases

As can be observed in Table 19, the La Paz Area and Recife have the highest mortality from tuberculosis with rates of 51.4 and 48.5 per 100,000 population, respectively. Two other projects, Chaco Province and Monterrey, also have high rates from tuberculosis, 33.9 and 30.4, respectively. The size of the death rates due to this disease indicate serious health problems in these areas.

Amebiasis was the underlying cause of 156 deaths of which 93 occurred in Monterrey and 30 in San Salvador Area. In addition, in 50 other deaths, amebiasis was an associated cause. The seriousness of this disease in certain areas is revealed by the nature of its complications and the age periods affected. In Monterrey, for instance, there were 81 infant deaths due to amebiasis as the underlying or associated cause which was two-thirds of the total deaths under 5 years of age involving amebiasis.

Congenital syphilis was the cause of 10 deaths in Recife and 9 in São Paulo. In total, there were 48 deaths due to congenital syphilis; this does not include deaths in which the underlying cause was maternal syphilis without manifested disease in the product.

In the column of other intestinal diseases in Table 19, typhoid fever was responsible for 7 deaths; other salmonellosis including paratyphoid fever produced 17 deaths; bacillary disentery was the underlying cause of 16 deaths and other enteric infections due to specific agents (category 008) caused 74 deaths in this group.

In 17 deaths, moniliasis was the underlying cause while it was an associated cause in 563 deaths. Likewise, 34 deaths were due to helminthiasis. This group of conditions (categories 120-129) contributed with 552 associated causes, often more than one type of helminthiasis was diagnosed in a deceased child.

The numbers of deaths from the remainder of the group of infectious diseases (last column of Table 19) are specified by cause in Table 20. Poliomyelitis produced only 10 deaths in all of these areas combined during the first year of the Investigation, distributed as follows: 2 each in Cartagena, Monterrey, Recife and Ribeirão Prêto Area, 1 in Medellín and 1 in São Paulo. Judging from the findings on vaccinations obtained through interviews with families of dead children, vaccination against poliomyelitis has been widely used in the areas of the Investigation.

Relatively few deaths were due to miscellaneous infectious diseases. The numbers of these deaths are given in Table 20.

Nutritional Deficiency

Measurement of the direct and indirect role of nutritional deficiencies in mortality has been a constant preoccupation and objective of this Investigation. The nutritional state of the children who die has been assessed by the use of all information available, such as weight at birth and successive body weights, clinical history and autopsy data. The Gomez classification and scale (14,15), based on the relationship of weights for age, applied to weight standards from Harvard(16) are being used for grading nutritional state. An effort has been made to determine whether nutritional deficiency is the underlying or an associated cause of death, following the rules of the International Classification of Diseases and rules developed in the Investigation. A group of experts in nutrition discussed in an internal meeting the nutritional aspects of the Investigation(17) and formulated recommendations regarding utilization of the results evolving from analysis of these data.

The role of nutritional deficiencies in mortality of infants and of children 1-4 years of age has been presented briefly in previous sections of this report. However, additional data are provided here regarding important aspects of their impact in specific age groups, the types of deficiencies found in deceased children, and their synergistic interrelationships with certain causes. The numbers of deceased children with nutritional deficiency as an underlying or associated cause in three age groups, under 1 year, 1 year, and 2-4 years, are given in Table 23. The death rates from nutritional defi-

Table 23. Nutritional Deficiency as Underlying or Associated Cause of Deaths for 3 Age Groups in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Under 1 year		1 year		2-4 years	
	Number	Rate*	Number	Rate*	Number	Rate*
Cali	185	14.9	107	8.7	81	2.2
Cartagena	137	14.6	82	9.2	33	1.2
Kingston	104	5.6	37	2.1	19	0.4
La Paz	335	19.7	203	12.7	101	2.1
Medellín	155	15.5	89	9.3	67	2.3
Monterrey	571	17.3	134	4.3	111	1.5
Recife	608	37.1	217	15.5	159	4.1
Resistencia	146	29.2	29	6.4	16	1.3
Ribeirão Prêto	71	15.8	12	2.9	16	1.3
San Juan	25	8.7	2	0.8	2	0.3
San Salvador	270	20.3	128	10.1	80	2.2
Santiago	230	14.6	31	2.0	15	0.3
São Paulo	559	20.1	77	3.0	58	0.7
Other area^						
Chaco, rural	103	26.4	45	13.2	16	1.6
Franca	61	24.1	11	5.5	12	2.3
San Juan, suburban	90	23.7	12	3.5	3	0.3
San Juan, rural	139	30.3	24	6.0	17	1.4
San Salvador, rural	88	31.4	68	28.3	77	12.0

*Excluding 4 other areas with insufficient deaths for analysis.

^Under 1 year, rate per 1,000 live births; 1-4 years, rate per 1,000 population.

ciency by age and the variation of their magnitude for the cities and other areas within the projects are shown in Figures 32 and 33. In later analysis of data for the two years of the Investigation, further subdivision may be possible by single years of age.

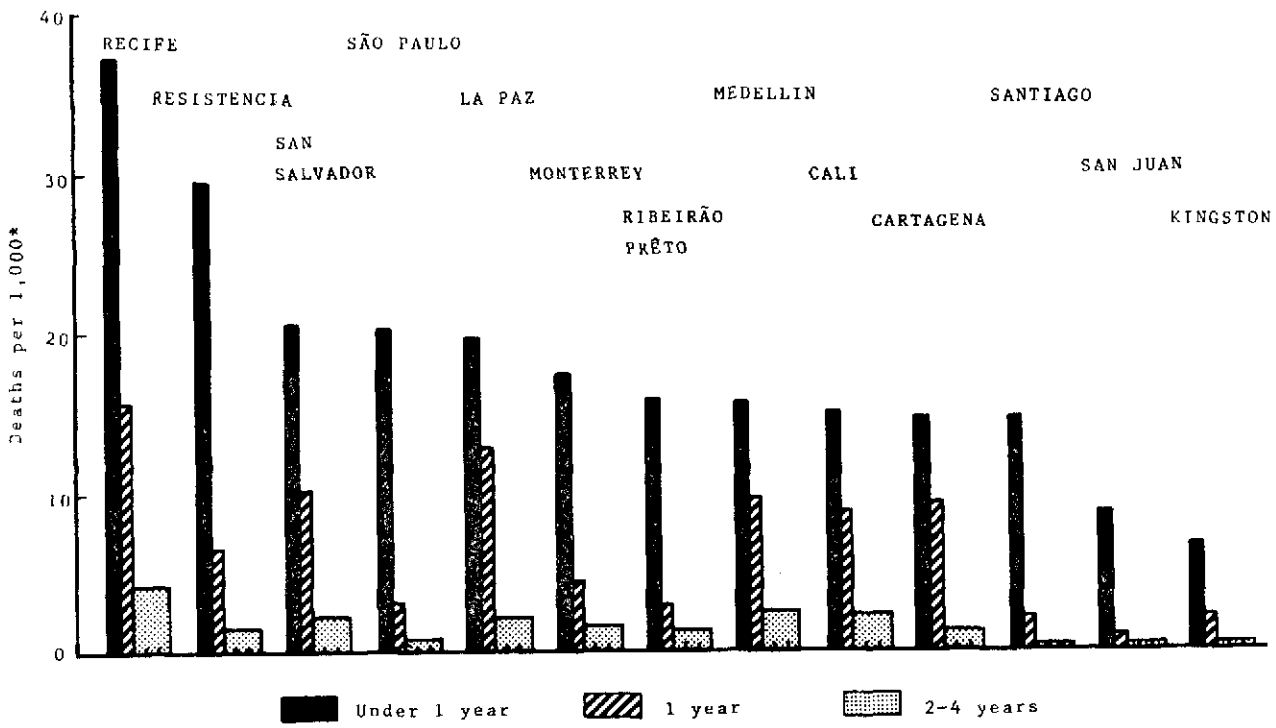
In both the urban and rural areas of all projects (with the exception of the rural communities of the San Salvador Area), mortality from this cause is much greater in the first year of life than in early childhood. The true impact of nutritional deficiency in early life is revealed only through the study of multiple causes as shown in Tables 9 and 18. The involvement of nutritional deficiency in infant mortality is apparent from the first months of life and indicates the need for measures leading toward prevention of deficiency states from their very origin. Some measures may have to be applied even in the prenatal period, in the form of insuring satisfactory nutritional state and medical attention to mothers during pregnancy.

In the second year of life, the death rates are also high in several cities; namely, Recife, La Paz, San Salvador and the three cities in Colombia. The problem of nutritional deficiency is much more serious in its contribution to mortality in children under 2 years of age than in older children.

Figure 32

NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSE OF DEATH

FOR THREE AGE GROUPS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

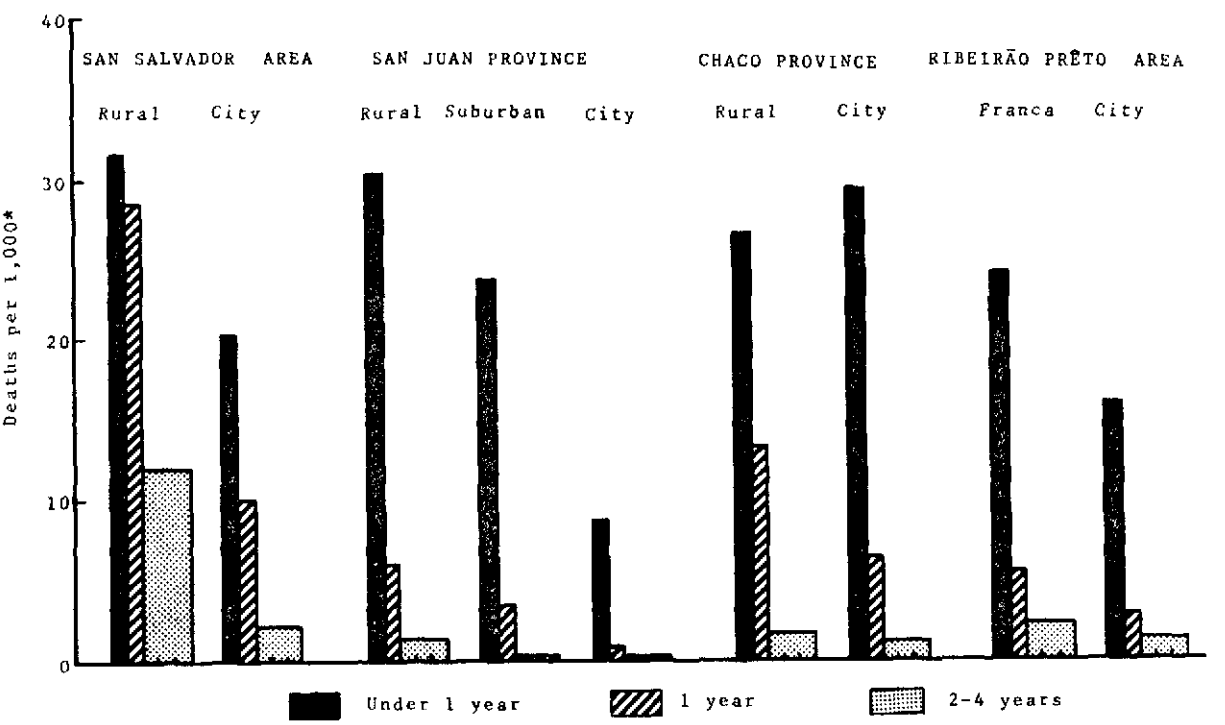


*Under 1 year: deaths per 1,000 live births
1-4 years: deaths per 1,000 population

In four projects in which both urban and rural areas are included, and for which sufficient data are available, the death rates are shown in Figure 33. In the projects, with the exception of Chaco Province, the rates are much higher in the rural areas than in the cities. The problem is particularly serious in the rural communities near San Salvador; the death rate at one year of age is nearly as high as the rate in infancy. Also, the rate for the age group 2-4 years of 10 per 1,000 population is much higher than in the other areas. At this time, although the data for rural areas are limited, they indicate that the problem of nutritional deficiency is greater in suburban and rural areas than in the cities. There is sufficient evidence to begin planning preventive programs for cities and even for larger programs in suburban and rural areas.

Figure 33

NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSE OF DEATH FOR THREE AGE GROUPS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



*Under 1 year: deaths per 1,000 live births
1-4 years: deaths per 1,000 population

The International Classification provides separate categories for specific avitaminoses, 260-266; for protein malnutrition, 267; for nutritional marasmus, 268; and for other and unspecified types of nutritional deficiency, 269. This latter category includes nutritional states in which there is insufficient information for assignment to a more specific category. In this Investigation, very few of the nutritional deficiency states which caused death, directly or indirectly, were specific avitaminoses. In fact, in only 15 deaths was an avitaminosis of the categories, 260-266, assigned, and in only one of these was the deficiency (vitamin C) assigned as the underlying cause of death. In all of the other deaths, one of the three categories, 267, 268 or 269, was assigned either as the underlying or an associated cause. Table 24 provides the numbers of deaths and death rates due to or associated with the following three categories of nutritional deficiency, protein malnutrition 267, nutritional marasmus 268 and other nutritional deficiency 269.

In infancy (under 1 year of age), relatively few deaths were attributed to protein malnutrition of the kwashiorkor type, while many more were from nutritional marasmus. In the cities from one-half to two-thirds of the deaths were assigned to the non-specific category, 269 (Figure 34), and were characterized by moderate or second degree malnutrition and by the unqualified forms of protein-calorie malnutrition.

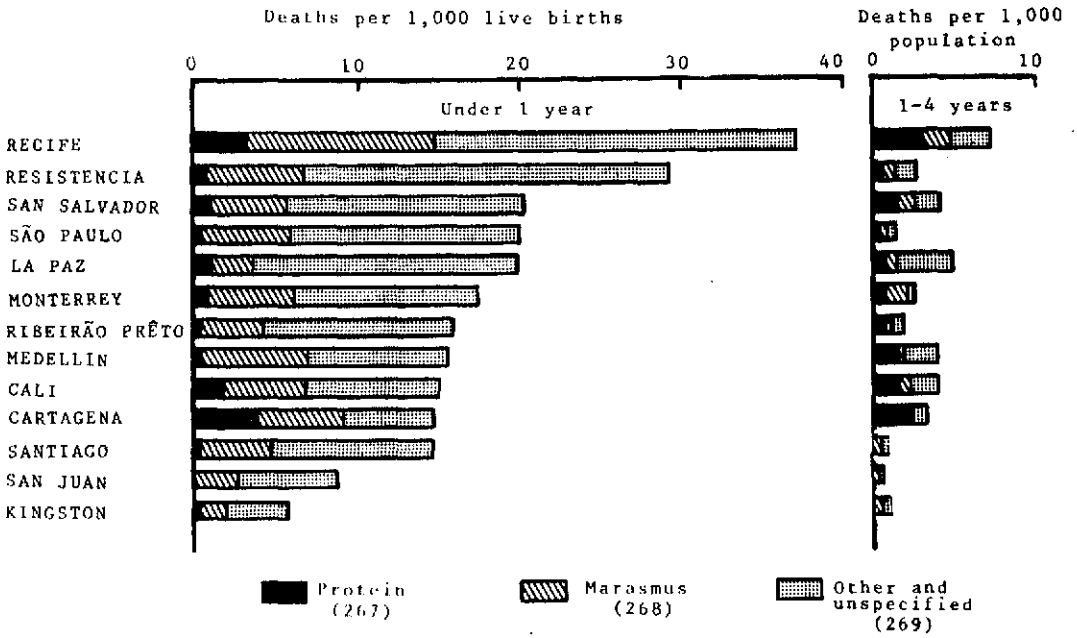
Table 24. Nutritional Deficiency as Underlying or Associated Cause of Deaths of Infants and Children 1-4 Years by Type of Deficiency in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Infant deaths								Children 1-4 years							
	Total		Protein malnutrition (267)		Marasmus (268)		Other (269)		Total		Protein malnutrition (267)		Marasmus (268)		Other (269)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	185*	14.9	18	1.5	65	5.2	101	8.1	188	3.8	73	1.5	28	0.6	87	1.8
Cartagena	137	14.6	35	3.7	31	3.3	71	7.6	115	3.2	71	2.0	8	0.2	36	1.0
Kingston	104	5.6	4	0.2	29	1.6	71	3.8	56	0.9	13	0.2	13	0.2	29	0.4
La Paz	335	19.7	15	0.9	43	2.5	277	16.3	304	4.8	42	0.7	37	0.6	225	3.5
Medellín	155**	15.5	2	0.2	64	6.4	87	8.7	156*	4.0	53	1.4	12	0.3	90	2.3
Monterrey	571	17.3	17	0.5	111	3.4	443	13.4	245^	2.3	65	0.6	44	0.4	136	1.3
Recife	608	37.1	50	3.0	190	11.6	368	22.4	376	7.1	152	2.9	94	1.8	130	2.4
Resistencia	146	29.2	3	0.6	35	7.0	108	21.6	45	2.7	8	0.5	13	0.8	24	1.5
Ribeirão Prêto	71	15.8	1	0.2	18	4.0	52	11.6	28	1.7	11	0.7	5	0.3	12	0.7
San Juan	25	8.7	-		7	2.4	18	6.3	4	0.4	-		1	0.1	3	0.3
San Salvador	270	20.3	11	0.8	62	4.7	197	14.8	208	4.2	70	1.4	51	1.0	87	1.7
Santiago	230**^	14.6	2	0.2	69	4.4	157	9.9	46^	0.7	6	0.1	9	0.1	31	0.5
São Paulo	559^	20.1	8	0.3	152	5.5	399	14.4	135^^	1.3	30	0.3	28	0.3	77	0.7
Other area																
Chaco, rural	103	26.4	3	0.8	7	1.8	93	23.8	61	4.5	7	0.5	7	0.5	47	3.5
Franca	61	24.1	1	0.4	17	6.7	43	17.0	23	3.2	3	0.4	2	0.3	18	2.5
San Juan, suburban	90	23.7	-		34	8.9	56	14.7	15	1.1	-		4	0.3	11	0.8
San Juan, rural	139	30.3	1	0.2	50	10.9	88	19.2	41	2.6	3	0.2	7	0.4	31	1.9
San Salvador, rural	88	31.4	9	3.2	11	3.9	68	24.3	145^^	16.5	78	8.9	28	3.2	39	4.4

* Includes one with category 260-266.
^ Excludes one associated cause with other nutritional deficiency.

Figure 34

MORTALITY IN INFANCY AND CHILDHOOD WITH NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSE BY TYPE OF DEFICIENCY IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



The pattern of death rates by type of nutritional deficiency was distinctly different in the 1-4 year age group. The clinical evidence was sufficient in over one-half of the deaths in 5 cities and 1 rural area for assignment to one of the specific categories. In Recife, of the deaths caused by or complicated by nutritional deficiency, the assignment was made to protein malnutrition in which edema was present in 152 or 40 per cent of the deaths and to nutritional marasmus in 94 or 25 per cent. Likewise, in San Salvador and in the rural communities near the city, protein malnutrition (267) accounted for high proportions of the deaths in this age group. In Cali, Medellín and Cartagena, Colombia, protein malnutrition was a serious cause of death in children in this age group with rates of 1.4-2.0 per 1,000 population. In Figure 35, the rates are shown for the urban and rural areas for these two age groups.

In order to clarify the relationship of nutritional deficiency as an associated cause of death to the underlying causes, deaths under 5 years, excluding neonatal deaths, have been combined in three broad groups of causes. Neonatal deaths have a distinct pattern, principally involving conditions present at birth and immaturity, and thus do not contribute to this analysis of nutritional deficiency by underlying causes. Data for postneonatal deaths and for deaths 1-4 years of age have been combined in Table 25 for the following three groups of underlying causes, infective and parasitic diseases (000-136),

Figure 35

MORTALITY IN INFANCY AND CHILDHOOD WITH NUTRITIONAL DEFICIENCY AS UNDERLYING OR ASSOCIATED CAUSE BY TYPE OF DEFICIENCY IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION

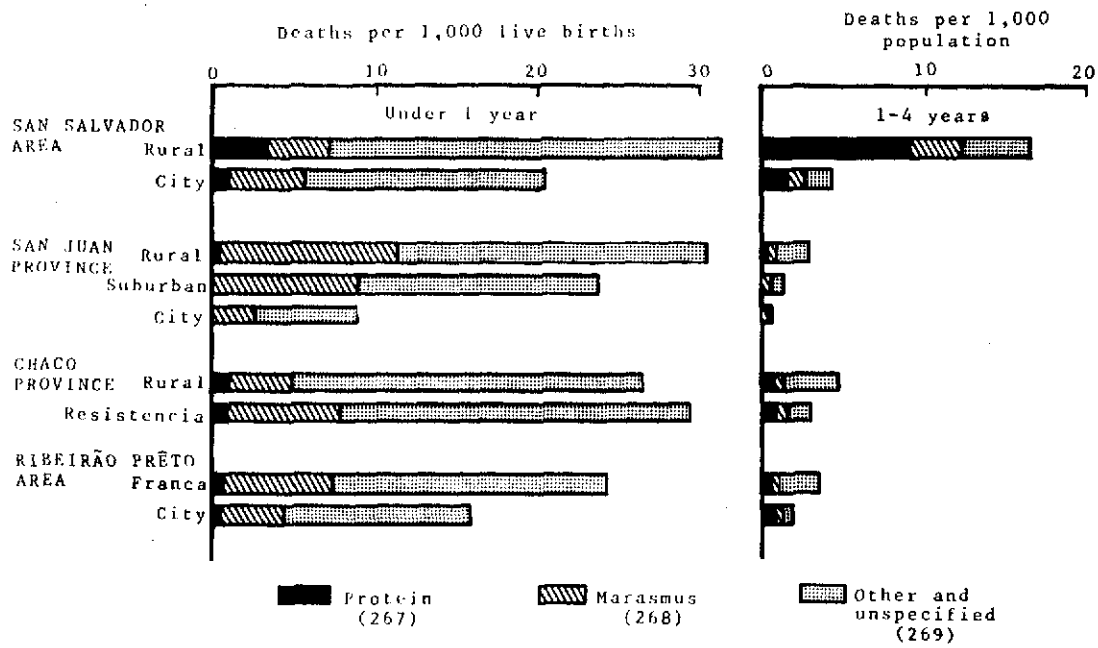


Figure 36

FREQUENCY OF NUTRITIONAL DEFICIENCY AS ASSOCIATED CAUSE FOR THREE GROUPS OF UNDERLYING CAUSES OF DEATHS UNDER 5 YEARS, EXCLUDING NEONATAL DEATHS, IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

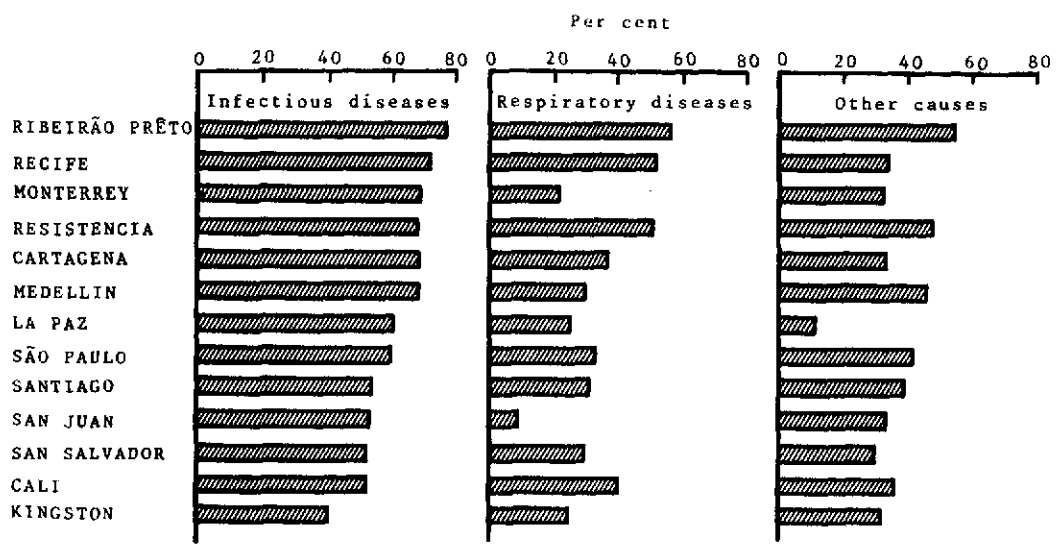


Table 25. Nutritional Deficiency as an Associated Cause of Death under 5 Years, Excluding Neonatal Deaths, by Underlying Cause Group in Central Cities and 5 Other Areas, First Year of Investigation

Underlying cause	Total deaths	With nutritional deficiency		Total deaths	With nutritional deficiency		Total deaths	With nutritional deficiency		Total deaths	With nutritional deficiency		Total deaths	With nutritional deficiency	
		Number	Per cent		Number	Per cent		Number	Per cent		Number	Per cent		Number	Per cent
	Cali			Cartagena			Kingston			La Paz			Medellín		
All causes	667	266	39.9	403	176	43.7	413	131	31.7	1366	556	40.7	501	254	50.7
Infective and parasitic diseases	373	196	52.5	191	129	67.5	171	68	39.8	722	433	60.0	283	189	66.8
Diarrheal disease	275	141	51.3	125	80	64.0	143	58	40.6	395	266	67.3	200	124	62.0
Measles	49	32	65.3	17	16	94.1	3	1	*	236	119	50.4	37	31	83.8
Other	49	23	46.9	49	33	67.3	25	9	36.0	91	48	52.7	46	34	73.9
Nutritional deficiency	106	-		74	-		26	-		50	-		54	-	
Diseases of respiratory system	83	33	39.8	61	22	36.1	63	15	23.8	423	104	24.6	55	16	29.1
Other causes	105	37	35.2	77	25	32.5	153	48	31.4	171	19	11.1	109	49	45.0
	Monterrey			Recife			Resistencia			Ribeirão Prêto			San Juan		
All causes	1465	721	49.2	1471	880	59.8	298	170	57.0	143	96	67.1	65	24	36.9
Infective and parasitic diseases	854	578	67.7	993	704	70.9	185	125	67.6	91	69	75.8	30	16	53.3
Diarrheal disease	497	321	64.6	559	393	70.3	147	99	67.3	57	43	75.4	19	13	68.4
Measles	151	106	70.2	327	243	74.3	21	14	66.7	24	17	70.8	6	2	*
Other	206	151	73.3	107	68	63.6	17	12	70.6	10	9	90.0	5	1	*
Nutritional deficiency	64	-		84	-		20	-		3	-		2	-	
Diseases of respiratory system	291	62	21.3	232	118	50.9	46	23	50.0	25	14	56.0	12	1	8.3
Other causes	256	81	31.6	172	58	33.7	47	22	46.8	24	13	54.2	21	7	33.3
	San Salvador			Santiago			São Paulo								
All causes	973	414	42.5	606	235	38.8	1235	558	45.2						
Infective and parasitic diseases	624	328	52.6	197	106	53.8	568	336	59.2						
Diarrheal disease	468	226	48.3	167	87	52.1	394	248	62.9						
Measles	91	63	69.2	?	?	*	81	42	51.9						
Other	65	39	60.0	23	12	52.2	93	46	49.5						
Nutritional deficiency	58	2	3.4	36	1	2.8	72	2	2.8						
Diseases of respiratory system	167	48	28.7	186	57	30.6	273	89	32.6						
Other causes	124	36	29.0	187	71	38.0	322	131	40.7						
Other area	Chaco, rural			Franca			San Juan, suburban			San Juan, rural			San Salvador, rural		
All causes	318	153	48.1	141	69	48.9	207	80	38.6	357	140	39.2	392	173	44.4
Infective and parasitic diseases	183	115	62.8	78	51	65.4	89	46	52.8	170	84	49.4	257	147	57.6
Diarrheal disease	136	91	66.9	64	44	68.8	52	31	61.5	105	56	53.3	196	107	54.6
Measles	26	14	53.8	6	3	*	22	8	36.4	42	15	35.7	37	28	78.4
Other	21	10	47.6	8	4	*	15	7	46.7	23	13	56.5	24	12	50.0
Nutritional deficiency	9	-		12	-		19	-		29	-		56	1	1.8
Diseases of respiratory system	72	27	24.5	22	10	45.5	54	19	35.2	95	37	38.9	38	15	39.5
Other causes	54	11	20.4	29	8	27.6	45	15	33.3	63	19	30.2	41	10	24.4

* Per cent not calculated for base less than 10.

diseases of the respiratory system (460-519) and all other causes, excluding nutritional deficiency. The percentages of these deaths with nutritional deficiency as an associated cause are shown in Figure 36 for 13 cities.

For deaths with infectious diseases as the underlying cause the percentage with an associated nutritional deficiency varied from 40 for Kingston to 71 for Recife and 76 for Ribeirão Prêto. For the other two groups of underlying causes the corresponding percentage were lower. These findings are in accordance with previous research indicating the importance of the host as well as the infectious agent in the development of disease. In addition, they indicate the need for consideration of the interrelationships between diseases as a basis for community action.

As pointed out in the previous section, the two principal infectious diseases are diarrheal disease and measles. Table 25 also provides data regarding the number and percentages of such deaths in which nutritional deficiency was an associated cause. For diarrheal disease, the percentages of the deaths with nutritional deficiency also were over 70 per cent in Recife and Ribeirão Prêto. In early infancy, nutritional deficiency is frequently a result (consequence) of repeated episodes of diarrheal disease. Later in infancy and in early childhood, the deficiency state acts more often as a contributory cause of deaths due to specific causes such as measles.

In projects with high death rates from measles, such as Recife, nutritional deficiency was an associated cause (usually contributory) in high percentages of the deaths (74 per cent in Recife). This interrelationship between nutritional deficiency and infectious diseases in early childhood is probably a major factor in the excessive death rates from measles, both in the size of the death rate and in the age group affected. These interrelationships also indicate the need for combined actions for prevention of infections and improvement of the nutritional state, within the context of comprehensive health programs.

Congenital Anomalies

In this section for discussion of the role of congenital anomalies in mortality in infancy and early childhood, there are included those conditions listed in categories 740-759 (section of congenital anomalies) of the International Calssification of Diseases and also other anomalies present at birth, such as congenital hernias, congenital blindness and deafness, congenital phimosis, and congenital dento-facial anomalies which appear in other categories of the Classification. Appendix Table VII provides detailed data by three-digit categories of the deaths under 5 years of age included in this discussion of congenital anomalies. In Appendix Table I, however, and other sections of this report, inclusions under the term "congenital anomalies" are restricted to categories 740-759 of the International Classification in order to allow comparisons at the international basis.

In the Investigation, congenital anomalies have been classified as underlying or associated causes of death and also as anomalies which were present but were not part of the process of death either as underlying or associated causes. For this report, however, only the anomalies that were significant as causes of death (underlying or associated) have been analyzed. Since the numbers of deaths with anomalies were small for several areas, combined data for the projects are presented.

Table 26 gives the number of deceased infants and children 1-4 years of age with anomalies as underlying or associated causes of death. Duplication within systems has been eliminated in this presentation even though more than one anomaly of the same system may have been coded, so that the number of infants with anomalies in a given system can be obtained easily. The total number of infants with congenital anomalies is the sum of those with anomalies

Table 26. Congenital Anomalies as Underlying or Associated Causes of Death of Infants and Children 1-4 Years in 13 Projects, First Year of Investigation

Project	Under 1 year*						1-4 years**					
	Total		Underlying		Associated		Total		Underlying		Associated	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	49	4.0	31	2.5	18	1.5	12	0.2	9	0.2	3	0.1
Cartagena	42	4.5	26	2.8	16	1.7	8	0.2	6	0.2	2	0.1
Chaco Province	31	3.5	26	2.9	5	0.6	6	0.2	5	0.2	1	0.0
Kingston Area	92	4.6	74	3.7	18	0.9	20	0.3	18	0.3	2	0.0
La Paz Area	32	1.8	22	1.3	10	0.6	5	0.1	2	0.0	3	0.0
Medellín	48	4.8	36	3.6	12	1.2	18	0.5	13	0.3	5	0.1
Monterrey	170	5.1	133	4.0	37	1.1	25	0.2	17	0.2	8	0.1
Recife	79	4.8	50	3.0	29	1.8	8	0.2	4	0.1	4	0.1
Ribeirão Prêto	41	4.6	32	3.6	9	1.0	3	0.1	2	0.1	1	0.0
San Juan Province	49	4.4	32	2.8	17	1.5	11	0.3	8	0.2	3	0.1
San Salvador Area	86	5.3	61	3.8	25	1.6	12	0.2	7	0.1	5	0.1
Santiago Area	98	5.7	69	4.0	29	1.7	23	0.3	16	0.2	7	0.1
São Paulo	152	5.5	110	4.0	42	1.5	24	0.2	15	0.1	9	0.1

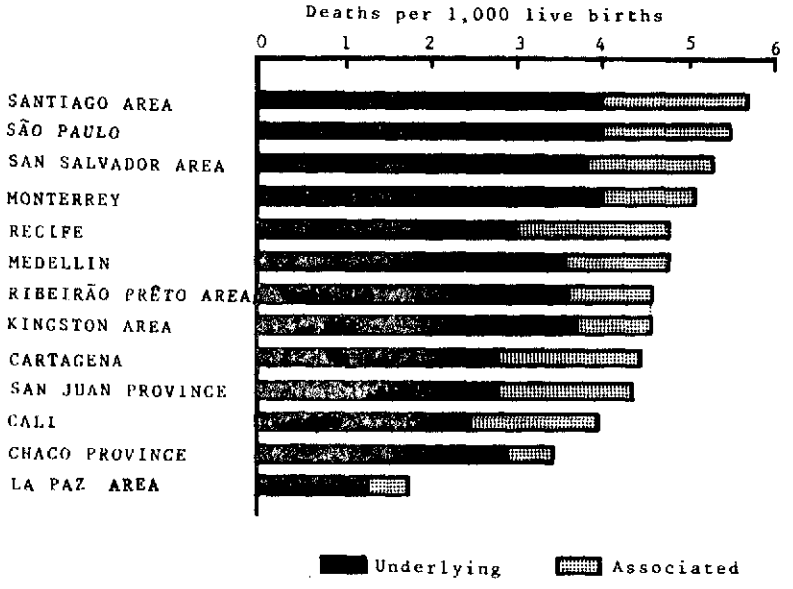
*Rate per 1,000 live births
**Rate per 1,000 population

as underlying cause plus the number with anomalies as associated causes only. For example, in Cartagena 26 infants had anomalies as the underlying cause of death and 16 as associated causes of death from underlying causes other than a congenital anomaly.

The rate per 1,000 live births of infants with congenital anomalies reported as underlying or associated causes of death varied between 1.8 in La Paz and 5.7 in the Santiago Area (Figure 37). Anomalies serious enough to be

Figure 37

CONGENITAL ANOMALIES AS UNDERLYING OR ASSOCIATED CAUSE OF DEATHS OF INFANTS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



considered one of the causes of death were generally the underlying cause of death. For 72 per cent of the deceased infants with one or more congenital anomalies as causes of death, an anomaly was the underlying cause; for only 28 per cent, the anomalies acted as associated causes.

Differences in completeness of registration, particularly of those deaths occurring in the first few days of life, can seriously affect the quality of data related to serious congenital anomalies. For example, information on several of the major anomalies of the central nervous system, like anencephalus, was obtained in one project only from the delivery book in searching for missing deaths. Congenital anomalies of the cardiovascular system seem to be more frequent in premature children[18] and their recognition as causes of death requires the inclusion of all deaths of these low birth weight babies.

Table 27. Specific Types of Congenital Anomalies as Underlying or Associated Causes of Death of Infants in 13 Projects, First Year of Investigation

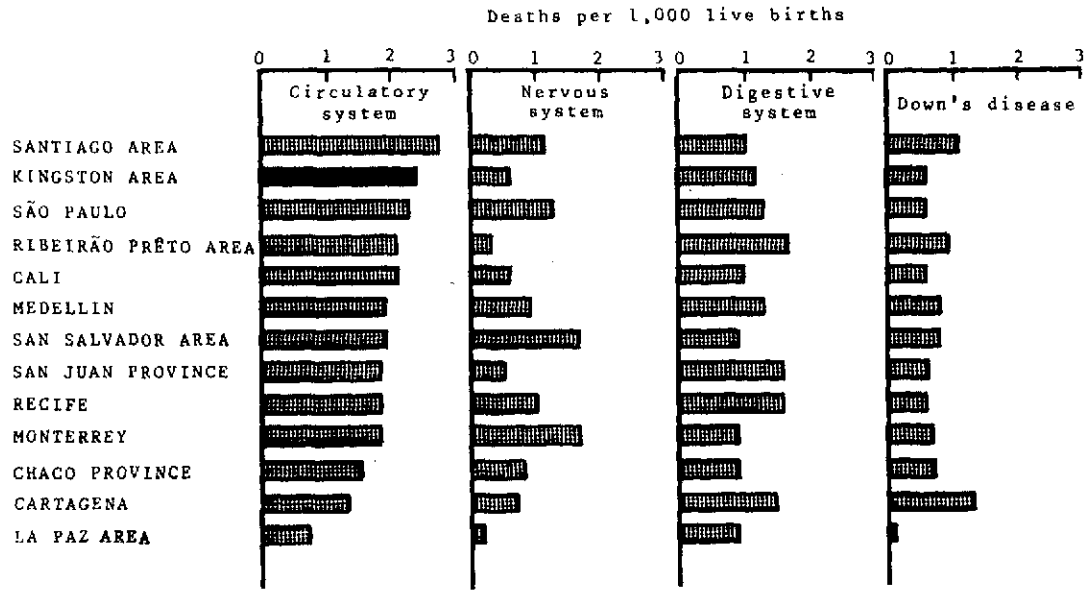
Project	Circulatory system		Nervous system		Digestive system		Down's disease	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Cali	26	2.1	7	0.6	13	1.0	8	0.6
Cartagena	12	1.3	7	0.7	14	1.5	12	1.3
Chaco Province	13	1.5	7	0.8	8	0.9	6	0.7
Kingston Area	48	2.4	12	0.6	25	1.2	13	0.6
La Paz Area	12	0.7	3	0.2	15	0.9	2	0.1
Medellín	19	1.9	9	0.9	13	1.3	8	0.8
Monterrey	58	1.8	55	1.7	29	0.9	23	0.7
Recife	29	1.8	16	1.0	26	1.6	10	0.6
Ribeirão Prêto Area	19	2.1	3	0.3	15	1.7	8	0.9
San Juan Province	20	1.8	6	0.5	18	1.6	7	0.6
San Salvador Area	30	1.9	27	1.7	15	0.9	13	0.8
Santiago Area	47	2.7	19	1.1	17	1.0	19	1.1
São Paulo	64	2.3	35	1.3	36	1.3	18	0.6

Also, the quantitative and qualitative aspects of clinical and autopsy records may influence the completeness of data related to internal congenital anomalies. In spite of these limitations, some apparent differences are intriguing as noted from data in Table 27 and Figure 38. For instance, in San Salvador and Monterrey, there appear to be relatively high rates from major anomalies of the central nervous system. These serious anomalies of the central nervous system as well as Down's disease are usually easy to recognize without an autopsy.

On the other hand, the death rate of infants with congenital anomalies of the circulatory system (usually heart and great vessels) in Santiago is twice the rate in Cartagena. It is interesting to note that with the exception of projects in La Paz and Chaco Province, the other projects have infant death rates from these anomalies similar to those found in previous decades in the United States (as underlying causes) where a decreasing trend has been observed.[19]

Figure 38

SPECIFIC CONGENITAL ANOMALIES AS UNDERLYING OR ASSOCIATED CAUSE OF DEATHS OF INFANTS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



It is expected that analysis of the material for the two years of the Investigation will permit a better definition of possible differences in death rates from congenital anomalies and of their relationships with other causes and factors.

Other Specific Causes

A few other causes have been studied at this time, either because of their volume or their special interest. These are diseases of the respiratory system, diseases of the nervous system and sense organs and malignant neoplasms. Brief presentations of these three groups of causes follow.

Diseases of the Respiratory System

This broad group is constituted by acute upper respiratory infections, acute bronchitis and bronchiolitis, influenza, the pneumonias and other diseases of the respiratory system. It does not include specific infections such as tuberculosis, whooping cough or any other morbid condition included in the Section of Infective and Parasitic Diseases of the International Classification of Diseases. Deaths from this group of diseases as underlying or associated causes in two age groups is given in Table 28, and the death rates are shown in Figure 39. Respiratory diseases are a problem, particularly,

in the first year of life, as revealed by death rates as underlying cause ranging from 27.0 per 1,000 live births in La Paz Area to 3.3 in the Kingston Area. The death rates for these diseases as associated causes range from 32.3 in Recife to a low of 6.4 in the Kingston Area. Thus, the problem is much greater when the associated as well as the underlying causes are considered.

Table 28. Diseases of the Respiratory and Nervous Systems as Underlying and Associated Causes of Death for Two Age Groups in 13 Projects, First Year of Investigation

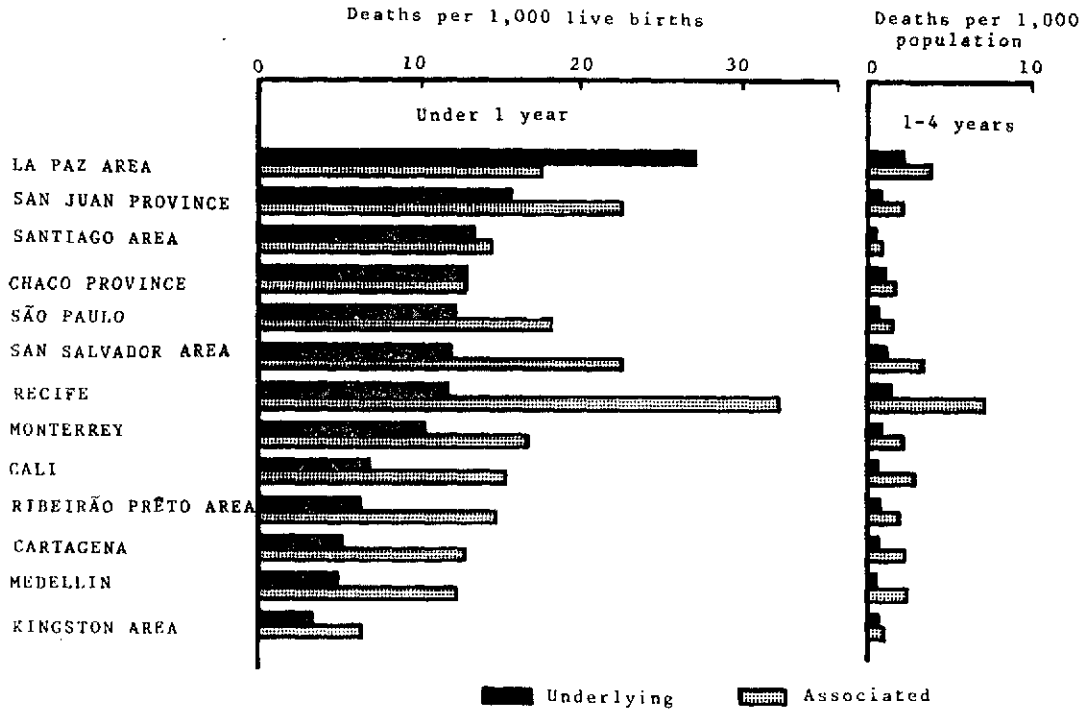
Project	Diseases of respiratory system				Diseases of nervous system			
	- 1 year		1-4 years		- 1 year		1-4 years	
	Number	Rate*	Number	Rate*	Number	Rate*	Number	Rate*
Cali								
Underlying	86	6.9	24	0.5	16	1.3	16	0.3
Associated	191	15.4	136	2.8	16	1.3	19	0.4
Cartagena								
Underlying	48	5.1	22	0.6	8	0.9	5	0.1
Associated	120	12.8	79	2.2	19	2.0	9	0.3
Chaco Province								
Underlying	114	12.8	25	0.8	18	2.0	6	0.2
Associated	112	12.6	45	1.5	23	2.6	10	0.3
Kingston Area								
Underlying	67	3.3	26	0.4	13	0.6	18	0.3
Associated	130	6.4	57	0.8	31	1.5	11	0.2
La Paz Area								
Underlying	469	27.0	129	2.0	12	0.7	12	0.2
Associated	301	17.3	238	3.6	12	0.7	19	0.3
Medellín								
Underlying	50	5.0	12	0.3	12	1.2	5	0.1
Associated	123	12.3	90	2.3	20	2.0	23	0.6
Monterrey								
Underlying	311	9.4	66	0.6	49	1.5	10	0.1
Associated	551	16.6	208	2.0	98	3.0	38	0.4
Recife								
Underlying	192	11.7	77	1.4	27	1.6	25	0.5
Associated	529	32.3	376	7.1	56	3.4	33	0.6
Ribeirão Prêto Area								
Underlying	55	6.2	17	0.6	18	2.0	7	0.2
Associated	130	14.7	53	1.8	24	2.7	15	0.5
San Juan Province								
Underlying	174	15.5	23	0.6	24	2.1	11	0.3
Associated	253	22.5	78	2.0	44	3.9	17	0.4
San Salvador Area								
Underlying	191	11.9	46	0.8	13	0.8	13	0.2
Associated	362	22.5	196	3.3	34	2.1	17	0.3
Santiago Area								
Underlying	228	13.2	18	0.3	47	2.7	20	0.3
Associated	244	14.2	45	0.7	37	2.1	9	0.1
São Paulo								
Underlying	337	12.1	50	0.5	118	4.2	20	0.2
Associated	506	18.2	139	1.3	73	2.6	18	0.2

*Under 1 year, rate per 1,000 live births; 1-4 years, rate per 1,000 population.

High proportions of conditions of this broad group are found in the categories 485 for bronchopneumonia and 486 for pneumonia of unspecified type, which are frequently acting as terminal conditions. Thus, their rates as associated causes are more likely to be high in those areas in which mortality from diseases such as measles, diarrhea and nutritional deficiency is also high.

Figure 39

DISEASES OF RESPIRATORY SYSTEM AS UNDERLYING AND ASSOCIATED CAUSES OF DEATHS OF INFANTS AND CHILDREN 1-4 YEARS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION

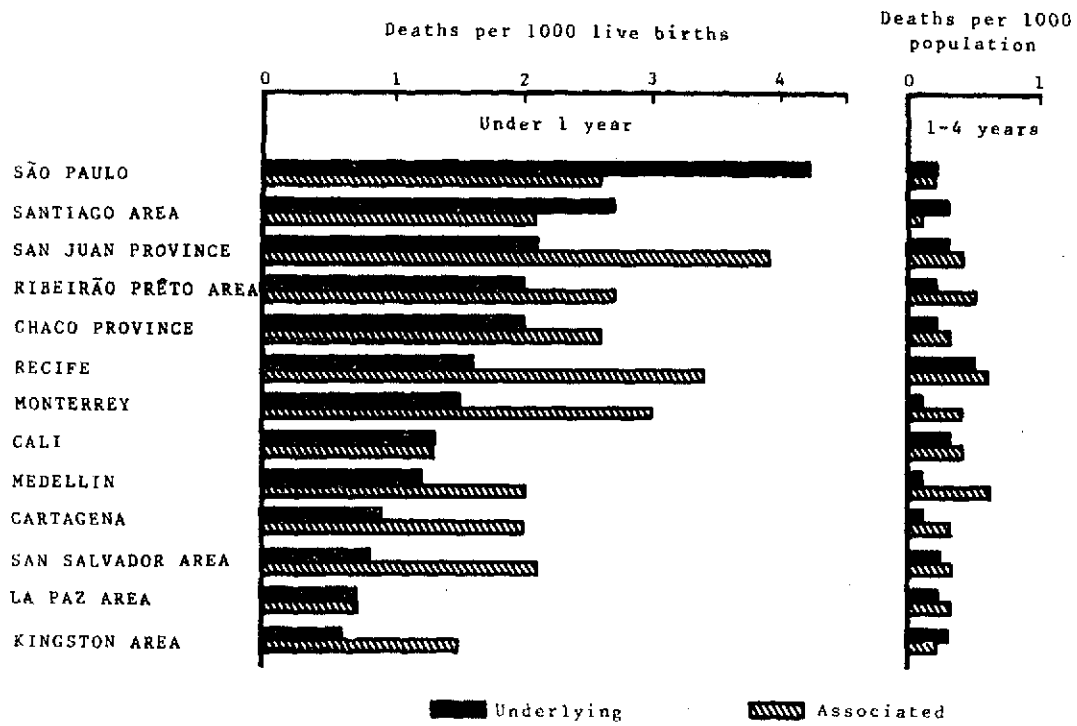


Diseases of the Nervous System and Sense Organs

This broad group of causes is composed of inflammatory diseases of the central nervous system, hereditary and familial diseases of the nervous system, cerebral spastic infantile paralysis, epilepsy and other diseases of the nervous system and sense organs. As given in Table 28 and shown in Figure 40, mortality due to these diseases is by far more important in the first year of life than in later years. Many of these deaths are produced by the inflammatory diseases of the central nervous system and of the ear. The death rates under 1 year of age from these diseases ranged from 4.2 in São Paulo to 0.6 per 1,000 live births in the Kingston Area.

Figure 40

DISEASES OF NERVOUS SYSTEM AND SENSE ORGANS AS UNDERLYING AND ASSOCIATED CAUSES OF DEATHS OF INFANTS AND CHILDREN 1-4 YEARS OF AGE IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Death rates from this group of diseases as associated causes were higher than the corresponding rates for underlying causes in both age groups, with a few exceptions, notably São Paulo and Santiago Area. Local medical and pathological practices as well as the quality of clinical autopsy records are responsible for apparent important differences in patterns of mortality by the diseases included in this broad group. This is particularly true for the inflammatory conditions of the central nervous system and of the ear, such as meningitis and otitis media.

Malignant Neoplasms

During the first year of the Investigation there were 72 deaths due to malignant neoplasms among those studied. Of these, 32 were leukemias. The distribution of the 72 deaths in the 13 projects is presented in Table 29. Four projects, the Kingston Area, Medellín, the Ribierão Prêto Area and São Paulo had high rates of 10-13 per 100,000 population under 5 years of age for all types of malignant neoplasms combined. There was less variation among the projects in the rates for leukemia than for those for other malignant neoplasms. Further analysis will be made by age, type and diagnostic evidence when data for the two years are available.

Table 29. Deaths under 5 Years from Malignant Neoplasms with Rates per 100,000 Population in 13 Projects, First Year of Investigation

Project	Total malignant neoplasms		Leukemia		Other malignant neoplasms	
	Number	Rate	Number	Rate	Number	Rate
Cali	3	4.9	2	3.3	1	1.6
Cartagena	4	8.9	2	4.5	2	4.5
Chaco Province	2	5.2	-		2	5.2
Kingston Area	12	13.2	5	5.5	7	7.7
La Paz Area	7	8.6	2	2.4	5	6.1
Medellín	6	12.4	2	4.1	4	8.3
Monterrey	4	2.9	2	1.4	2	1.4
Recife	1	1.5	1	1.5	-	
Ribeirão Prêto Area	4	10.5	2	5.3	2	5.3
San Juan Province	4	7.9	3	5.9	1	2.0
San Salvador Area	2	2.7	-		2	2.7
Santiago Area	7	8.1	4	4.6	3	3.5
São Paulo	16	12.3	7	5.4	9	6.9

IV. MEDICAL AND HEALTH SERVICES

Medical and health services provided to mothers during their pregnancies and for deliveries of the children included in the Investigation, as well as the medical attention to those children, can be studied from data collected in interviews with the families. In certain instances, data from hospitals or other sources complemented the information obtained in home interviews. In this report, reference will be made to services and indicators pertaining to deceased children and their mothers. Later, such information will become available for the general population of these areas from the probability sample of households so that comparisons may be made. It is hoped that the following brief presentation will stimulate actions directed toward solving the problems indicated, as well as the initiation of studies regarding factors regulating the qualitative and quantitative aspects of health services and their utilization.

Interviews with families of deceased children were carried out in 90 per cent or more of the deaths in 5 cities and 7 other areas (Appendix Table IX). All families were interviewed in rural St. Andrew and high proportions in the projects of Chaco and San Juan Provinces and the San Salvador Area. Several projects, particularly those in Colombia and Bolivia, experienced great difficulty in locating families, in large part due to unsatisfactory addresses on death certificates and hospital records.

In order to obtain information on the reproductive history and prenatal care of the mother, and on facts about the delivery, breast feeding, and growth and development of the child, the mother was considered the preferable source of information in the home. In a few areas, the father preferred to provide the information to the nurse or social worker, and in others the grandmother often was the source of the data. Appendix Table IX gives the numbers and percentages of families of deceased children with family interviews and those in which the mother provided the data.

Prenatal Care

Close surveillance is required if the serious complications of pregnancy and delivery are to be discovered early enough to avoid excessive loss of life. The success in collecting this important information varied among the projects, depending on the possibility of carrying out family interviews; thus, the data presented here relate only to mothers in families with interviews.

For consideration of the prenatal care received by these mothers, the data are sufficient for combining into three groups (1) those with at least four prenatal visits to a doctor or clinic, (2) those with one, two or three visits, including those in which at least one visit was made but the total number was not known, and (3) those with no visits or with no information available regarding prenatal care (Table 30). As shown in Figure 41, the city of San Juan was found to have the highest percentage of mothers with

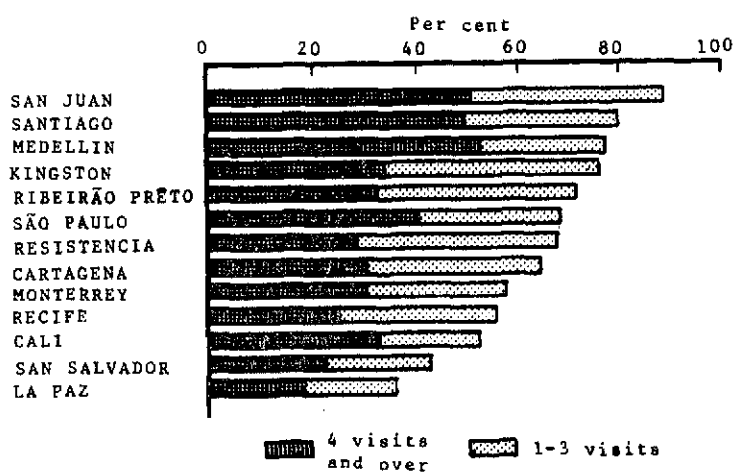
Table 30. Visits for Prenatal Care of Mothers of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total mothers*	4 visits and over		1-3 visits		None and unspecified	
		Number	Per cent	Number	Per cent	Number	Per cent
Cali	667	220	33.0	135	20.2	312	46.8
Cartagena	410	124	30.2	141	34.4	145	35.4
Kingston	841	285	33.9	357	42.4	199	23.7
La Paz	1,078	191	17.7	204	18.9	683	63.4
Medellín	497	264	53.1	121	24.3	112	22.5
Monterrey	1,809	544	30.1	502	27.8	763	42.2
Recife	1,817	459	25.3	568	31.3	790	43.5
Resistencia	428	122	28.5	167	39.0	139	32.5
Ribeirão Prêto	226	73	32.3	89	39.4	64	28.3
San Juan	128	65	50.8	49	38.3	14	10.9
San Salvador	1,273	287	22.5	264	20.7	722	56.7
Santiago	743	372	50.1	224	30.1	147	19.8
São Paulo	1,867	758	40.6	523	28.0	586	31.4
Other area							
Chaco, rural	420	48	11.4	138	32.9	234	55.7
Franca	210	65	31.0	66	31.4	79	37.6
Ribeirão Prêto, rural	97	22	22.7	43	44.3	32	33.0
San Juan, suburban	343	155	45.2	124	36.2	64	18.7
San Juan, rural	524	162	30.9	239	45.6	123	23.5
San Salvador, rural	464	48	10.3	75	16.2	341	73.5
Santiago, suburban	98	45	45.9	22	22.4	31	31.6
St. Andrew, rural	83	39	47.0	31	37.3	13	15.7
Viacha	53	2	3.8	8	15.1	43	81.1

*With family interviews.

Figure 41

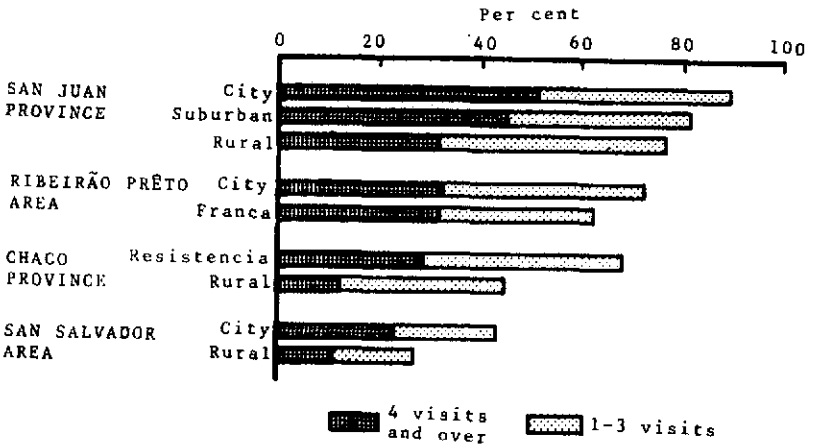
FREQUENCY OF VISITS FOR PRENATAL CARE OF MOTHERS OF DECEASED CHILDREN IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



prenatal visits. As a matter of fact, in the suburban and rural areas of San Juan Province also, high proportions of the mothers had prenatal care, as shown in Figure 42. In both urban and rural areas of the projects of Kingston Area, Santiago Area, San Juan Province and Ribeirão Prêto Area, over 60 per cent of the mothers received prenatal care. The cities of Cartagena, Medellín, Resistencia and São Paulo also had over 60 per cent of the mothers with prenatal care. In the city of La Paz, only 37 per cent of the mothers made visits to prenatal services and only 18 per cent made 4 or more control visits. The lowest percentages of mothers with prenatal care were noted in the rural communities of San Salvador and in Viacha, Bolivia.

Figure 42

FREQUENCY OF VISITS FOR PRENATAL CARE OF MOTHERS OF DECEASED CHILDREN IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



In addition to the number of visits, the promptness with which prenatal care is sought is important for the outcome of the pregnancy. The month of pregnancy in which prenatal care was first received by the mothers of the deceased children is given in Table 31 and is shown in Figure 43. In the city of San Juan over one-half of the mothers received their first prenatal attention in the second or third month of pregnancy and in Medellín 46 per cent received attention early. For the other cities and for the suburban and rural areas, lower percentages received care in the first trimester of pregnancy (Figures 43 and 44).

Table 31. Month of Pregnancy First Prenatal Care Received by Mothers of Deceased Children under 5 Years Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total mothers*	No prenatal care		Month of pregnancy									
				2nd-3rd		4th-5th		6th-7th		8th-9th		Unspecified	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	667	312	46.8	212	31.8	70	10.5	44	6.6	11	1.6	18	2.7
Cartagena	410	145	35.4	136	33.2	71	17.3	31	7.6	13	3.2	14	3.4
Kingston	841	199	23.7	151	18.0	233	27.7	200	23.8	39	4.6	19	2.3
La Paz	1,078	683	63.4	163	15.1	88	8.2	83	7.7	20	1.9	41	3.8
Medellín	497	112	22.5	227	45.7	103	20.7	32	6.4	10	2.0	13	2.6
Monterrey	1,809	763	42.2	494	27.3	258	14.3	176	9.7	42	2.3	76	4.2
Recife	1,817	790	43.5	325	17.9	339	18.7	258	14.2	68	3.7	37	2.0
Resistencia	428	139	32.5	126	29.4	71	16.6	41	9.6	22	5.1	29	6.8
Ribeirão Prêto	226	64	28.3	73	32.3	36	15.9	38	16.8	8	3.5	7	3.1
San Juan	128	14	10.9	68	53.1	19	14.8	19	14.3	5	3.9	3	2.3
San Salvador	1,273	722	56.7	289	22.7	111	8.7	59	4.6	16	1.3	76	6.0
Santiago	743	147	19.8	297	40.0	154	20.7	100	13.5	11	1.5	34	4.6
São Paulo	1,867	586	31.4	651	34.9	354	19.0	169	9.1	43	2.3	64	3.4
Other area													
Chaco, rural	420	234	55.7	66	15.7	34	8.1	35	8.3	21	5.0	30	7.1
Franca	210	79	37.6	66	31.4	22	10.5	15	7.1	12	5.7	16	7.6
Ribeirão Prêto, rural	97	32	33.0	30	30.9	15	15.5	12	12.4	3	3.1	5	5.2
San Juan, suburban	343	64	18.7	133	38.8	67	19.5	50	14.6	18	5.2	11	3.2
San Juan, rural	524	123	23.5	155	29.6	91	17.4	112	21.4	22	4.2	21	4.0
San Salvador, suburban	464	341	73.5	52	11.2	36	7.8	13	2.8	6	1.3	16	3.4
Santiago, suburban	98	31	31.6	24	24.5	28	28.6	6	6.1	7	7.1	2	2.0
St. Andrew, rural	83	13	15.7	13	15.7	34	41.0	13	15.7	2	2.4	8	9.6
Viacha	53	43	81.1	2	3.8	2	3.8	3	5.7	2	3.8	1	1.9

*With family interviews.

Figure 43

MONTH OF PREGNANCY OF FIRST VISIT FOR PRENATAL CARE OF MOTHERS OF DECEASED CHILDREN IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

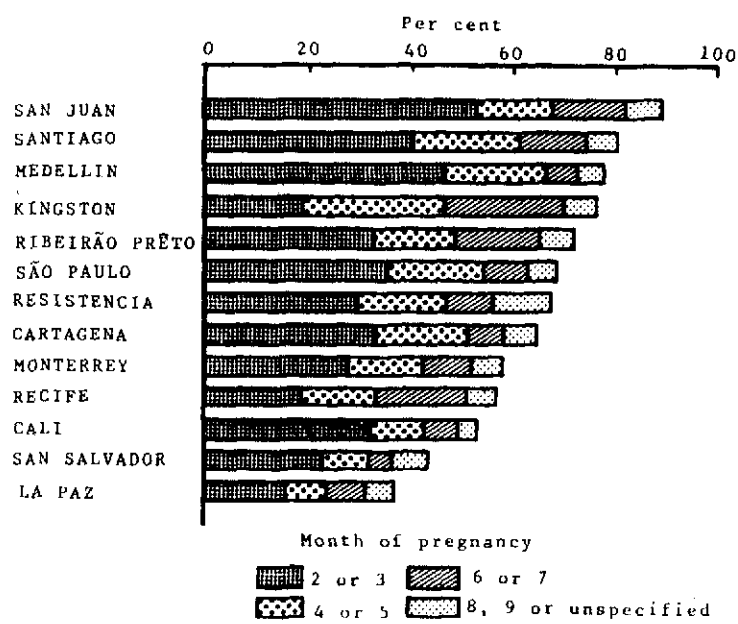
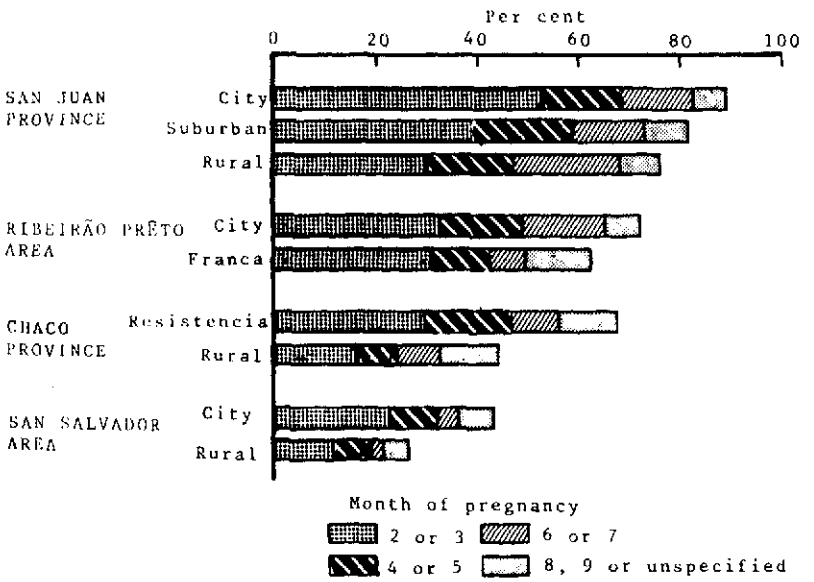


Figure 44

MONTH OF PREGNANCY OF FIRST VISIT FOR PRENATAL CARE OF MOTHERS OF DECEASED CHILDREN IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



From these data, it is evident that there is much to be done in most areas of the Investigation to improve the availability and/or the utilization of prenatal health services. The definition of the limiting factors for adequate coverage and efficiency in this crucial aspect of medical attention, and how to face them, would constitute an important phase of an operational research project in maternal and child health.

Place of Birth

The information on place of birth was usually obtained in the family interview. Thus, the failure to locate a family often resulted in the place of birth being unknown. However, when the source of information about the death of small infants was a hospital record, such as the books in delivery and premature wards, the place of birth was known even if no interview was obtained.

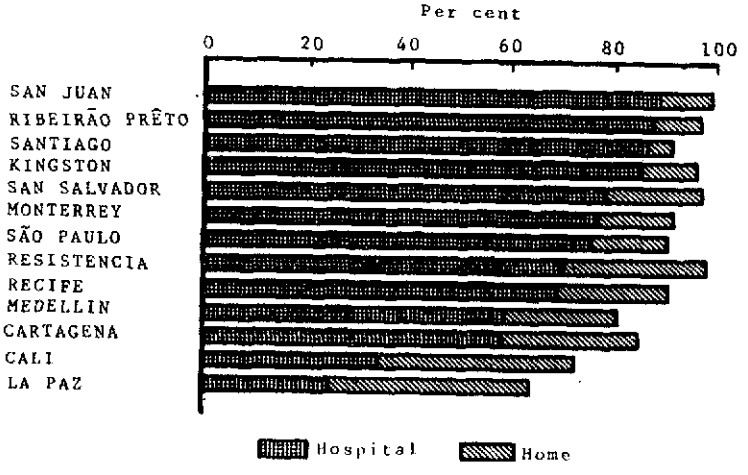
In Table 32, the place of birth is given for deceased children under 5 years of age in all projects during the first year of the Investigation. The distributions of the deaths by place of birth are shown for cities in Figure 45 and for urban and rural areas of four projects in Figure 46. The place of birth was known for over 95 per cent of the deceased children in five cities and seven other areas.

Table 32. Place of Birth of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total	Hospital, clinic, etc.		Home		Other		Unspecified	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	964	321	33.3	375	38.9	2	0.2	266	27.6
Cartagena	621	359	57.8	165	26.6	2	0.3	95	15.3
Kingston	920	779	84.7	103	11.2	6	0.7	32	3.5
La Paz	1,913	447	23.4	756	39.5	-		710	37.1
Medellín	692	470	67.9	88	12.7	5	0.7	129	18.6
Monterrey	2,321	1,768	76.2	348	15.0	8	0.3	197	8.5
Recife	2,035	1,391	68.4	449	22.1	4	0.2	191	9.4
Resistencia	452	313	69.2	129	28.5	1	0.2	9	2.0
Ribeirão Prêto	251	219	87.3	22	8.8	-		10	4.0
San Juan	133	118	88.7	14	10.5	-		1	0.8
San Salvador	1,334	1,036	77.7	252	18.9	2	0.1	44	3.3
Santiago	915	784	85.7	48	5.2	2	0.2	81	8.9
São Paulo	2,203	1,647	74.8	324	14.7	4	0.2	228	10.3
Other area									
Chaco, rural	433	196	45.3	221	51.0	2	0.5	14	3.2
Franca	257	187	72.8	46	17.9	-		24	9.3
Ribeirão Prêto, rural	107	88	82.2	15	14.0	-		4	3.7
San Juan, suburban	360	310	86.1	46	12.8	-		4	1.1
San Juan, rural	546	433	79.3	101	18.5	4	0.7	8	1.5
San Salvador, rural	486	131	27.0	335	68.9	-		20	4.1
Santiago, suburban	103	75	72.8	24	23.3	1	1.0	3	2.9
St. Andrew, rural	83	34	41.0	44	53.0	4	4.8	1	1.2
Viacha	69	7	10.1	46	66.7	-		16	23.2

Figure 45

PLACE OF BIRTH OF DECEASED CHILDREN UNDER 5 YEARS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

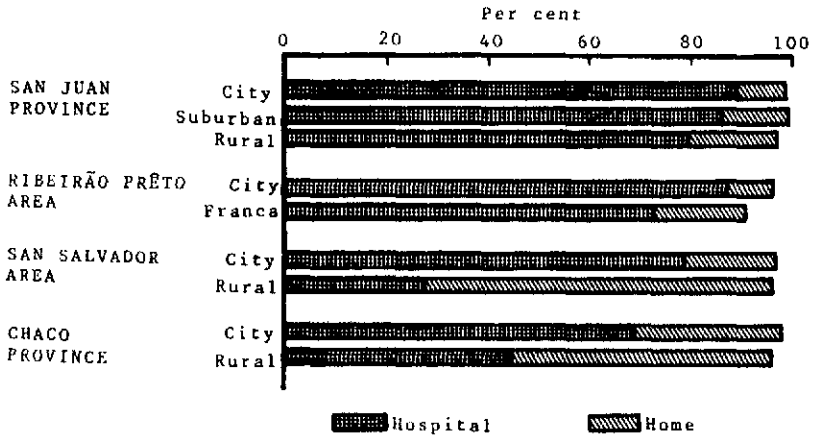


The proportion of the deceased children known to have been born in hospitals varies widely from over 80 per cent in the cities of Kingston, Ribeirão Prêto, San Juan and Santiago to less than 40 per cent in Cali. In La Paz, the place of birth was not known for 37 per cent of the deceased

children; only 23 per cent were known to have been born in hospitals. It is probable that some of those for whom birthplace was unknown were born in hospitals. In fact, provisional data from the probability sample of households reveals that around 40 per cent of the live births in La Paz occur in hospitals.

Figure 46

PLACE OF BIRTH OF DECEASED CHILDREN UNDER 5 YEARS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



It is the general consensus that, even in the absence of adequate prenatal care, hospital delivery offers a greater chance for a healthy outcome of the mother and of the product of gestation, particularly in areas in which domiciliary obstetrical attention is not under adequate control. However, the explanation for the differences in the extent to which hospital services are available and are utilized in the various areas of the Investigation have not been explored.

The quality of information on causes of death, particularly in the neonatal period, depends mainly on the place of birth (and death) and on the completeness of information on clinical records regarding items such as condition and weight at birth. The birth weight of each child born in a hospital should be recorded and the practice of this routine procedure might, in a sense, be considered as an indicator of quality of medical attention of the newborn infant. The percentages of deceased infants who were born in hospitals (Table 33) differ only slightly from the percentages for deceased children under 5 years of age given in Table 32. For the births known to have occurred in hospitals, birth weights were recorded for over 90 per cent in 5 cities and 5 other areas. However, in Cali and Recife over 30 per cent of the infants had not been weighed or the birth weight was not recorded or it was not found by the medical interviewer. Also, in six cities and in four other areas, birth weights were not available to the Investigation for over 10 per cent of the

Table 33. Percentage of Deceased Infants Born in Hospitals and Recording of Their Birth Weights in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total infant deaths	Born in hospital					
		Total		Birth weight			
				Recorded		Not recorded	
		Number	Per cent	Number	Per cent	Number	Per cent
Cali	659	238	36.1	160	67.2	78	32.8
Cartagena	451	279	61.9	241	86.4	38	13.6
Kingston	776	675	87.0	616	91.3	59	8.7
La Paz	1,297	386	29.8	348	90.2	38	9.8
Medellín	463	330	71.3	291	88.2	39	11.8
Monterrey	1,909	1,519	79.6	1,273	83.8	246	16.2
Recife	1,500	1,085	72.3	722	66.5	363	33.5
Resistencia	380	276	72.6	243	88.0	33	12.0
Ribeirão Prêto	211	196	92.9	168	85.7	28	13.3
San Juan	122	109	89.3	107	98.2	2	1.8
San Salvador	1,020	804	78.8	746	92.8	58	7.2
Santiago	798	697	87.3	665	95.4	32	4.6
São Paulo	1,917	1,499	78.2	1,299	86.7	200	13.3
Other area							
Chaco, rural	330	162	49.1	76	46.9	86	53.1
Franca	213	173	81.2	121	69.9	52	30.1
Ribeirão Prêto, rural	88	74	84.1	54	73.0	20	27.0
San Juan, suburban	317	277	87.4	271	97.8	6	2.2
San Juan, rural	449	359	80.0	339	94.4	20	5.6
San Salvador, rural	284	89	31.3	81	91.0	8	9.0
Santiago, suburban	93	69	74.2	64	92.8	5	7.2
St. Andrew, rural	57	21	36.8	19	90.5	2	9.5
Viacha	44	6	13.6	4	66.7	2	33.3

births. It is important that records for newborns be established in hospitals and that babies be weighed and the weights recorded routinely. Each hospital should have scales available for weighing. Some of the difficulties encountered were due to the failure of the hospital to insist on a hospital record for each birth on which birth weight could be recorded as well as other important information related to the condition of the child at birth and during the stay in the hospital.

Place of Death

The place of death is considered important information to characterize the medical attention and utilization of health services. As with place of birth, place of death is a determining factor of quality of information, particularly in relation to clinical and autopsy data. When the only source of information on a death was a hospital record, the place of death was known even if the family of the deceased child was not located. Fortunately, death certificates, the most common starting point for investigation of each death, usually indicated the name of the hospital even when the address of the parents was inadequate. The place of death was known in over 95 per cent of all deaths in all of the cities, with the exception of Cali and La Paz and in all other areas except Viacha.

The place of death has been classified according to the following categories and subcategories:

1. Deaths in hospitals
   a. Those children dying in the hospital after 48 or more hours of hospitalization.
   b. Children who died in the hospital within a period of 48 hours of hospitalization. This subcategory includes infants who were born and died in the hospital at less than 48 hours of age.
   c. Deaths occurring in an outpatient service, clinic or emergency room.
2. Deaths that occurred at home.
3. Deaths that occurred while en route to or from a health institution, physician's office, etc. or in any other place, such as on a highway due to an accident.
4. Place of death unknown.

Table 34 gives the number and percentage of deaths in each category for the 13 projects. In three cities and two other areas, over 80 per cent

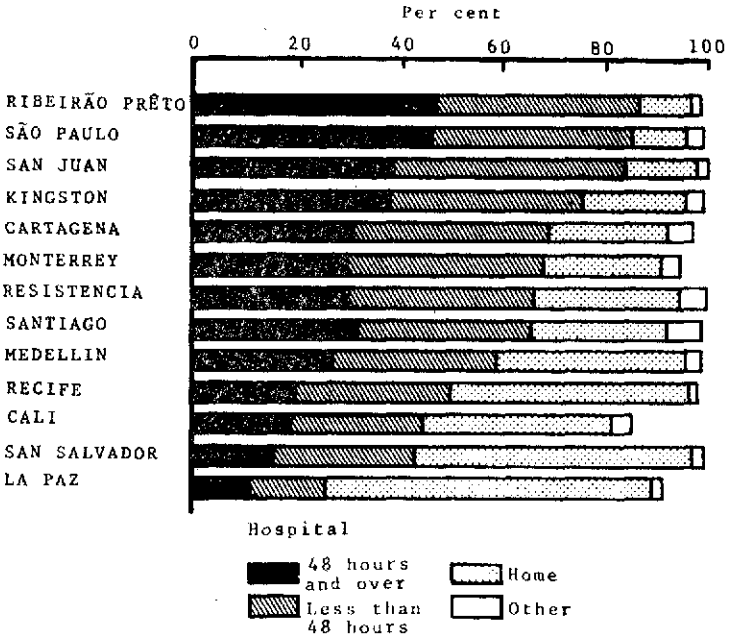
Table 34. Place of Death for Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total deaths	Hospital								Home		Other		Unspecified	
		Total		48 hours and over		Less than 48 hours		Emergency, out-patient service							
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	964	420	43.6	174	18.0	199	20.6	47	4.9	366	38.0	34	3.5	144	14.9
Cartagena	621	431	69.4	192	30.9	198	31.9	41	6.6	148	23.8	27	4.3	15	2.4
Kingston	920	697	75.8	342	37.2	334	36.3	21	2.3	183	19.9	35	3.8	5	0.5
La Paz	1913	486	25.4	186	9.7	259	13.5	41	2.1	1228	64.2	32	1.7	167	8.7
Medellín	692	409	59.1	178	25.7	193	27.9	38	5.5	257	37.1	20	2.9	6	0.9
Monterrey	2321	1582	68.2	676	29.1	788	34.0	118	5.1	537	23.1	89	3.8	113	4.9
Recife	2035	1016	49.9	393	19.3	534	26.2	89	4.4	958	47.1	26	1.3	35	1.7
Resistencia	452	300	66.4	134	29.6	150	33.2	16	3.5	128	28.3	24	5.3	-	
Ribeirão Prêto	251	218	86.9	116	46.2	91	36.3	11	4.4	27	10.8	4	1.6	2	0.8
San Juan	133	112	84.2	51	38.3	57	42.9	4	3.1	19	14.3	2	1.5	-	
San Salvador	1334	573	43.0	202	15.1	332	24.9	39	2.9	734	55.0	20	1.5	7	0.5
Santiago	915	601	65.7	282	30.8	270	29.5	49	5.4	240	26.2	64	7.0	10	1.1
São Paulo	2203	1882	85.4	1002	45.5	747	33.9	133	6.0	240	10.9	70	3.2	11	0.5
Other area															
Chaco, rural	435	240	55.4	98	22.6	119	27.5	23	5.3	156	36.0	36	8.3	1	0.2
Franca	257	191	74.3	90	35.0	77	30.0	24	9.3	56	21.8	6	2.3	4	1.6
Ribeirão Prêto, rural	107	89	83.2	37	34.6	44	41.1	8	7.5	15	14.0	3	2.8	-	
San Juan, suburban	360	297	82.5	128	35.6	159	44.2	10	2.8	47	13.1	14	3.9	2	0.3
San Juan, rural	546	481	69.8	182	33.3	180	33.0	19	3.5	112	20.5	48	8.8	5	0.9
San Salvador, rural	486	63	13.0	29	6.0	30	6.2	4	0.8	406	83.5	14	2.9	3	0.6
Santiago, suburban	103	41	39.8	21	20.4	15	14.6	5	4.9	49	47.5	13	12.6	-	
St. Andrew, rural	83	34	41.0	16	19.3	16	19.3	2	2.4	39	47.0	10	12.0	-	
Viacha	69	4	5.8	2	2.9	2	2.9	-		51	73.9	1	1.4	13	18.8

of the deaths occurred in hospitals. In the other areas, this percentage was not as satisfactory. In La Paz, for example, only 25 per cent of the deaths occurred in hospitals. Of the areas other than the central cities, the rural communities of San Salvador and Viacha had the lowest proportions of deaths in hospitals. Deficits in registration or in inclusion of deaths occurring in hospitals in the early neonatal period may affect these proportions since they should be included in this category. Figures 47 and 48 show the use of hospitals in the cities and rural areas.

Figure 47

PLACE OF DEATH OF CHILDREN UNDER 5 YEARS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



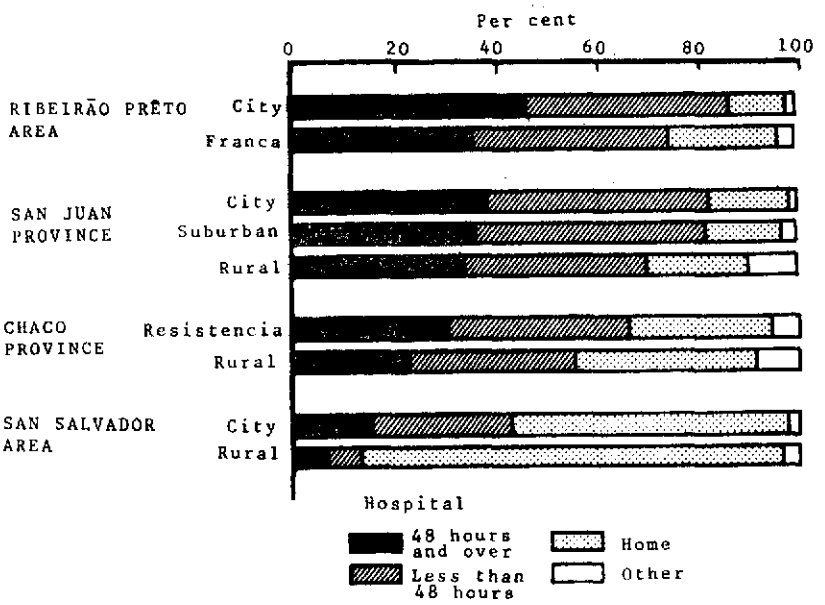
The relative use of hospitals for birth and death of these infants and young children is clear in certain areas. For example, in Kingston and Recife higher percentages of births than of deaths occurred in hospitals. These percentages are as follows:

Kingston:	births 84.7 and deaths 75.8
Recife:	births 68.4 and deaths 49.9

The reverse situation is noted in São Paulo where deaths occurred more frequently in hospitals than births (deaths 85.4 and births 74.8) or in other words, there were more births than deaths at home.

Figure 48

PLACE OF DEATH OF CHILDREN UNDER 5 YEARS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Many of the deaths occurring in early days of life could probably be prevented if adequate prenatal and natal medical attention was provided to mothers and their products of conception. Likewise, considering the acute nature of most morbid conditions responsible for infant and childhood mortality, the place of death and the nature and duration of medical services rendered have important implications. For example, the fact that in several areas a large proportion of children die at home, on the way to hospitals or shortly after admission, serves as an indicator of inadequate coverage of health services or unfavorable factors such as low level of education of parents.

Vaccinations

In the family interview, the informant was asked to specify the vaccinations the deceased child had received. Data were tabulated for vaccinations reported for six specific diseases and for a group of miscellaneous vaccinations. The usual vaccination reported in this latter category was BCG. Data on the coverage of vaccinations in the general population will be available after the analysis of the information collected in the probability sample.

Table 35 gives the vaccinations reported for the children 1-4 years of age in which family interviews were made. As the findings in suburban and rural areas were similar to those in the city, and as the numbers were small in several rural areas, the data are given for the 13 projects. The percentages of deceased children 1-4 years who were reported to have received a vaccination of any type were as follows:

Santiago Area	88	Cali	64
San Juan Province	87	Cartagena	60
Ribeirão Prêto Area	86	San Salvador Area	47
São Paulo	79	La Paz Area	37
Monterrey	76	Recife	29
Medellín	67	Kingston Area	21
Chaco Province	65		

In all except four of these projects, more than one-half of the children were reported to have received at least one type of vaccination.

Table 35. Vaccinations Reported for Deceased Children 1-4 Years in 13 Projects, First Year of Investigation

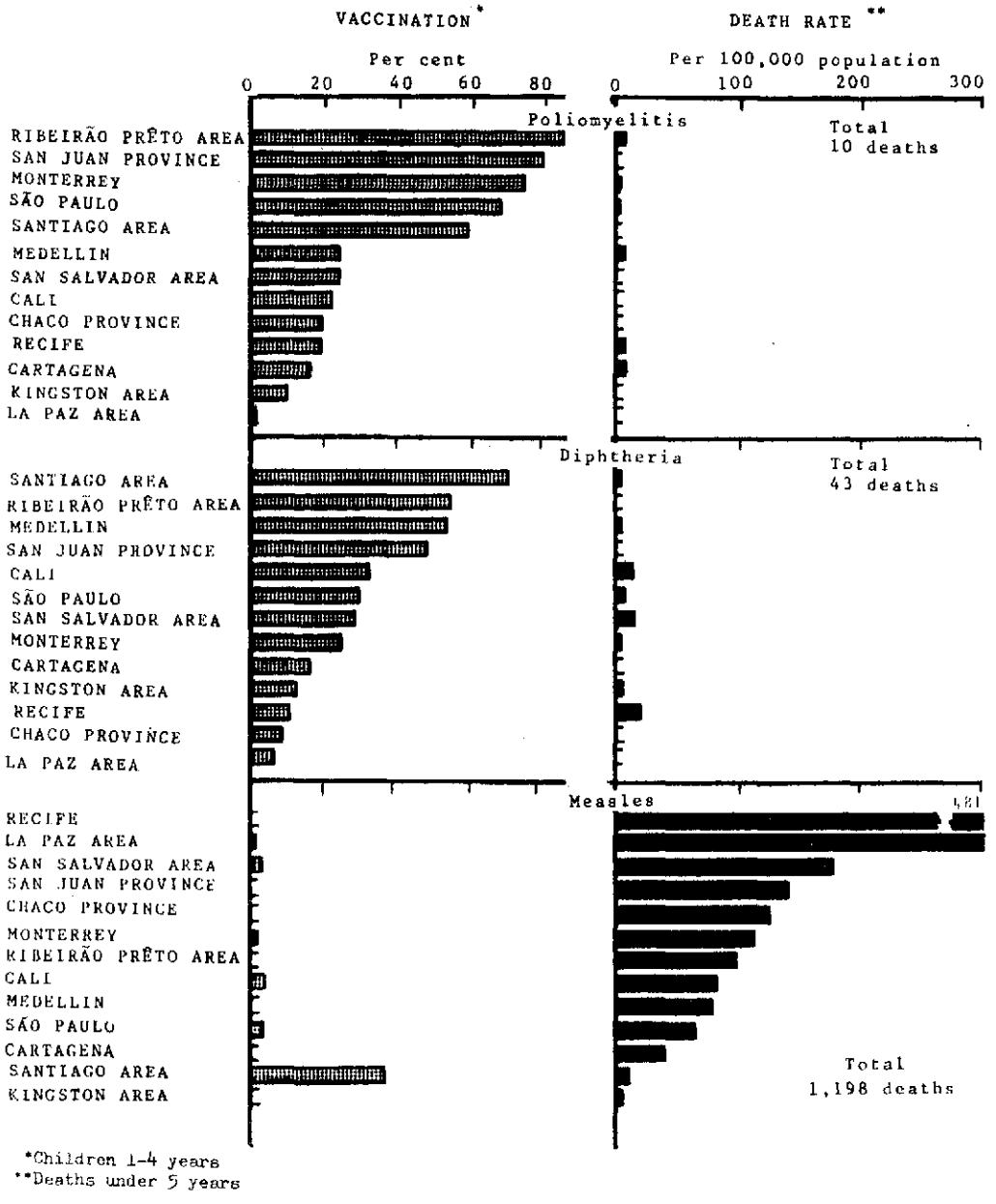
Project	Total children*	Smallpox		Whooping cough		Diphtheria		Tetanus		Poliomyelitis		Measles		Other	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	196	76	38.8	64	32.7	63	32.1	63	32.1	41	20.9	9	4.6	13	6.6
Cartagena	129	44	34.1	19	14.7	19	14.7	19	14.7	20	15.5	2	1.6	37	28.7
Chaco Province	172	4	2.3	13	7.6	14	8.1	13	7.6	31	18.0	-		6	3.5
Kingston Area	156	12	7.7	11	7.1	18	11.5	17	10.9	17	10.9	-		2	1.3
La Paz Area	477	74	15.5	30	6.3	29	6.1	29	6.1	5	1.0	5	1.0	63	13.2
Medellín	168	91	54.2	89	53.0	89	53.0	87	51.8	39	23.2	1	0.6	20	11.9
Monterrey	348	22	6.3	88	25.3	83	23.9	86	24.7	257	73.9	12	3.4	19	5.5
Recife	490	26	5.3	52	10.6	49	10.0	52	10.6	87	17.8	-		12	2.4
Ribeirão Prêto Area	85	17	20.0	45	52.9	46	54.1	45	52.9	72	84.7	-		17	20.0
San Juan Province	147	12	8.2	69	46.9	69	46.9	70	47.6	116	78.9	-		36	24.5
San Salvador Area	488	45	9.2	132	27.0	134	27.5	133	27.3	113	23.2	14	2.9	83	17.0
Santiago Area	106	26	24.5	74	69.8	74	69.8	8	7.5	61	57.5	39	36.8	67	63.2
São Paulo	235	50	21.3	67	28.5	69	29.4	63	26.8	160	68.1	10	4.3	55	23.4

*With family interviews.

Vaccine against poliomyelitis appears to have been given to these children more frequently than any other in Recife, the Ribeirão Prêto Area, Chaco and San Juan Provinces, Monterrey and São Paulo. Vaccination against diphtheria and whooping cough was also used relatively frequently with coverage of over 50 per cent in the Santiago Area, the Ribeirão Prêto Area and Medellín. The percentages of these children who had received vaccination against poliomyelitis, diphtheria and measles are shown in Figure 49. Antidiphtheria and whooping cough vaccine and tetanus toxoid in the form of triple vaccine were usually given in all of the projects except the Santiago Area where anti-tetanus toxoid was not included. Vaccination against measles was nearly negligible in all projects except Santiago where 37 per cent of the deceased children 1-4 years had been vaccinated.

Figure 49

FREQUENCY OF VACCINATION AGAINST SPECIFIED DISEASES AND DEATH RATES FOR 13 PROJECTS, FIRST YEAR OF INVESTIGATION

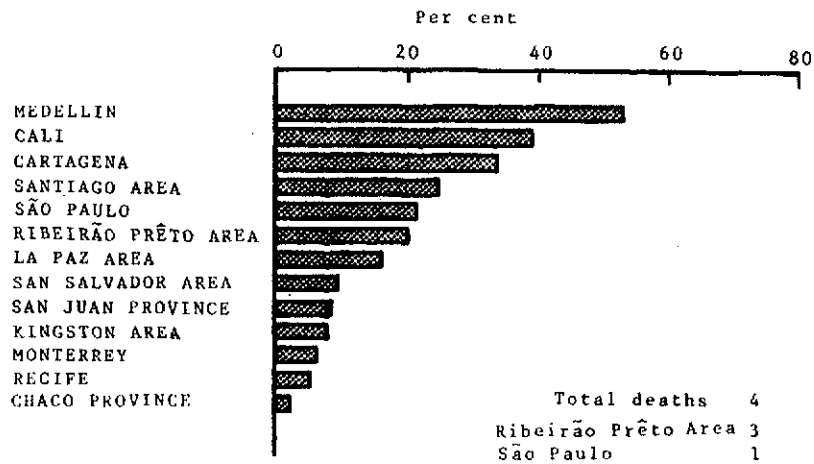


The impact of effective preventive programs against these communicable diseases is predictable and experience at national and international levels is abundant. The data collected during the first year of the Investigation, presented in Tables 19 and 20 reveal 10 deaths from poliomyelitis, 43 from diphtheria and 1,198 from measles; the death rates are shown in Figure 49, as well as the percentages of children vaccinated against these diseases.

The size of the programs of vaccination against smallpox appear to vary as judged by its use in these children 1-4 years of age. In Figure 50, the percentages of deceased children 1-4 years of age vaccinated against this disease are shown and those with the highest coverage were the projects of Colombia.

Figure 50

VACCINATION AGAINST SMALLPOX OF DECEASED CHILDREN 1-4 YEARS IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION



Judging from this experience, there is much to be done in several of the areas to reach an acceptable level of protection against these diseases. As discussed previously, an effective vaccination program against diseases such as measles in conjunction with prevention of malnutrition would significantly reduce childhood mortality in Latin American countries.

V. SOCIO-CULTURAL AND BIOLOGICAL FACTORS

During the home interviews, information was obtained regarding parents of the child, members of the household at the time of death of the child, the reproductive history of the mother, and information related to the deceased child such as breast feeding, introduction of other foods and growth and development. Some of these data have been utilized in this section. More complete analyses will be made later when the bases for rates on age of mother and birth order are obtained or can be estimated for the projects and data for the two years become available. Also, data from the probability sample of households are needed to characterize properly the differences in families in which deaths occurred and in the general population of the same areas.

Marital Relationship of Parents

The households in which these children lived differed among the areas in size and composition of members as well as in the marital relationship of the parents. Table 36 provides data regarding the parents in families in which a home interview was made and Figure 51 shows the proportion of the homes in which both parents were members of the household and their marital relationship. In only one city, Monterrey, were both parents reported to live in the household in as many as 90 per cent of the families: however, in

Table 36. Families of Deceased Children under 5 Years by Presence of Parents in Home and Their Marital Relationship in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total families*	Both parents in household						Mother only		Father only		Neither	
		Total		Married		Common-law							
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	666	525	78.8	357	53.6	168	25.2	118	17.7	13	2.0	10	1.5
Cartagena	410	311	75.9	153	37.3	158	38.5	85	20.7	6	1.5	8	2.0
Kingston	837	447	53.4	136	16.2	311	37.2	360	43.0	10	1.2	20	2.4
La Paz	1,065	947	88.9	806	75.7	141	13.2	103	9.7	12	1.1	3	0.3
Medellín	496	389	78.4	364	73.4	25	5.0	90	18.1	2	0.4	15	3.0
Monterrey	1,807	1,659	91.8	1,480	81.9	179	9.9	124	6.9	13	0.7	11	0.6
Recife	1,817	1,411	77.7	790	43.5	621	34.2	300	16.5	34	1.9	72	4.0
Resistencia	428	325	75.9	116	27.1	209	48.8	92	21.5	6	1.4	5	1.2
Ribeirão Prêto	226	197	87.2	177	78.3	20	8.8	26	11.5	-		3	1.3
San Juan	128	101	78.9	83	64.8	18	14.1	22	17.2	1	0.8	4	3.1
San Salvador	1,273	807	63.4	172	13.5	635	49.9	412	32.4	21	1.6	33	2.6
Santiago	740	647	85.8	521	70.2	116	15.6	89	12.0	2	0.3	14	1.9
São Paulo	1,846	1,630	88.8	1,387	75.5	243	13.2	180	9.8	9	0.5	17	0.9
Other area													
Chaco, rural	420	354	84.3	112	26.7	242	57.6	50	11.9	5	1.2	11	2.6
Franca	210	187	89.0	183	87.1	4	1.9	19	9.0	-		4	1.9
Ribeirão Prêto, rural	97	85	87.6	76	78.4	9	9.3	12	12.4	-		-	
San Juan, suburban	342	291	85.1	222	64.9	69	20.2	39	11.4	2	0.6	10	2.9
San Juan, rural	524	427	81.5	323	61.6	104	19.8	87	16.6	1	0.2	9	1.7
San Salvador, rural	464	299	64.4	77	16.6	222	47.8	127	27.4	10	2.2	28	6.0
Santiago, suburban	97	82	84.5	70	72.2	12	12.4	12	12.4	-		3	3.1
St. Andrew, rural	84	42	50.6	15	18.1	27	32.5	36	43.4	-		5	6.0
Viacha	54	44	81.1	39	73.6	4	7.5	9	17.0	1	1.9	-	

*With interviews.

Figure 51

PRESENCE IN THE HOME OF BOTH PARENTS OF DECEASED CHILDREN AND THEIR MARITAL RELATIONSHIP IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

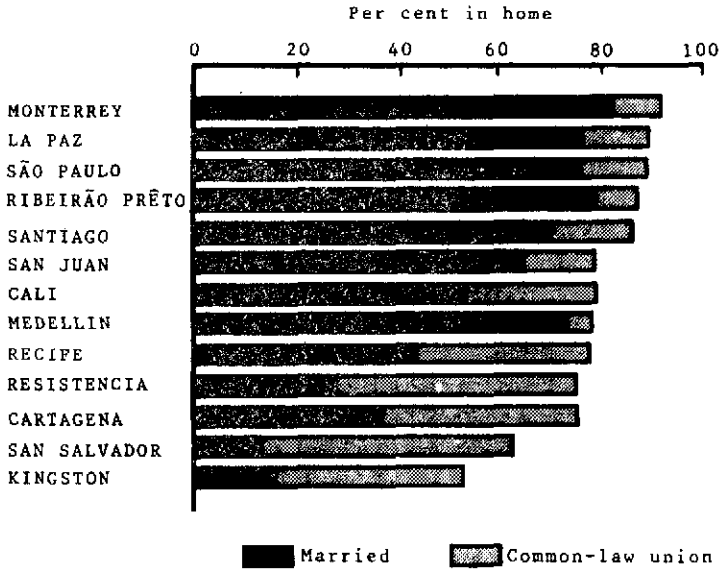
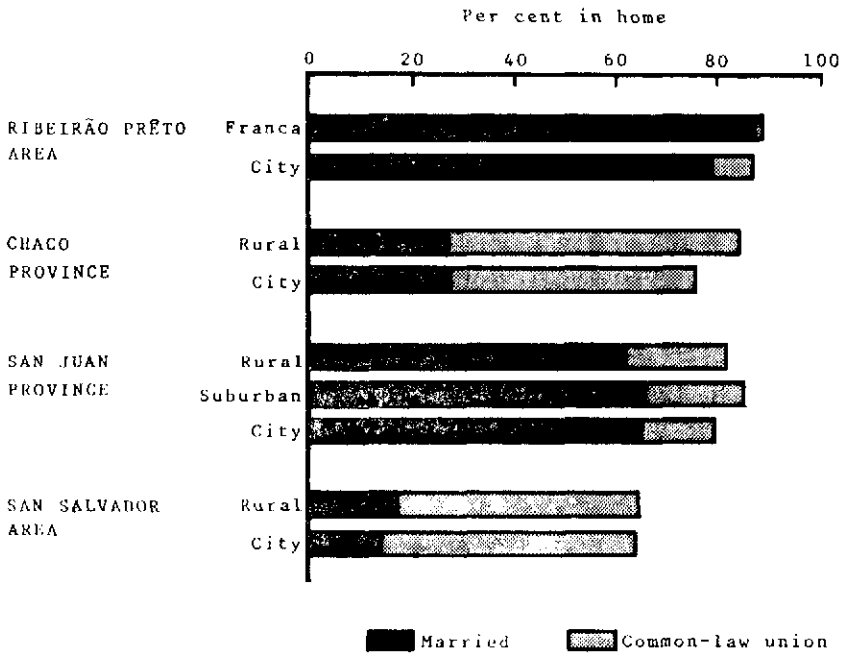


Figure 52

PRESENCE IN THE HOME OF BOTH PARENTS OF DECEASED CHILDREN AND THEIR MARITAL RELATIONSHIP IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



the others, except two, both parents were members of at least 70 per cent of the households of the deceased children. Common-law unions were reported most frequently in the cities of Resistencia and San Salvador. Actually in Kingston and San Salvador, only small proportions of the parents were married. In Kingston, children are often placed in the homes of grandparents so that the mother is free to work. The relatively unstable forms of marital unions in Jamaica and in other Caribbean Islands are known to be common, as reported by Marino.(20)

In the comparison of urban and rural areas of four projects (Figure 52) similar differences are noted. In the rural communities of San Salvador project, only 64.4 per cent of families of deceased children had both parents living together in marriage or common-law union. In these two areas, as in the rural area of Chaco Province, the parents were living in common-law union more frequently than in marriage.

Age of Mother and Birth Order

The age distribution of mothers at the birth of deceased infants and the birth order of those infants have been obtained in order to establish their relationship to mortality. Since the numbers are small in several areas and the differences are minor, divisions are not made into urban and rural areas but the projects are treated as a whole. However, for San Salvador, where differences were noted, the data are presented for the city and for the rural communities. When the material is available for two years, divisions of other areas may be made.

The distribution of mothers by age at birth of the infant who died shows distinct patterns in these projects (Table 37 and Figure 53). These distributions are influenced by the levels of the birth rates which in several cities have been lowered by family planning. Also if the death rate is excessive for infants of very young and of older mothers, such high rates would influence the age distributions of mothers, that is, the proportions of births in the maternal groups of highest risk influence these distributions.

In Figure 53, the age distributions are given in decreasing order of percentage of mothers in the age group under 20 years. In Chaco Province, 27.6 per cent of the mothers were less than 20 years of age and another 25.9 per cent were 20-24 years of age. This pattern is distinctly different from that of the other areas in which the highest percentages of mothers were in

Table 37. Infant Deaths by Age of Mother at Birth of Child in 13 Projects, First Year of Investigation

Project*	Total	Age group in years						
		Under 20	20-24	25-29	30-34	35-39	40 and over	Unknown
	Number of deaths							
Cali	659	81	122	97	75	43	15	226
Cartagena	451	51	78	47	35	27	8	205
Chaco Province	710	178	167	110	94	65	31	65
Kingston Area	833	172	215	166	82	56	20	122
La Paz Area	1,341	130	239	145	101	69	24	633
Medellín	463	64	83	65	53	42	21	135
Monterrey	1,909	204	400	304	239	213	61	488
Recife	1,498	197	340	336	202	156	54	213
Ribeirão Prêto Area	512	71	119	98	66	44	29	85
San Juan Province	888	160	213	190	102	68	47	108
San Salvador - City	1,020	191	233	136	108	64	27	261
Rural	284	45	51	42	34	24	7	81
Santiago Area	891	141	221	145	117	82	36	149
São Paulo	1,917	195	504	370	250	143	41	414
	Per cent**							
Cali	100	18.7	28.2	22.4	17.3	9.9	3.5	
Cartagena	100	20.7	31.7	19.1	14.2	11.0	3.3	
Chaco Province	100	27.6	25.9	17.1	14.6	10.1	4.8	
Kingston Area	100	24.2	30.2	23.3	11.5	7.9	2.8	
La Paz Area	100	18.4	33.8	20.5	14.3	9.7	3.4	
Medellín	100	19.5	25.3	19.8	16.2	12.8	6.4	
Monterrey	100	14.4	28.1	21.4	16.8	15.0	4.3	
Recife	100	15.3	26.5	26.1	15.7	12.1	4.2	
Ribeirão Prêto Area	100	16.6	27.9	23.0	15.5	10.3	6.8	
San Juan Province	100	20.5	27.3	24.4	13.1	8.7	6.0	
San Salvador - City	100	25.2	30.7	17.9	14.2	8.4	3.6	
Rural	100	22.2	25.1	20.7	16.7	11.8	3.4	
Santiago Area	100	19.0	29.8	19.5	15.8	11.1	4.9	
São Paulo	100	13.0	33.5	24.6	16.6	9.5	2.7	

*With division of San Salvador Project into urban and rural areas.

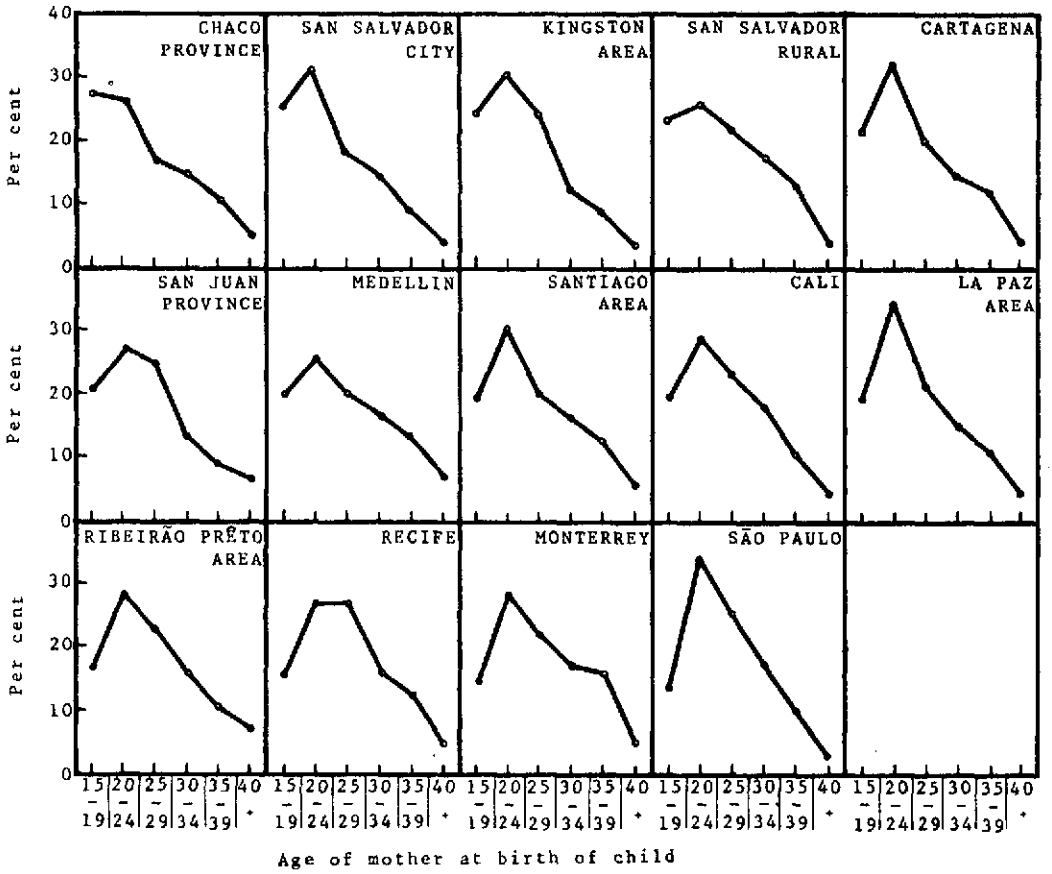
**Based on deaths with age of mother stated.

the 20-24 year age group. From 25.1 to 33.8 per cent of the mothers were in the age group 20-24 years and usually the percentages in the next 5-year age group, 25-29 years, were lower. Recife was an exception with nearly as high a percentage in the 25-29 year age group as in the 20-24 year age group. The birth rate is known to be high in Recife, around 40 per 1,000 population, which is reflected in the percentage distribution of these infant deaths by age of mother with relatively high percentages of older mothers. The pattern in São Paulo is for an area with a low birth rate - of 22 per 1,000 population.

The pattern in the La Paz Area is puzzling, with a relatively low percentage for mothers under 20 years of age, but with the highest percentage of all projects at 20-24 years of age and a relatively low percentage for mothers 35 years and over.

Figure 53

INFANT DEATHS BY AGE OF MOTHER AT BIRTH OF CHILD IN 13 PROJECTS*
FIRST YEAR OF INVESTIGATION



*With division of San Salvador project into urban and rural areas

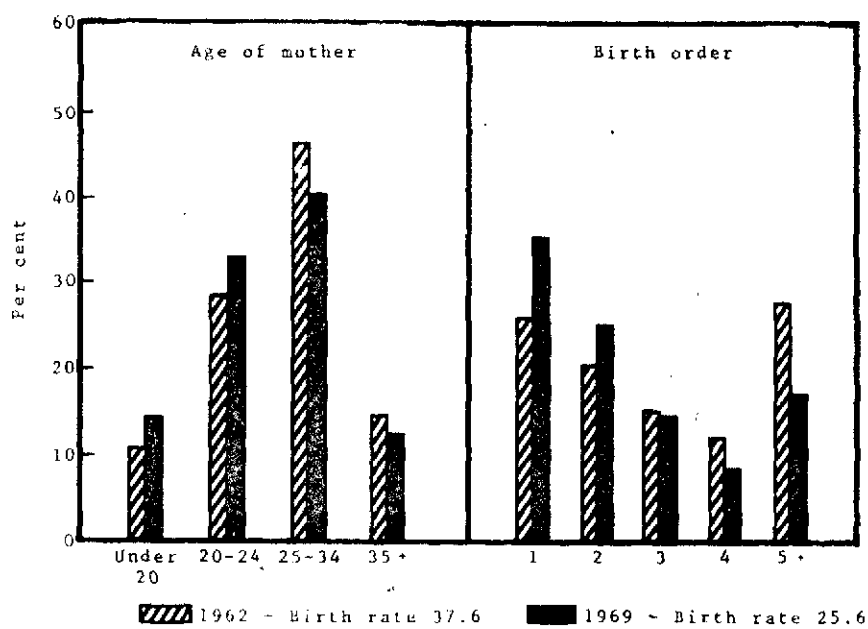
Data for Santiago are used to illustrate the effect of a reduction in the birth rate on the age distribution of mothers of live births. Table 38 and Figure 54 using data from the 1969 Report of Zone V Santiago[21] illustrate the change in the age distribution with the decline in the birth rate from 37.6 in 1962 to 25.6 per 1,000 population in 1969.

Table 38. Percentage Distribution of Live Births by Age of Mother, Province of Santiago, 1962 and 1969

Age group	1962	1969
Less than 20 years	10.7	14.3
20-24 years	28.6	32.9
25-34 years	46.3	40.4
35 years and over	14.4	12.4

Figure 54

LIVE BIRTHS BY AGE OF MOTHER AND BIRTH ORDER, PROVINCE OF SANTIAGO, CHILE 1962 AND 1969



The proportion of the births of young mothers (under 25 years) was higher in 1969 than in 1962 with a corresponding reduction for those of mothers 25 years and over.

As with the age of mother, distinct differences are noted in the birth order of the deceased infants (Table 39). In Figure 55, the projects are shown in order of the percentage of first births. The La Paz project had the highest proportion of first births with Chaco Province second. São Paulo and the Santiago Area with low birth rates were third and fourth in order. Recife with a high birth rate had relatively low percentages for each birth order, with 12.4 for first births and 13.7 for second births and 34.2 per cent for the seventh and later births.

Table 39. Infant Deaths by Birth Order of Child in 13 Projects, First Year of Investigation

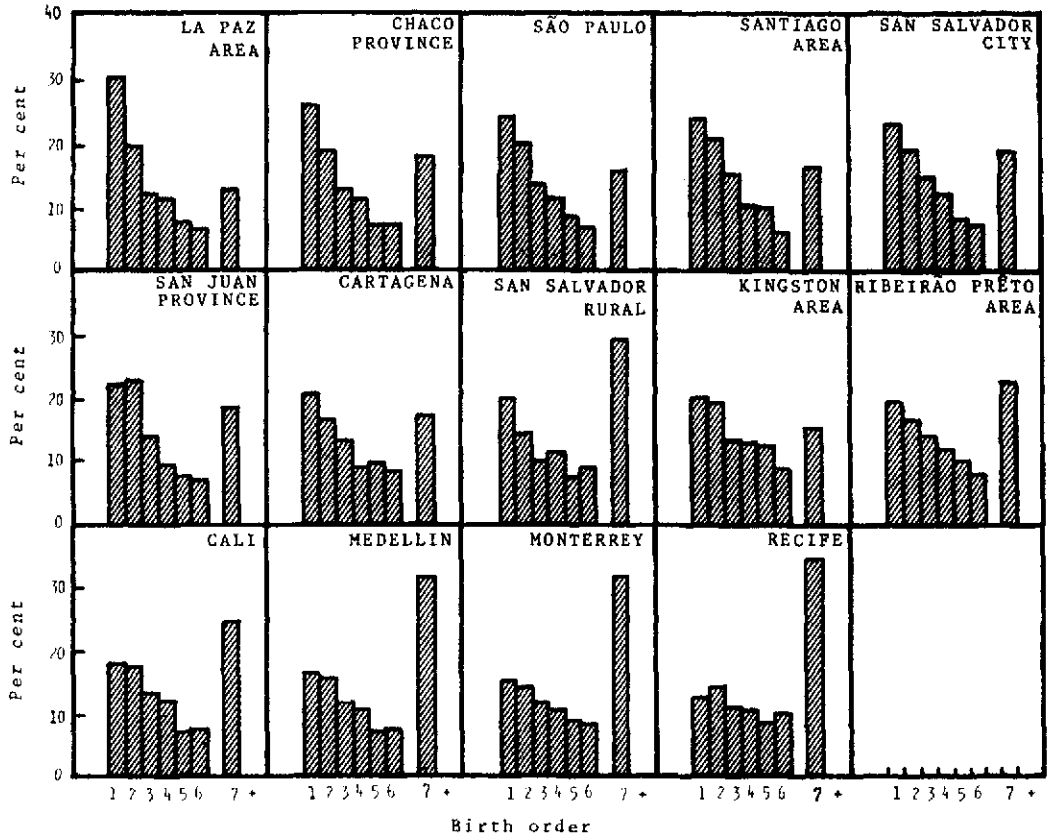
Project*	Total	1	2	3	4	5	6	7 and over	Unspecified
	Number of deaths								
Cali	659	86	83	63	59	35	37	121	175
Cartagena	451	79	64	52	34	36	27	91	68
Chaco Province	710	180	128	86	77	49	49	126	15
Kingston Area	833	150	148	101	98	94	66	115	61
La Paz Area	1,341	257	167	101	93	61	53	107	502
Medellín	463	62	58	42	39	27	29	117	89
Monterrey	1,909	235	226	178	164	135	131	496	344
Recife	1,498	162	179	140	139	114	126	447	191
Ribeirão Prêto Area	512	84	73	60	51	43	34	99	68
San Juan Province	888	189	194	117	79	64	61	159	25
San Salvador - City	1,020	225	180	140	111	76	68	180	40
Rural	284	55	39	27	31	19	24	81	8
Santiago Area	891	198	173	126	84	82	48	136	44
São Paulo	1,917	406	334	223	185	138	105	257	269
	Per cent**								
Cali	100	17.8	17.1	13.0	12.2	7.2	7.6	25.0	
Cartagena	100	20.6	16.7	13.6	8.9	9.4	8.1	17.0	
Chaco Province	100	25.9	18.4	12.4	11.1	7.1	7.1	18.1	
Kingston Area	100	19.4	19.2	13.1	12.7	12.2	8.5	14.9	
La Paz Area	100	30.6	19.9	12.0	11.1	7.3	6.3	12.8	
Medellín	100	16.6	15.5	11.2	10.4	7.2	7.8	31.3	
Monterrey	100	15.0	14.4	11.4	10.5	8.6	8.4	31.7	
Recife	100	12.4	13.7	10.7	10.6	8.7	9.6	34.2	
Ribeirão Prêto Area	100	18.9	16.4	13.5	11.5	9.7	7.7	22.3	
San Juan Province	100	21.9	22.5	13.6	9.2	7.4	7.1	18.4	
San Salvador - City	100	23.0	18.4	14.3	11.3	7.8	6.9	18.4	
Rural	100	19.9	14.1	9.9	11.2	6.9	8.7	29.3	
Santiago Area	100	23.4	20.4	14.9	9.9	9.7	5.7	16.1	
São Paulo	100	24.6	20.3	13.5	11.2	8.4	6.4	15.6	

*With division of San Salvador Project into urban and rural areas.

**Based on deaths with birth order specified.

Figure 55

INFANT DEATHS BY BIRTH ORDER IN 13 PROJECTS*, FIRST YEAR OF INVESTIGATION



*With division of San Salvador project into urban and rural areas.

The change in birth order due to the 32 per cent reduction in the birth rate in Santiago Province is also given in Table 40 and shown in Figure 54.

Table 40. Percentage Distribution of Live Births by Birth Order, Province of Santiago, 1962 and 1969

Birth order	1962	1969
1	25.7	35.4
2	19.9	24.9
3	15.0	14.3
4	11.9	8.4
5 and over	27.5	17.0

The percentage of first births increased from 25.7 in 1962 to 35.4 in 1969 and the reduction of births of high birth order, 5 and over, was from 27.5 to 17.0 per cent.

The distributions of births by age of mother and by birth order influence the level of infant mortality in an area . The data collected in the Investigation should be analyzed using information on the numbers of live births by age of mother and birth order. Two examples are given at this time and it is expected that bases for rates will become available from several projects for use in the final report and in studies by the principal collaborators.

The numbers of live births by age of mother for São Paulo for the 12 months of the Investigation, June 1968 through May 1969, were provided by the principal collaborator. The age distribution was applied to the number of live births estimated as the base for the first year, 27,800.
The resulting numbers of live births and the numbers of infants dying in the neonatal period and in the first year of life are given in Table 41 by age of mother at birth of the child. Those in which the age of mother was not known were assumed to have the same distribution as those of known age. Both the neonatal and infant death rates are very high for mothers less than 20 years of age. The lowest rates are for mothers 25-29 years of age followed by increasingly higher rates for births of older mothers.

Table 41. Neonatal and Infant Mortality by Age of Mother at Birth of Child with Rates per 1,000 Live Births, São Paulo, First Year of Investigation

Age of mother	Live births	Neonatal deaths*		Infant deaths*	
		Number	Rate	Number	Rate
Total	27,800	968	34.8	1,917	69.0
Under 20 years	2,244	130	57.9	248	110.5
20-24 years	8,906	292	32.8	643	72.2
25-29 years	8,499	252	29.7	472	55.5
30-34 years	4,842	171	35.3	319	65.9
35 years and over	3,309	123	37.2	235	71.0

*For 185 neonatal and 414 infants deaths with age of mother unknown the distribution of those with known age was assumed.

For the Santiago Area, the age distribution of mothers of live births in Santiago Province referred to earlier was applied to the base of live births being used for the first year of the Investigation (Table 42). For infant deaths the low rates were for the 10-year span 25-34 years. These neonatal and infant death rates for the Santiago Area are lower than the comparable rates in São Paulo (Figure 56). The neonatal death rate for young mothers in the Santiago Area is unusually low. There may be differences in the utilization of the WHO definition of a live birth and fetal death in the two areas.

Table 42. Neonatal and Infant Mortality by Age of Mother at Birth of Child with Rates per 1,000 Live Births, Santiago Area, First Year of Investigation

Age of mother	Live births*	Neonatal deaths[1]		Infant Deaths[1]	
		Number	Rate	Number	Rate
Total	17,220	337	19.6	891	51.7
Under 20 years	2,460	48	19.5	169	68.7
20-24 years	5,670	83	14.6	265	46.7
25-34 years	6,960	140	20.1	315	45.3
35 years and over	2,130	66	31.0	142	66.7

*Distributed by age of mother of live births in Santiago Province, 1969.

[1]For 57 neonatal deaths and 149 infant deaths with age of mother unknown the distribution of those with known age was assumed.

Likewise for the Santiago Area, it was possible to calculate neonatal and infant death rates by birth order (Table 43 and Figure 56). The rates are lowest for first births and increase to very high rates for fifth and later births. Usually the neonatal death rate is higher for first births than for second births. The marked reduction of the birth rate as in Santiago Province has a favorable influence on infant mortality, since births of the higher orders in which the risk of death is greatest are the ones reduced. For full understanding of natality and mortality, live births by age of mother and birth order are essential.

Figure 56

NEONATAL AND INFANT MORTALITY BY AGE OF MOTHER IN SÃO PAULO AND SANTIAGO AREA AND BY BIRTH ORDER IN SANTIAGO AREA, FIRST YEAR OF INVESTIGATION

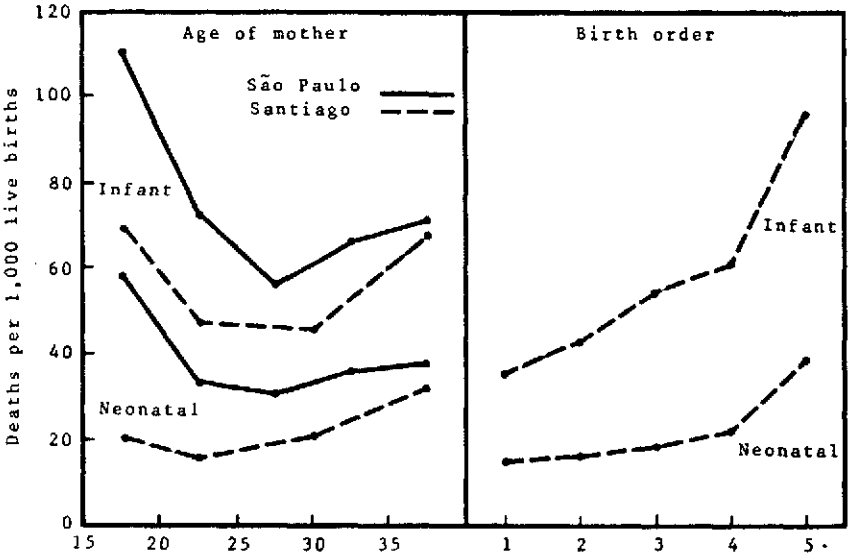


Table 43. Neonatal and Infant Mortality by Birth Order with Rates per 1,000 Live Births, Santiago Area, First Year of Investigation

Birth order	Live births*	Neonatal deaths[1]		Infant deaths[1]	
		Number	Rate	Number	Rate
Total	17,220	337	19.6	891	51.7
1	6,100	85	13.9	208	34.1
2	4,290	66	15.4	182	42.4
3	2,460	44	17.9	133	54.1
4	1,440	31	21.5	88	61.1
5 and over	2,930	111	37.9	280	95.6

*Distribution by birth order of live births in Santiago Province, 1969.

[1]For 17 neonatal deaths and 44 infant deaths with birth order unknown the distribution of those with known birth order was assumed.

Outcome of Previous Pregnancies

The outcome of previous pregnancies of these mothers of deceased children has been analyzed. In several projects, the staff was unusually successful in obtaining complete information regarding all products of previous pregnancies with the exact dates of delivery and the outcome stated. Attimes only the birth order and age of mother were known. Thus, the data are characterized according to their reliability and, for this section, only histories considered reliable are included.

The total and average number of products of previous pregnancies are considered first, that is, the number of live births and fetal deaths (Table 44 and Figure 57). The cities of Monterrey, Medellín and Recife, with high percentages of mothers in the older age groups (19.3, 19.2 and 16.3 per cent 35 years and over), have the largest average numbers of products of previous pregnancies, 4.1, 4.5 and 4.6, respectively. The cities of San Juan and La Paz have the smallest numbers, 1.9 and 2.3. The low averages in Santiago and São Paulo are evidence of limitation of family size, as is probably the explanation for San Juan. However, the comparatively few products in La Paz is surprising and requires further study.

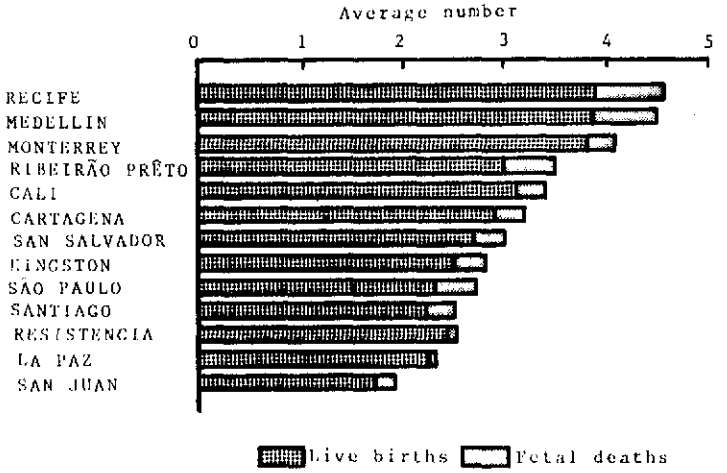
Table 44. Outcome of Products of Previous Pregnancies of Mothers of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Number of mothers*	Total products		Products dead						Live births		Neonatal deaths		Infant deaths	
				Total		Fetal deaths		Deaths**							
		Number	Average	Number	Per cent	Number	Per cent	Number	Per cent	Number	Average per mother	Number	Rate^	Number	Rate^
Cali	651	2245	3.4	520	23.2	202	9.0	318	14.2	2022	3.1	85	42.0	204	100.9
Cartagena	434	1409	3.2	311	18.6	137	8.2	174	10.4	1255	2.9	36	28.7	95	75.7
Kingston	824	2281	2.8	385	16.9	191	8.4	194	8.5	2084	2.5	71	34.1	132	63.3
La Paz	1076	2488	2.3	683	27.5	114	4.6	569	22.9	2373	2.2	97	40.9	340	143.3
Medellín	528	2380	4.5	643	27.0	273	11.5	370	15.5	2035	3.9	61	30.0	196	96.3
Monterrey	1772	7228	4.1	1511	20.9	550	7.6	961	13.3	6664	3.8	273	41.0	623	93.5
Recife	1738	7967	4.6	2987	37.5	1124	14.1	1863	23.4	6831	3.9	362	53.0	1345	196.9
Resistencia	419	1037	2.5	181	17.5	47	4.5	134	12.9	987	2.4	41	41.5	107	108.4
Ribeirão Prêto	215	754	3.5	206	27.3	116	15.4	90	11.9	638	3.0	30	47.0	62	97.2
San Juan	128	248	1.9	64	25.8	33	13.3	31	12.5	214	1.7	12	56.1	27	126.2
San Salvador	1238	3727	3.0	1254	33.6	326	8.7	928	24.9	3398	2.7	200	58.9	577	169.8
Santiago	792	1995	2.5	464	23.3	258	12.9	206	10.3	1718	2.2	65	37.8	174	101.3
São Paulo	1851	5089	2.7	1461	28.7	756	14.9	705	13.9	4324	2.3	213	49.3	525	121.4
Other area															
Chaco, rural	401	1233	3.1	187	15.2	38	3.1	149	12.1	1195	3.0	43	36.0	107	89.5
Franca	206	674	3.3	170	25.2	93	13.8	77	11.4	581	2.8	28	48.2	54	92.9
Ribeirão Prêto, rural	92	332	3.6	98	29.5	57	17.2	41	12.3	275	3.0	11	40.0	26	94.5
San Juan, suburban	343	1002	2.9	241	24.1	116	11.6	125	12.5	886	2.6	35	39.5	107	120.8
San Juan, rural	522	1666	3.2	368	22.1	124	7.4	244	14.6	1539	2.9	67	43.5	185	120.2
San Salvador, rural	457	1800	3.9	648	36.0	105	5.8	543	30.2	1694	3.7	106	62.6	275	162.3
Santiago, suburban	94	327	3.5	53	16.2	15	4.6	38	11.6	289	3.1	4	13.8	27	93.4
St. Andrew, rural	80	263	3.3	42	16.0	18	6.8	24	9.1	245	3.1	6	24.5	14	57.1
Vischa	53	149	2.8	39	26.2	1	0.7	38	25.5	148	2.8	12	81.1	24	162.2

*With apparently reliable pregnancy histories.
**Includes deaths at any age prior to death of study child.
^Rates per 1000 live births.

Figure 57

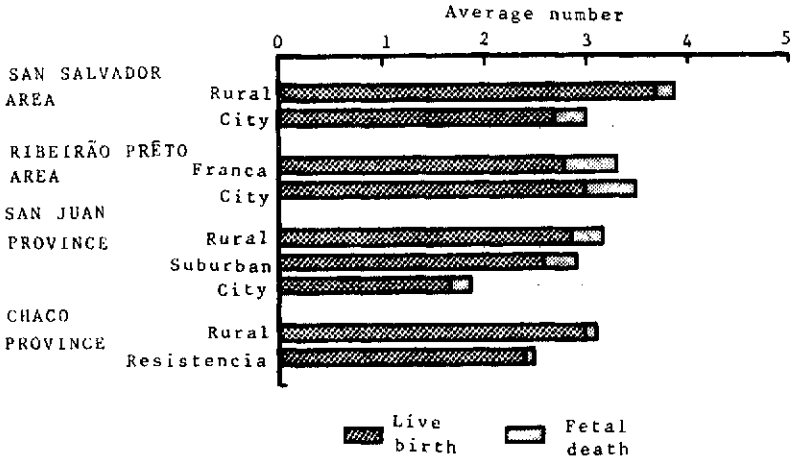
AVERAGE NUMBER OF PRODUCTS OF PREVIOUS PREGNANCIES OF MOTHERS OF DECEASED CHILDREN UNDER 5 YEARS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



In three projects fewer products were noted for the cities than for the rural areas (Figure 58). The difference between the averages for Franca and the city of Ribeirão Prêto was small.

Figure 58

AVERAGE NUMBER OF PRODUCTS OF PREVIOUS PREGNANCIES OF MOTHERS OF DECEASED CHILDREN UNDER 5 YEARS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Also in Table 44, the outcome of these products of previous pregnancies is given as of the date of death of the study child. From 17 to 38 per cent were reported as fetal deaths or as deaths of live births. The greatest pregnancy wastage appears in Recife where 1,738 mothers had 7,967 products of previous pregnancies of which 2,987 were dead (37.5 per cent). The percentages of previous products which were deaths of a live born child or fetal deaths in the 13 projects are shown in Figure 59. Collection of good quality data of this type on a retrospective basis is not an easy task and disproportions such as those noted in Chaco Province and La Paz between deaths of live born children and fetal deaths may be due to incomplete reporting of fetal deaths by the mother due to failure to remember or perhaps a lower incidence of fetal deaths. This does not invalidate the findings of excessive reproductive wastage found in several of the areas studied.

From data regarding age at death and live births, infant and neonatal death rates in products of previous pregnancies have been calculated (Table 44). In all of these projects, infant mortality of the previous live births was greater than that found in the Investigation, as shown for the cities in Figure 60. The high infant mortality among the previous live born children of the mothers in this Investigation may be indicative of a specific group with high risk of pregnancy loss. Part of the difference in the rates is due to the time factor since infant mortality has been declining and the infants of older mothers would have experienced conditions of 10 years ago.

Figure 59

MORTALITY OF PRODUCTS OF PREVIOUS PREGNANCIES OF MOTHERS OF DECEASED CHILDREN IN 13 PROJECTS, FIRST YEAR OF INVESTIGATION

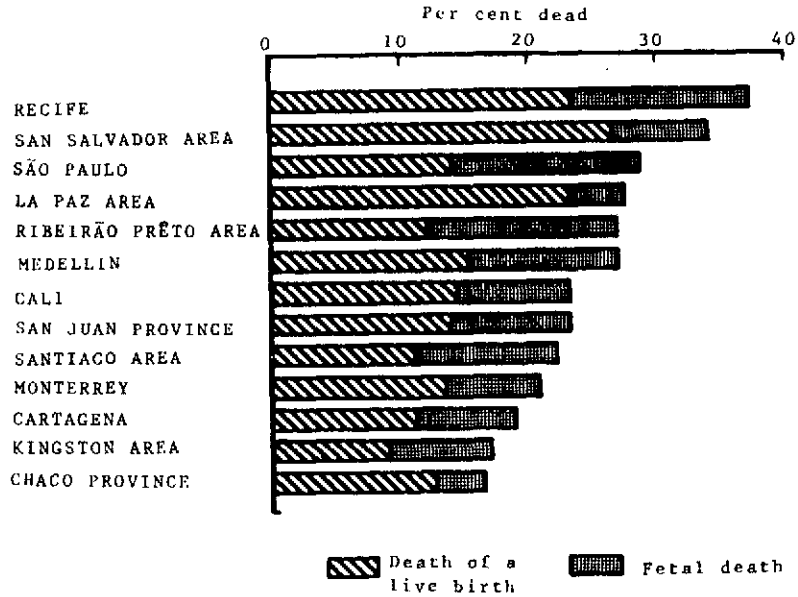


Figure 60

INFANT MORTALITY IN CENTRAL CITIES AND IN PRODUCTS OF PREVIOUS PREGNANCIES OF MOTHERS OF DECEASED CHILDREN, FIRST YEAR OF INVESTIGATION

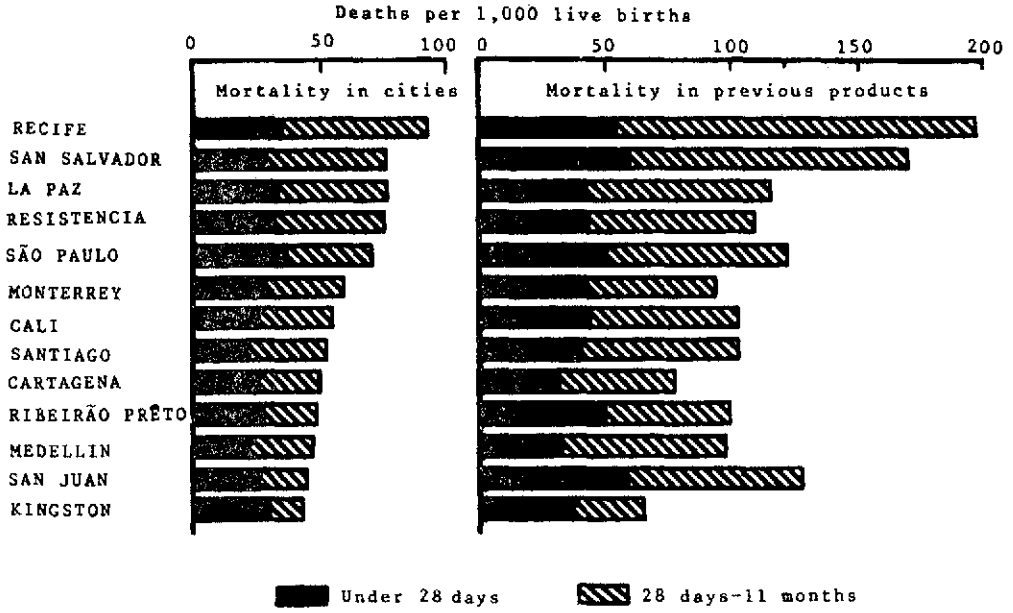
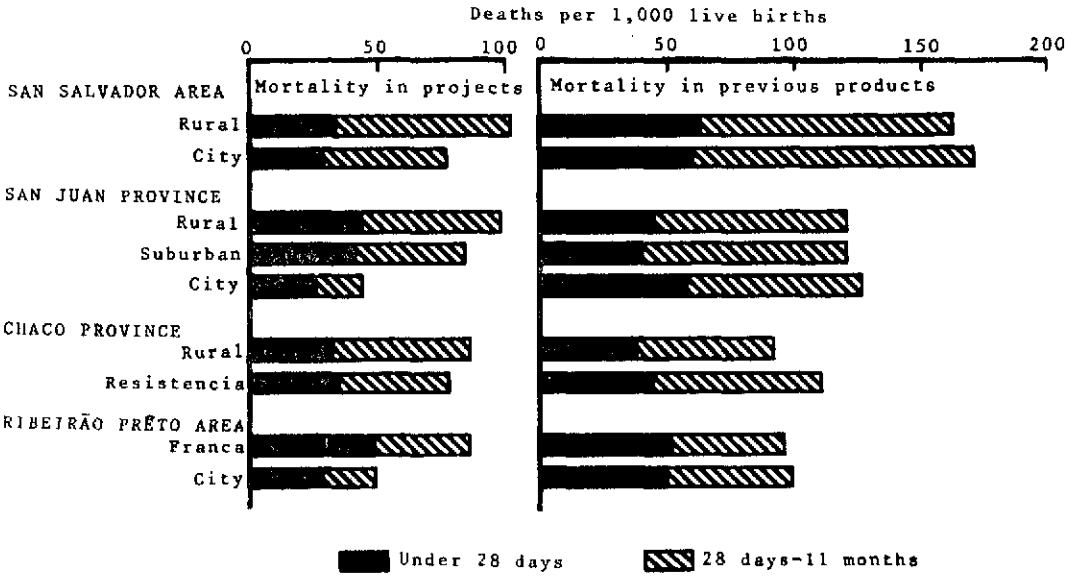


Figure 61

INFANT MORTALITY IN URBAN AND RURAL AREAS OF 4 PROJECTS AND IN PRODUCTS OF PREVIOUS PREGNANCIES OF MOTHERS OF DECEASED CHILDREN, FIRST YEAR OF INVESTIGATION



As observed for urban and rural areas of four projects (Figure 61), the infant death rates of live births of previous pregnancies were essentially the same in rural and urban areas. In the Investigation, however, the rural areas have higher rates. These differences may be explained on the basis of the introduction of health programs, including water supplies and also to better educational standards and family planning practices in the urban areas.

Further analyses of this material will be possible for the two-year period for the final report. This information is provisional and is being provided to indicate its potential value in understanding the mortality problems.

Education of the Mother

The years and level of education of the mothers of deceased children (and the level reached) were obtained in the home interview and are presented in four divisions (Table 45 and Figures 62 and 63). Here again, as in many of the factors considered, there is wide variation. Small proportions of mothers of the deceased children had secondary, technical or university education. Such education was more frequent in the cities of San Juan and Santiago than

Table 45. Educational Level of Mothers of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total mothers*	Secondary, university, etc.		Primary, 3 years and over		Primary, 1 and 2 years		None and unspecified	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	666	88	13.2	329	49.4	144	21.6	105	15.8
Cartagena	410	34	8.3	192	46.8	92	22.4	92	22.4
Kingston	837	99	11.8	681	81.4	30	3.6	27	3.2
La Paz	1,065	191	17.9	386	36.2	138	13.0	350	32.9
Medellín	496	64	12.9	246	49.6	108	21.8	78	15.7
Monterrey	1,807	174	9.6	899	49.8	322	17.8	412	22.8
Recife	1,817	81	4.5	482	26.5	302	16.6	952	52.4
Resistencia	428	19	4.4	201	47.0	87	20.3	121	28.3
Ribeirão Prêto	226	13	5.8	110	48.7	51	22.6	52	23.0
San Juan	128	46	35.9	59	46.1	13	10.2	10	7.8
San Salvador	1,273	111	8.7	625	49.1	167	13.1	370	29.1
Santiago	742	188	25.3	422	56.9	56	7.5	76	10.2
São Paulo	1,846	190	8.2	795	40.0	595	21.5	556	30.3
Other area									
Chaco, rural	420	10	2.4	99	23.6	106	25.2	205	48.8
France	210	17	8.1	95	45.2	49	23.3	49	23.3
Ribeirão Prêto, rural	97	2	2.1	33	34.0	19	19.6	43	44.3
San Juan, suburban	342	44	12.9	186	54.4	75	21.9	37	10.8
San Juan, rural	524	16	3.1	289	54.4	140	26.7	83	15.8
San Salvador, rural	464	5	1.1	101	21.8	72	15.5	286	61.6
Santiago, suburban	97	9	9.3	49	50.5	20	20.6	19	19.6
St. Andrew, rural	83	6	7.2	58	69.9	9	10.8	10	12.0
Viacha	53	1	1.9	19	35.8	-		33	62.3

*With family interviews.

Figure 62

EDUCATIONAL LEVEL OF MOTHERS OF DECEASED CHILDREN
IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

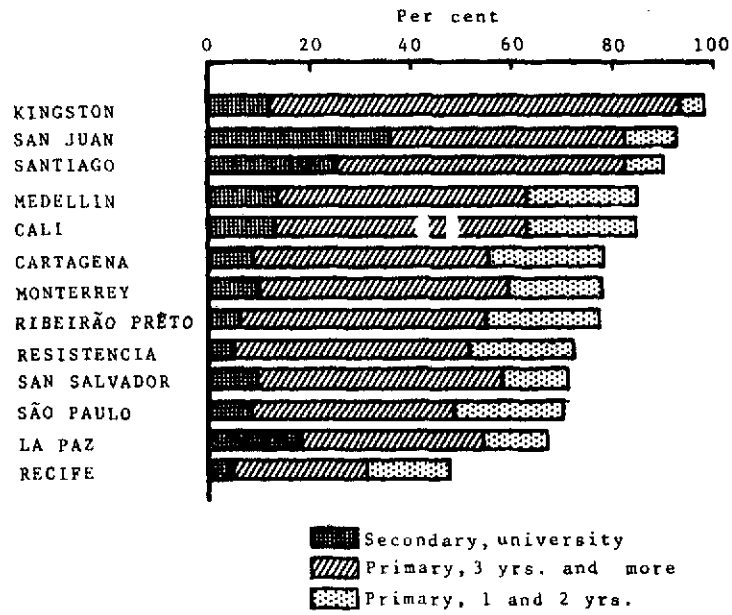
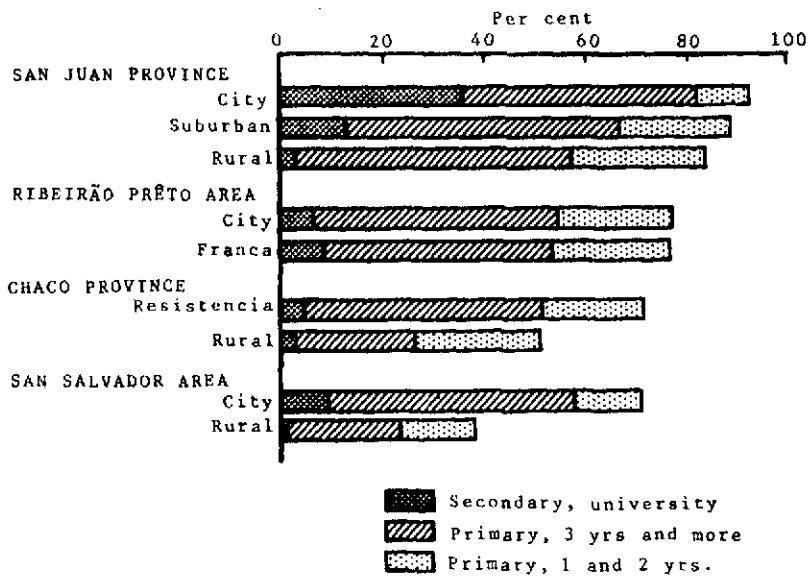


Figure 63

EDUCATIONAL LEVEL OF MOTHERS OF DECEASED CHILDREN IN URBAN AND
RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



in the other cities. At least half of the mothers in all the cities except Recife and São Paulo had completed at least two years of primary school. As expected, the education of mothers in suburban and rural areas, except those of the Ribeirão Prêto Area, was less than in the corresponding cities. This was found to be particularly true in the project of San Salvador where 62 per cent of the mothers of deceased children in the rural communities had no education. The educational level of mothers is important in planning health programs. It is obvious that in some areas educational material through pamphlets will not be useful and that the health programs must feature prenatal and well baby clinics.

Breast Feeding

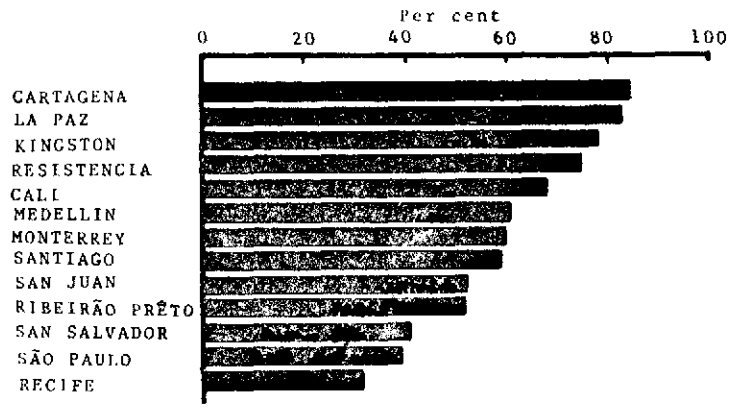
Because of its direct and indirect implications on nutritional state and on the incidence of diarrheal disease, breast feeding has been considered among the important factors related to mortality in childhood. Its duration as well as the introduction of complementary and supplementary foods of protein nature into the diet of deceased and living children has been investigated. The patterns of breast feeding in the areas of the Investigation will be known when the material of the probability sample of households for the two years is analyzed.

Data in this presentation relate to children under 5 years of age excluding the neonatal period. Premature infants dying in the hospitals who are not breast fed account for a major portion of neonatal deaths and is the reason that deaths in the neonatal period are excluded.

Table 46 provides information on breast feeding of deceased children by age for cities and other areas of the 13 projects. The differences in the cities in provision of breast feeding are marked, as can be seen in this table and in Figure 64. In Recife and San Salvador, less than 40 per cent of all

Figure 64

PERCENTAGE OF DECEASED CHILDREN UNDER 5 YEARS* BREAST FED ONE MONTH OR LONGER IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



*Excluding neonatal deaths

Table 46. Percentage of Deceased Children* Breast Fed One Month or Longer by Age at Death in Central Cities and Other Areas, First Year of Investigation

Central city and other area	28 days-4 years			28 days-11 months			1-4 years		
	Total children	Breast fed 1 month or longer		Total children	Breast fed 1 month or longer		Total children	Breast fed 1 month or longer	
		Number	Per cent		Number	Per cent		Number	Per cent
Cali	435	293	67.4	239	144	60.3	196	149	76.0
Cartagena	309	259	83.8	180	143	79.4	129	116	89.9
Kingston	383	297	77.5	253	188	74.3	130	109	83.8
La Paz	783	641	82.0	423	316	74.7	360	325	90.3
Medellín	364	218	59.9	196	99	50.5	168	119	70.8
Monterrey	1217	723	59.4	869	457	52.6	348	266	76.4
Recife	1328	410	30.9	838	225	26.8	490	185	37.8
Resistencia	292	216	74.0	221	154	69.7	71	62	87.3
Ribeirão Prêto	126	64	50.8	93	38	40.9	33	26	78.8
San Juan	62	32	51.6	51	24	47.1	11	8	72.7
San Salvador	932	371	39.8	634	200	31.5	298	171	57.4
Santiago	500	287	57.4	404	224	55.4	96	63	65.6
São Paulo	1032	398	38.6	797	260	32.6	235	138	58.7
Other area									
Chaco, rural	309	236	76.4	208	151	72.6	101	85	84.2
Franca	111	72	64.9	77	41	53.2	34	31	91.2
Ribeirão Prêto, rural	57	29	50.9	39	13	33.3	18	16	88.9
San Juan, suburban	201	107	53.2	159	75	47.2	42	32	76.2
San Juan, rural	346	219	63.3	252	142	56.3	94	77	81.9
San Salvador, rural	375	229	61.1	185	79	42.7	190	150	78.9
Santiago, suburban	72	43	59.7	63	38	60.3	9	5	**
St. Andrew, rural	56	45	80.4	30	24	80.0	26	21	80.8
Viacha	34	32	94.1	17	16	94.1	17	16	94.1

*Excluding neonatal deaths; in families with home interviews.
**Percent not calculated for base less than 10.

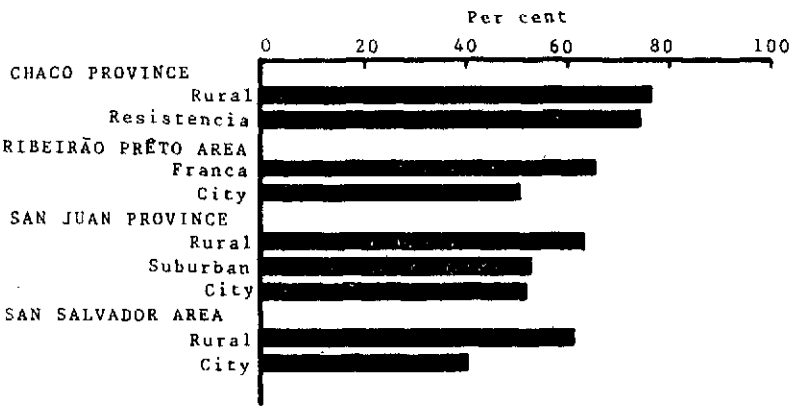
deceased children between 28 days-4 years of age had been breast fed for at least one month, while in Cartagena, La Paz, Kingston and Resistencia more than 70 per cent had been breast fed the same length of time. In general in the rural areas (Figure 65) proportions of deceased children breast fed for at least a month were slightly higher than in the corresponding cities and the variations in the rural areas were less than in the cities.

Another puzzling finding was that the proportions breast fed of the children who died at 1-4 years of age were higher than of children who died in the postneonatal period (Figures 66 and 67). A striking example of this is in São Paulo as shown below:

	Deaths	Breast fed	
		Number	Per cent
Postneonatal	797	260	32.6
1-4 years	235	138	58.7

Figure 65

PERCENTAGE OF DECEASED CHILDREN UNDER 5 YEARS* BREAST FED ONE MONTH OR LONGER IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION

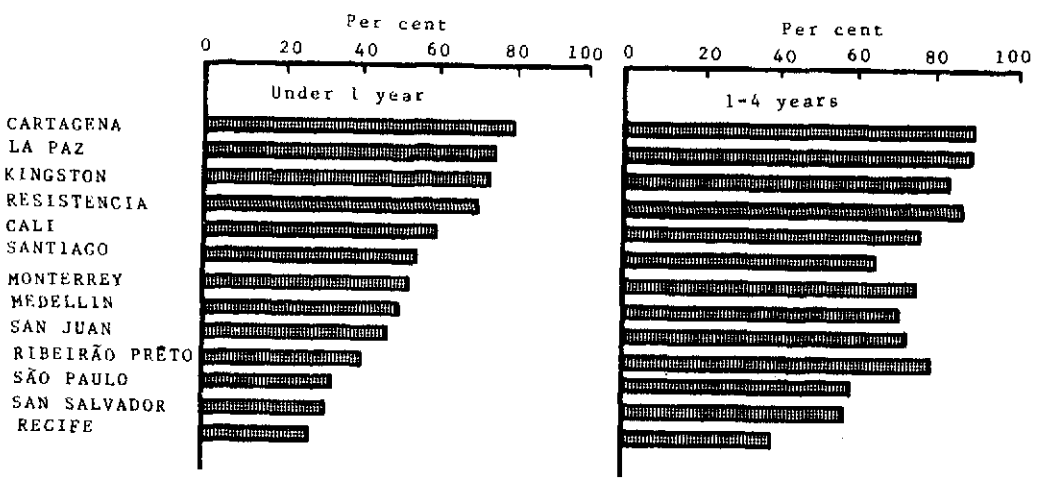


*Excluding neonatal deaths

This difference of 26.1 between the percentages for breast feeding in the two age groups clearly indicates a need for further study of the two groups to understand the role of breast feeding on mortality as well as other factors involved. Study of the causes of death of children that were breast fed and those who were not breast fed is advisable. A similar and slightly smaller

Figure 66

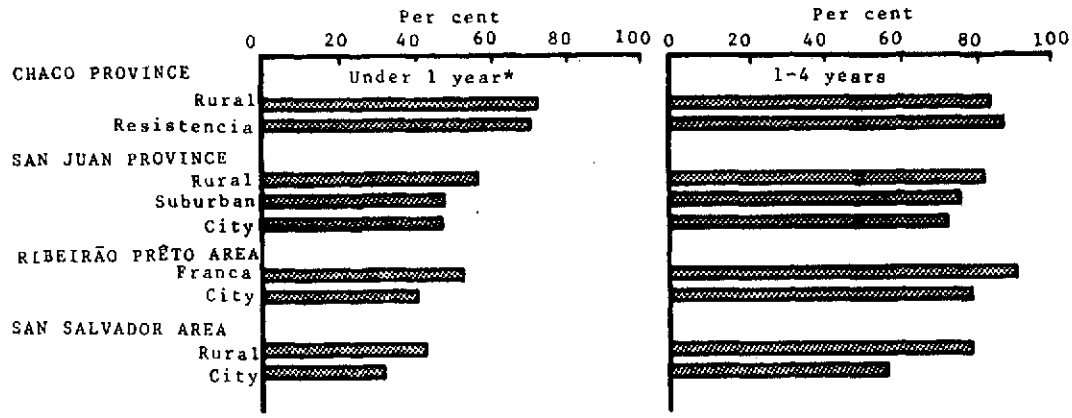
PERCENTAGE OF DECEASED CHILDREN* BREAST FED ONE MONTH OR LONGER FOR 2 AGE GROUPS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



*Excluding neonatal deaths

Figure 67

PERCENTAGE OF DECEASED CHILDREN* BREAST FED ONE MONTH OR LONGER FOR 2 AGE GROUPS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



*Excluding neonatal deaths

difference of 23.8 was noted in Monterrey. At the two extremes, with high and with low proportions breast fed, the differences were small. In Recife, low percentages were noted for both age groups. In Cartagena and Kingston, the percentages were high in both age groups. However, in each city or other area the differences were in the same direction, with higher percentages breast fed for the children 1-4 years of age.

The cities with the very high death rates, Recife and San Salvador, have small proportions of children breast fed. Also, these same cities have other unfavorable conditions such as limited prenatal care and piped water supplies available to only a small portion of homes. Thus, limited breast feeding and several other negative factors in combined action contribute greatly to excessive death rates in these areas. Further analyses are indicated for greater understanding of the effect of breast feeding on mortality.

In summary, wide differences are noted in many social and biological factors affecting mortality in these families of deceased children. The reproductive histories reveal serious pregnancy losses in several areas and high infant mortality of previous products of these mothers. The role of age of mother and birth order on infant mortality has been illustrated as an example of analyses that will result from this Investigation. The relation of breast feeding to infant mortality requires further exploration. In general, the data indicate sufficient different patterns of these social, cultural and biological characteristics to recommend collection of complete and accurate data on live births and infant deaths for analyses for greater understanding of natality and mortality in each country.

VI. ENVIRONMENTAL CONDITIONS

The type of water supply, toilet facilities and housing available to the families of deceased children were investigated during the family interview. As in the case of other environmental and socio-cultural factors, the completeness of the information depends on the success in locating the homes. The data presented in this section relate to those families in which a home interview was performed. Information on environmental conditions has been analyzed for the 13 cities and for the suburban and rural areas of four projects. Data for two years are needed for presentation of findings in the suburban communities of Santiago, rural Ribeirão Prêto and St. Andrew and Viacha.

Water Supply

The information on water supply was limited to piped water inside or outside the house or other sources of supply. As presented in Table 47 and Figure 68, piped water, either inside or outside the house, was found to be provided to more than 80 per cent of the homes of interviewed families in six cities: Cali, Cartagena, Kingston, Medellín, San Juan and Santiago. In

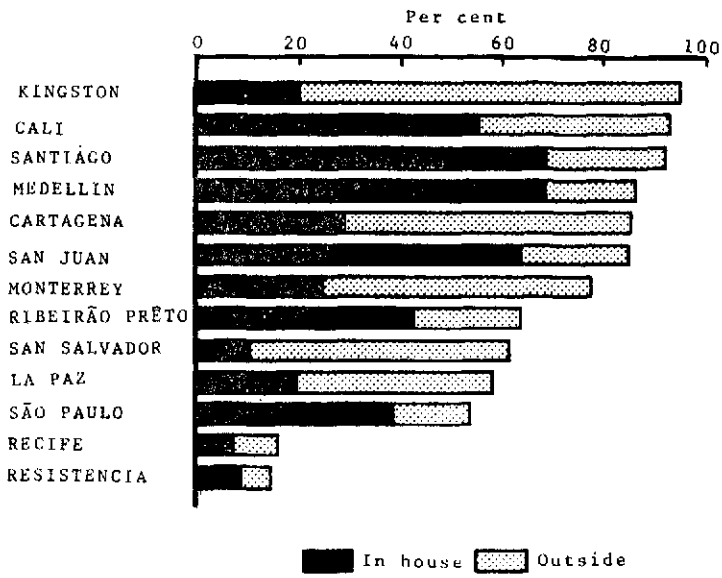
Table 47. Water Supply in Homes of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total homes*	Piped water				Other or unknown	
		In house		Outside			
		Number	Per cent	Number	Per cent	Number	Per cent
Cali	667	365	54.7	251	37.6	51	7.6
Cartagena	410	117	28.5	229	55.9	64	15.6
Kingston	841	164	19.5	631	75.0	46	5.5
La Paz	1,078	194	18.0	422	39.1	462	42.9
Medellín	497	335	67.4	90	18.1	72	14.5
Monterrey	1,809	437	24.2	956	52.8	416	23.0
Recife	1,817	108	5.9	165	9.1	1544	85.0
Resistencia	428	33	7.7	25	5.8	370	86.4
Ribeirão Prêto	226	94	41.6	48	21.2	84	37.2
San Juan	128	81	63.3	27	21.1	20	15.6
San Salvador	1,273	117	9.2	653	51.3	503	39.5
Santiago	743	507	68.2	175	23.6	61	8.2
São Paulo	1,867	702	37.6	286	15.3	879	47.1
Other area							
Chaco, rural	420	6	1.4	11	2.6	403	96.0
Franco	210	45	21.4	26	12.4	139	66.2
Ribeirão Prêto, rural	97	34	35.1	46	47.4	17	17.5
San Juan, suburban	343	56	16.3	52	15.2	235	68.5
San Juan, rural	524	23	4.4	21	4.0	480	91.6
San Salvador, rural	464	2	0.4	63	13.6	399	86.0
Santiago, suburban	98	16	16.3	47	48.0	35	35.7
St. Andrew, rural	87	4	4.8	38	45.8	41	49.4
Viacha	53	20	37.7	21	39.6	12	22.6

*With family interviews.

Figure 68

PERCENTAGE OF HOMES OF DECEASED CHILDREN WITH PIPED WATER IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



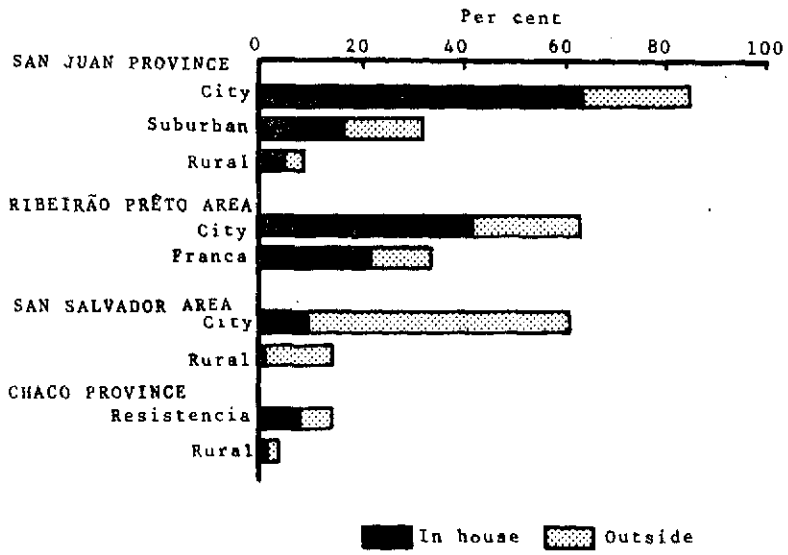
the Colombian projects of Cali and Cartagena, location of homes was unsuccessful for over 30 per cent of the deceased children and thus environmental conditions are not known in that high proportion. However, the principal collaborators of these projects report that piped water is available to nearly all the population.

In Resistencia and Recife and several rural areas, a very small proportion of homes had piped water. In the projects that include also suburban and rural areas, the differences in the provision of piped water are striking as given in Table 47 and shown in Figure 69.

The central cities and other areas with limited water supplies, especially Recife, Resistencia and San Salvador, are the ones with excessive mortality of children under 5 years of age. In contrast, Kingston and Santiago with water supplies available to high proportions of homes have low death rates. Cali and the other cities in Colombia, however, with water provided to a high proportion of homes have intermediate positions in mortality. Thus, the provision of water does not appear to have the same inverse correlation for these areas as presented in the Progress Report, June 1970. Within Brazil, the inverse relationship is noted and likewise, when urban and rural areas in projects are studied. In Figure 70 the relationship between availability of piped water and death rates is presented for the rural areas and corresponding cities of four projects. In these an inverse relationship can be observed

Figure 69

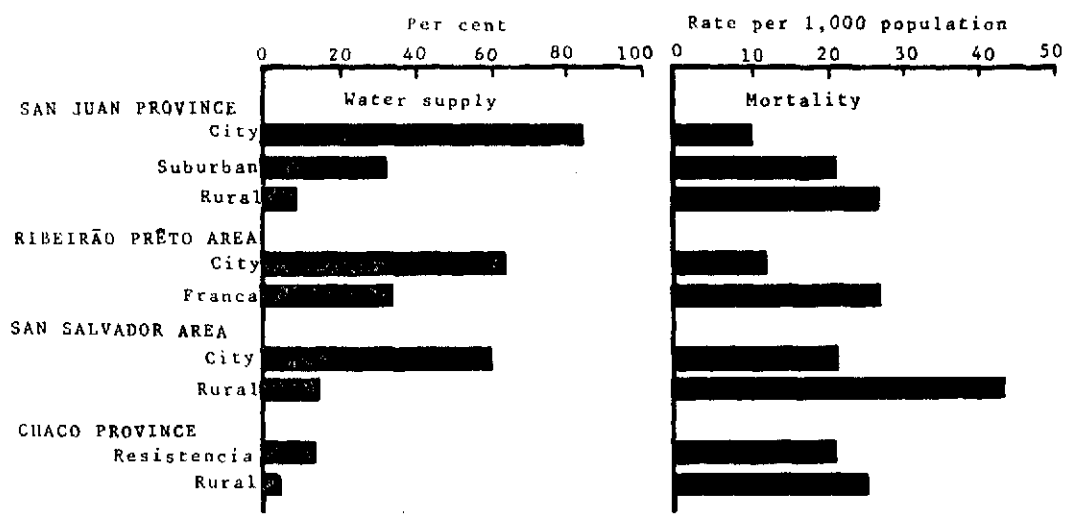
PERCENTAGE OF HOMES OF DECEASED CHILDREN WITH PIPED WATER IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



between mortality and availability of piped water. Thus, it seems evident that intensive efforts should be made to provide urban and rural populations with adequate service of water supplies. Lack of this essential sanitary facility can be an important contributing factor to high mortality in infancy and childhood particularly in areas in which breast feeding and other sources of high quality nutrients are insufficient.

Figure 70

PERCENTAGE OF HOMES OF DECEASED CHILDREN WITH PIPED WATER AND MORTALITY UNDER 5 YEARS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Toilet Facilities

As with piped water supplies, the availability of toilet facilities varies strikingly among the areas of the Investigation. These facilities have been divided into three categories: flush toilet in the house, communal toilet and other. Table 48 and Figures 71 and 72 describe the situation encountered during the home visits to families of deceased children.

Recife and Resistencia were found to have the lowest proportions of houses with flush toilet facilities either in the house or communal. La Paz and Cartagena had the largest proportions of families of deceased children with no toilet facilities at all.

In Kingston 52 per cent of the families were found to have toilet facilities of the communal type. Likewise in Monterrey, this type of service was reported in 24 per cent of the families of deceased children. In all other areas, less than 10 per cent of the families had communal facilities. In the suburban and rural areas of San Juan Province and rural communities of San Salvador project the availability of toilet facilities was much less than in the cities, with large proportions of homes without any sanitary installation of this sort.

Table 48. Toilet Facilities in Homes of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total homes*		Flush toilet				Other		None and unknown	
			House		Communal					
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	667	100.0	317	47.5	46	6.9	262	39.3	42	6.3
Cartagena	410	100.1	61	14.9	6	1.5	134	32.7	209	51.0
Kingston	841	100.0	160	19.0	435	51.7	236	28.1	10	1.2
La Paz	1,078	100.0	160	14.8	43	4.0	164	15.2	711	66.0
Medellín	497	99.9	284	57.1	10	2.0	121	24.3	82	16.5
Monterrey	1,809	100.0	408	22.6	429	23.7	796	44.0	176	9.7
Recife	1,817	100.0	64	3.5	3	0.2	1,128	62.1	622	34.2
Resistencia	428	100.0	23	5.4	4	0.9	277	64.7	124	29.0
Ribeirão Prêto	226	100.0	85	37.6	21	9.3	96	42.5	24	10.6
San Juan	128	100.0	60	46.9	8	6.2	26	20.3	34	26.6
San Salvador	1,273	100.1	99	7.8	104	8.2	784	61.6	286	22.5
Santiago	743	100.0	390	52.5	23	3.1	280	37.7	50	6.7
São Paulo	1,867	100.1	496	26.6	125	6.7	1,017	54.5	229	12.3
Other area										
Chaco, rural	420	100.0	5	1.2	7	1.7	292	69.5	116	27.6
Franca	210	100.0	41	19.5	8	3.8	148	70.5	13	6.2
Ribeirão Prêto, rural	97	100.0	30	30.9	6	6.2	54	55.7	7	7.2
San Juan, suburban	343	100.0	41	12.0	10	2.9	78	22.7	214	62.4
San Juan, rural	524	100.1	16	3.1	3	0.6	96	18.3	409	78.1
San Salvador, rural	464	100.0	2	0.4	2	0.4	141	30.4	319	68.8
Santiago, suburban	98	100.0	11	11.2	5	5.1	63	64.3	19	19.4
St. Andrew, rural	83	100.0	2	2.4	-		81	97.6	-	
Viacha	53	100.1	3	5.7	-		2	3.8	48	90.6

*With family interviews.

Figure 71

TOILET FACILITIES IN HOMES OF DECEASED CHILDREN IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

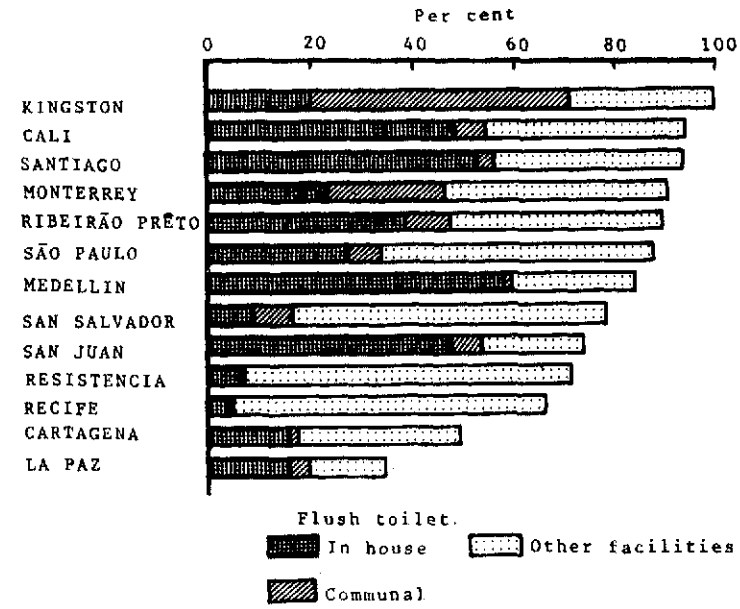
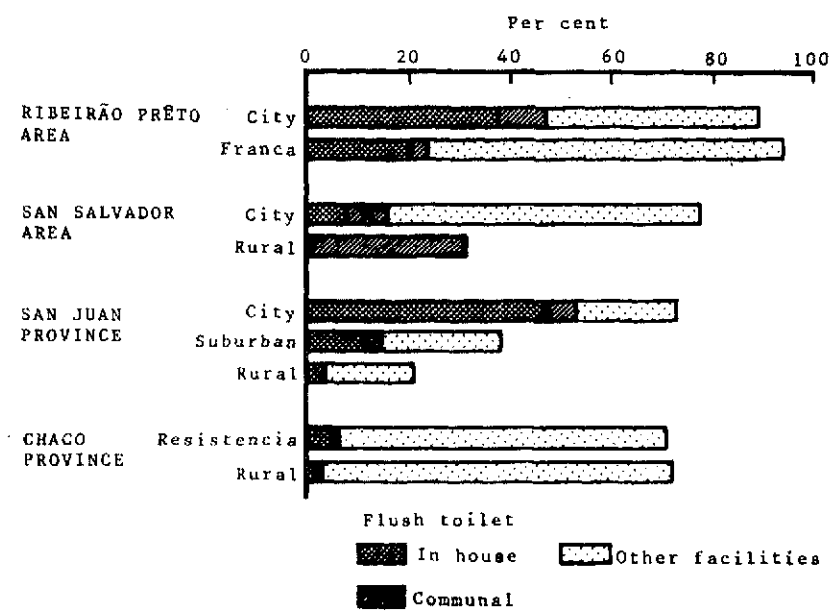


Figure 72

TOILET FACILITIES IN HOMES OF DECEASED CHILDREN IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Housing Conditions

During the visits to the families, an appraisal was made of housing conditions, including a classification of the house and of the neighborhood and the number of rooms in the house. In this report, reference will be made only to the size of families, to the number of rooms per family and persons per room as means to estimate crowding. The average size of families of the deceased children in the cities varies from 4.0 per family in La Paz to 6.9 in Cartagena (Table 49). In the areas outside the cities the lowest number of persons per family was found in Viacha (4.4) and the highest in rural St. Andrew (6.8).

Table 49. Average Size of Family of Deceased Children under 5 Years in Central Cities and Other Areas, First Year of Investigation

Central City	Families*	Persons	Average per family	Other area	Families*	Persons	Average per family
Cali	667	3,371	5.1	Chaco, rural	420	2,214	5.3
Cartagena	410	2,843	6.9	Franca	210	1,115	5.3
Kingston	841	3,634	4.3	Ribeirão Prêto, rural	97	550	5.7
La Paz	1,078	4,286	4.0	San Juan, suburban	343	1,914	5.6
Medellín	497	3,176	6.4	San Juan, rural	524	3,054	5.8
Monterrey	1,809	11,039	6.1	San Salvador, rural	464	2,951	6.4
Recife	1,817	10,733	5.9	Santiago, suburban	98	560	5.7
Resistencia	428	2,336	5.5	St. Andrew, rural	83	568	6.8
Ribeirão Prêto	226	1,239	5.5	Viacha	53	231	4.4
San Juan	128	703	5.5				
San Salvador	1,273	6,983	5.5				
Santiago	743	3,599	4.8				
São Paulo	1,867	7,795	4.2				

*With interviews.

In Table 50 and Figure 73, the distribution of families by number of rooms is presented. The range is rather wide varying in the cities from San Salvador and Kingston in which more than 70 per cent of the families of deceased children lived in one room to San Juan and Recife where around 70 per cent of the families lived in houses with more than two rooms. In rural San Salvador 90 per cent of the families lived in one room (Figure 74). The housing conditions of families appeared to be similar in the suburban and rural areas to those in the corresponding cities of the projects.

Table 50. Families of Deceased Children under 5 Years by Size of House in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total families*	Number of rooms in house									
		One		Two		Three		Four		Five or more	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	640	177	27.7	124	19.4	102	15.9	85	13.3	152	23.8
Cartagena	405	140	34.6	137	33.8	63	15.6	34	8.4	31	7.7
Kingston	836	593	70.9	142	17.0	53	6.3	21	2.5	27	3.2
La Paz	1,008	552	54.8	232	23.0	107	10.6	60	6.0	57	5.7
Medellín	486	98	20.2	100	20.6	95	19.5	83	17.1	110	22.6
Monterrey	1,750	510	29.1	806	46.1	257	14.7	105	6.0	72	4.1
Recife	1,803	173	9.6	373	20.7	402	22.3	400	22.2	455	25.2
Resistencia	420	165	39.3	153	36.4	66	15.7	26	6.2	10	2.4
Ribierão Prêto	225	31	13.8	61	27.1	61	27.1	45	20.0	27	12.0
San Juan	127	15	11.8	25	19.7	29	22.8	26	20.5	32	25.2
San Salvador	1,258	1004	79.8	114	9.1	61	4.8	34	2.7	45	3.6
Santiago	709	186	26.2	177	25.0	113	15.9	112	15.8	121	17.1
São Paulo	1,815	327	18.0	796	43.9	391	21.5	194	10.7	107	5.9
Other area											
Chaco, rural	413	189	45.8	140	33.9	45	10.9	21	5.1	18	4.4
Franca	206	18	8.7	53	25.7	58	28.2	44	21.4	33	16.0
Ribeirão Prêto, rural	97	7	7.2	28	28.9	17	17.5	18	18.6	27	27.8
San Juan, suburban	340	75	22.1	75	22.1	80	23.5	61	17.9	49	14.4
San Juan, rural	513	74	14.4	142	27.7	149	29.0	92	17.9	56	10.9
San Salvador, rural	454	385	84.8	52	11.5	13	2.9	1	0.2	3	0.7
Santiago, suburban	95	19	20.0	34	35.8	20	21.1	13	13.7	9	9.5
St. Andrew, rural	83	7	8.4	12	14.5	27	32.5	17	20.5	20	24.1
Viacha	50	23	46.0	14	28.0	4	8.0	4	8.0	5	10.0

*Families with interviews and information provided.

Figure 73

PERCENTAGE OF FAMILIES OF DECEASED CHILDREN LIVING IN HOMES OF ONE OR TWO ROOMS IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION

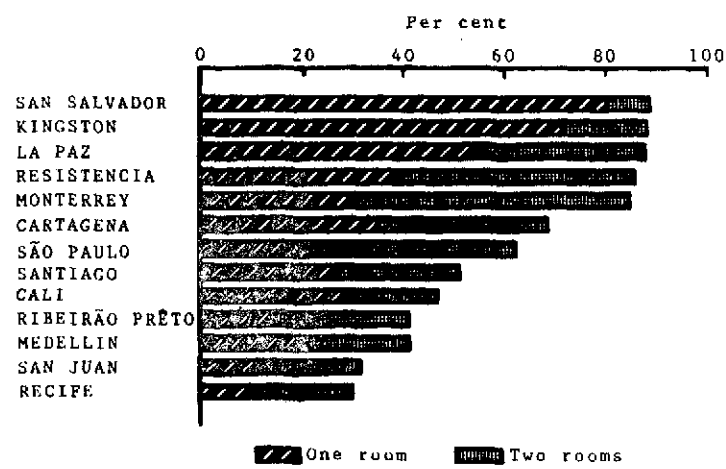
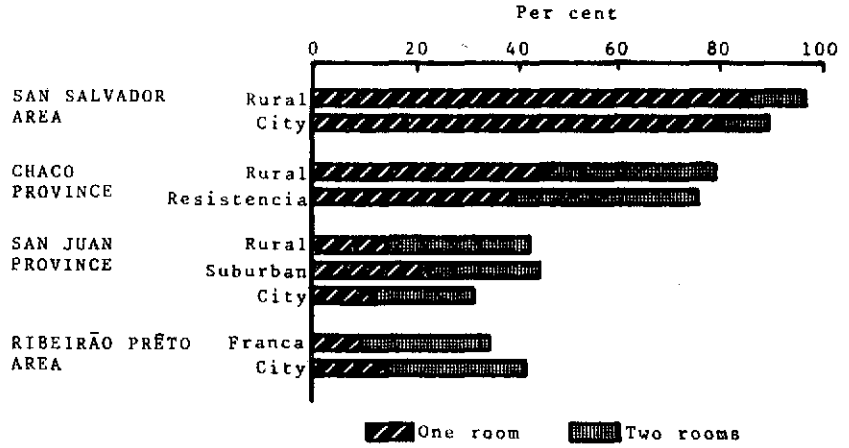


Figure 74

PERCENTAGE OF FAMILIES OF DECEASED CHILDREN LIVING IN HOMES OF ONE OR TWO ROOMS IN URBAN AND RURAL AREAS OF 4 PROJECTS, FIRST YEAR OF INVESTIGATION



Since the average size of the families varied in these areas, the distribution of families by number of persons per room has been calculated. As given in Table 51 and shown in Figure 75, the index of crowding in the cities

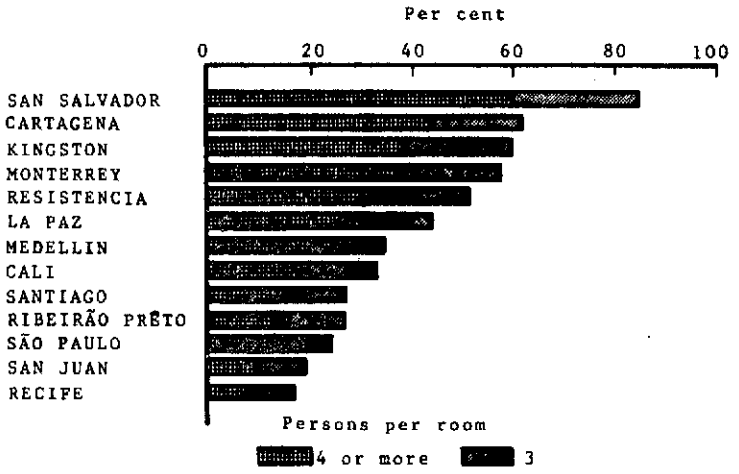
Table 51. Families of Deceased Children under 5 Years by Average Number of Persons per Room in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total families*	Persons per room									
		Less than one		One		Two		Three		Four or more	
		Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Cali	622	121	19.5	155	24.9	137	22.0	100	16.1	109	17.5
Cartagena	402	6	1.5	80	19.9	67	16.7	74	18.4	175	43.5
Kingston	834	17	2.0	123	14.7	196	23.5	181	21.7	317	38.0
La Paz	997	74	7.4	209	21.0	276	27.7	179	18.0	259	26.0
Medellín	484	61	12.6	138	28.5	114	23.6	61	12.6	110	22.7
Monterrey	1,747	82	4.7	326	18.7	347	19.9	332	19.0	660	37.8
Recife	1,798	183	10.2	819	45.6	494	27.5	160	8.9	142	7.9
Resistencia	420	13	3.1	88	21.0	102	24.3	82	19.5	135	32.1
Ribeirão Prêto	223	20	9.0	90	40.4	52	23.3	30	13.5	31	13.9
San Juan	127	17	13.4	64	50.4	22	17.3	12	9.4	12	9.4
San Salvador	1,254	21	1.7	95	7.6	208	16.6	181	14.4	749	59.7
Santiago	697	84	12.1	237	34.0	184	26.4	99	14.2	93	13.3
São Paulo	1,786	227	12.7	672	37.6	451	25.3	213	11.9	223	12.5
Other area											
Chaco, rural	413	21	5.1	61	14.8	104	25.2	75	18.2	152	36.8
Franca	204	25	12.3	92	45.1	52	25.5	20	9.8	15	7.4
Ribeirão Prêto, rural	96	15	15.6	41	42.7	20	20.8	11	11.5	9	9.4
San Juan, suburban	339	42	12.4	105	31.0	81	23.9	46	13.6	65	19.2
San Juan, rural	512	38	7.4	178	34.8	138	27.0	78	15.2	80	15.6
San Salvador, rural	454	-		12	2.6	29	6.4	64	14.1	349	76.9
Santiago, suburban	94	3	3.2	31	33.0	27	28.7	17	18.1	16	17.0
St. Andrew, rural	83	4	4.8	37	44.6	28	33.7	9	10.8	5	6.0
Viacha	50	1	2.0	14	28.0	16	32.0	8	16.0	11	22.0

*Families with interviews and information provided.

Figure 75

PERCENTAGE OF FAMILIES OF DECEASED CHILDREN WITH AT LEAST 3 PERSONS PER ROOM IN CENTRAL CITIES, FIRST YEAR OF INVESTIGATION



has been found greatest in the families of deceased children in San Salvador where 60 per cent had four or more persons per room and 14 per cent at least three persons per room. In the other extreme, Recife and San Juan had less than 10 per cent of the families with four or more members per room. Crowding conditions are essentially the same in the suburban and rural areas as in the corresponding cities of the projects, as given in Table 51. It thus seems that improvements in some environmental conditions such as housing has not reached even the urban populations in some areas of the Investigation.

In summary, it is evident that the environmental conditions of the families of deceased children are far from favorable in several areas of the Investigation, and even less favorable in the rural sectors. Once analyses are made of the material from the probability sample of households and descriptions of these conditions are available for the general populations of the areas, a better definition can be made of vulnerable sectors of populations. In the meantime, however, it seems safe to assign to these unfavorconditions an important role in excessive mortality and to make strong recommendation for extending the coverage of environmental health services - particularly of water supplies.

VII. UTILIZATION OF RESULTS

An important objective of the Investigation is full utilization of the findings for local, national and international actions. Although the projects were conducted in specific areas, certain results serve also for indication of problems in other areas of the countries and for neighboring regions. Serious problems revealed, such as nutritional deficiency, deserve additional studies for measurement and actions at the local level. There are several important fields for action.

First, Integrated Maternal and Child Health Programs. The comprehensive study of mortality in childhood, taking into account the multiple causes of death and the determination of contributing factors, provides measurement of the major problems in child health. This knowledge should be utilized in planning activities for improvement of the health of mother and child.

Throughout this report, the interrelationships of diseases and conditions such as immaturity, nutritional deficiency and infectious diseases have been analyzed. The availability and use of adequate food supplies by mothers and their children is probably the most important factor to be stressed for the prevention of mortality. Several factors have been analyzed such as breast feeding, prenatal care, vaccinations and provision of water supplies which indicate the need for actions in these specific fields.

From the preliminary analysis of the information obtained during the first year of data collection, it seems evident that in several areas and possibly in several countries the health problems are serious. Indeed there seems to exist an unavailability and/or subutilization of basic health services, such as prenatal care, hospital services for delivery, and prophylactic health services against childhood diseases and nutritional deficiency.

The magnitude of these deficiencies is increased by the reciprocal actions of unfavorable factors prevalent in these areas. Such is the case in the low level of education in general, the inadequate environmental sanitation, especially in relation to water supplies and housing conditions. All these and other adverse factors result in excessive biological wastage.

The solution to the complex health problems of mother and child requires comprehensive and coordinated actions within a multisectorial and multidisciplinary approach. For example, immunization programs against an infectious disease as measles will succeed in the prevention of measles, but without improvement of the nutritional state, the susceptible child will probably continue to be at risk of death from another infectious disease. Without provision of water for the family, the risk of spread of diarrheal diseases continues. Thus, an attack on these problems simultaneously is strongly recommended.

Second, Research and Teaching. Community centered research in health problems is an ideal method for faculties of medicine and public health to obtain knowledge of local conditions and to teach from their findings and experiences locally. The patterns of mortality in infancy and childhood vary widely and only through knowledge of the specific problems can actions be taken. Problems have been revealed in the Investigation that can be solved by the leadership of health authorities and faculties of such schools. This program is only a beginning, involving 14 schools of medicine or public health. Greater participation in research by such faculties in the Americas will have immeasurable benefits.

In the area of education, the material collected locally should be used for teaching in schools of medicine and public health and in the schools of other health sciences. Seminars, analyses and discussions of specific phases of the Investigation as well as studies of local problems with field work by students would contribute to understanding the role of community centered research and the actions required for solution of problems. The analyses could serve in the orientation, in the methology of teaching and in the content of curricula, principally in the fields of maternal and child health, epidemiology, social medicine and statistics. The development of important disciplines, such as pathology in general and pediatric pathology in particular, is highly recommended in order that the standard of teaching and practice in the disciplines related to maternal and child health be elevated.

Operational research in the delivery of health services is urgently needed. Once the serious health problems are measured and the related factors described, practical solutions within the context of the resources available should be found and applied.

The improvement of nutritional status and prevention of infectious diseases deserve the highest priority for operation research leading to development of practical procedures adaptable to local needs and characteristics of areas.

Epidemiological studies of the longitudinal type in human reproduction taking into account biological, social and environmental factors are highly recommended in order to understand the differences in patterns of vital wastage. This knowledge is essential for sound programs oriented to attaining optimal reproduction and health of the product of conception.

Third, Vital Statistics. Difficulties encountered in the conduct of the research program have indicated the importance of the improvement of vital and hospital statistics. Procedures are needed for the immediate registration of each birth and each death at the time of occurrence of these events. Since high proportions of births and deaths occur in hospitals, these events should be registered in the same institution. In several countries, procedures have been modernized so that the data obtained on admission to the hospital of a woman for delivery are recorded and used on the birth certificate. The infant's birth weight as well as other pertinent data on the conditions at birth can be added to that document. Likewise, if death occurs, the death certificate should be completed before the body is released for burial.

The hospital records completed by physicians and other attending staff in the hospital are the best source of data for the facts regarding the infant or child as well as for the multiple causes of death. The development, improvement and surveillance of these records in each hospital is mandatory in order to attain quality in vital statistics.

The international standards and definitions of WHO should be followed in all countries. Without registration of each death of a liveborn infant and of each birth, comparability is impossible in respect to infant mortality, mortality from all causes and life expectancy. Measurement on progress toward the goals of the Charter of Punta del Este is hampered by lack of quality in the basic vital statistics data.

In the field of natality and fertility as in mortality, basic information regarding each live birth is essential. The Investigation has revealed unusually low birth weights in neonatal deaths in several areas and distinctly different patterns of birth order and age of mothers of infant deaths. The high altitude area of the study, La Paz, has intriguing differences which warrant further studies of human reproduction.

The study of mortality should be broadened from the use of the underlying cause only to inclusion of the associated causes of death. Because of classification procedures in the past, infectious diseases have been given preference as underlying causes and the role of nutritional deficiency as an important contributor to mortality has been ignored. Thus, improvements in the analysis of vital statistics data as well as in the systems of collection of data are essential especially for knowledge of the health problems of infants and young children.

Fourth, Hospital Statistics. Hospital directors and administrators as well as the clinical staff have an important role in the improvement of clinical data and administrative procedures related to infants and young children. Records should be completed routinely with the facts regarding the birth, the time (hour and day), the condition of the child, its birth weight, etc. A clear distinction is necessary between those born alive and those born dead in accordance with the WHO definition*

If death of the infant occurs, the exact time, hour and day as well as the age and the multiple causes of death should be clearly stated. For improvement of procedures and reduction of mortality, a summary of these vital events is recommended with daily, weekly, monthly and annual reports. The director of the hospital needs to know currently the results of deliveries, the size of perinatal mortality as well as mortality by causes and age.

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*"Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached; each product of such a birth is considered live born."(6)

All staff in hospitals, including administrative, professional and auxiliary personnel, should participate in cooperative efforts to introduce and follow standard definitions and procedures in the recording and handling of basic information. For instance, only through coordinated activity of obstetricians, pediatricians, pathologists, nurses and midwives can complete information be obtained on perinatal, neonatal and even infant morbidity and mortality for understanding the problems and for application of sound preventive measures.

Fifth, Environmental Health. The provision of piped water to homes has an important relationship to mortality. The data presented for the central cities show wide variations in the provision of piped water. The death rates in childhood are usually higher in rural areas than in the cities and water supplies in the rural areas are available for much smaller proportions of the population. Thus, provision of water supplies for rural as well as urban areas, that is for all sectors of the population, is an important component of a program for reduction of mortality in infancy and childhood.

Sixth, Other Actions. A meeting of the principal collaborators is scheduled in January 1972 in which the findings in the first year will be subject to critical review in order that the final reports may be as complete and useful as possible. For example, if unregistered deaths which are missing can be found, they should be included in the final report. The live births used as bases for the rates and estimated populations under 5 years of age are subject to revision after census data and data on live births in the period become available. Also, the experience of the principal collaborators in the field work and in the analysis and interpretation of data will be translated into progressive development of activities leading to solution of problems, education in health sciences and community centered research.

Specific objectives for the meeting of principal collaborators include the following:

1. Recommendations for local and national actions for registration of births and deaths with special attention to those in hospitals, for establishment of registration offices in hospitals and for current hospital reports.

2. Review of results of analyses of multiple causes of death and development of plans for their use for improvement of maternal and child health programs with special attention to the incorporation of nutritional aspects.

3. Plans for use of the material in teaching in schools of public health and medicine, not only in those participating in the Investigation, but in all schools in Latin America.

4. Development of procedures whereby local and national health authorities may take full advantage of the results of the Investigation for future actions especially in planning.

5. Development of operational research for determining methods of preventing nutritional deficiency and for further studies of community health problems revealed by the Investigation.

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The main purpose of this progress report which presents the provisional results of the first year of the Investigation is to promote actions leading to the solution of the problems revealed. More comprehensive analyses will be made of all the material collected on deaths for the two-year period and on the probability sample of households for the two years of the Investigation. In the meantime, however, these findings can be utilized for development of indicated actions, and by doing so reducing mortality, and above all improving health conditions.

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APPENDIX

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Cali, Colombia, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	964	297	198	164	166	139	1588	459	350	246	281	252
Infective and parasitic diseases.....000-136	413	40	110	111	95	57	287	37	56	46	74	74
Amebiasis.....006	3	-	-	2	-	1	2	-	-	-	1	1
Diarrheal disease.....009	294	19	95	97	63	20	145	2	31	31	37	44
Other intestinal infectious diseases.....000-005, 007, 008	12	4	5	-	3	-	2	2	-	-	-	-
Tuberculosis.....010-019	9	-	1	2	4	2	7	-	-	-	5	2
Diphtheria.....032	7	-	-	-	1	6	-	-	-	-	-	-
Whooping cough.....033	9	-	2	1	5	1	-	-	-	-	-	-
Tetanus.....037	8	6	1	-	-	1	-	-	-	-	-	-
Septicemia.....038	8	7	1	-	-	-	66	27	16	8	9	6
Measles.....055	49	-	2	7	18	22	3	-	-	-	1	2
Congenital syphilis.....090	4	3	1	-	-	-	2	-	1	1	-	-
Moniliasis.....112	1	-	1	-	-	-	22	6	7	4	4	1
Helminthiases.....120-129	2	-	-	-	1	1	33	-	-	2	14	17
Other infective and parasitic diseases.....Rest of 000-136	7	1	1	2	-	3	5	-	1	-	3	1
Leukemia.....204-207	2	-	-	-	2	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	1	-	-	-	-	1	1	-	-	-	-	1
Neoplasms, benign and unspecified.....210-239	1	-	-	-	-	1	-	-	-	-	-	-
Nutritional deficiency.....260-269	106	-	13	24	31	38	267	1	77	70	76	43
Vitamin deficiency.....260-266	-	-	-	-	-	-	1	-	1	-	-	-
Protein malnutrition.....267	71	-	-	13	28	30	20	-	-	5	10	5
Nutritional marasmus.....268	25	-	11	8	2	4	68	-	30	16	17	5
Other nutritional deficiency.....269	10	-	2	3	1	4	178	1	46	49	49	33
Endocrine and metabolic diseases.....240-258, 270-279	1	-	-	-	-	1	1	1	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	5	3	-	-	2	-
Other diseases of blood and blood-forming organs.....282-289	3	1	-	-	1	1	12	-	3	4	1	4
Inflammatory diseases of central nervous system.....320-324	21	2	7	2	7	3	24	2	7	4	4	7
Other diseases of nervous system and sense organs.....310-315, 330-389	11	-	3	2	2	4	11	1	1	1	3	5
Diseases of circulatory system.....390-458	1	-	-	-	1	-	26	1	7	2	4	12
Pneumonia and influenza.....470-486	68	25	23	12	5	3	311	51	77	54	70	59
Other diseases of respiratory system.....460-466, 490-519	42	2	17	7	9	7	16	-	4	5	1	6
Diseases of digestive system.....520-577	4	2	2	-	-	-	22	4	9	2	2	5
Diseases of genito-urinary system.....580-629	10	1	3	-	3	3	17	2	5	3	4	3
Diseases of skin and subcutaneous tissue.....680-709	5	-	2	2	-	1	18	1	2	5	5	5
Diseases of musculoskeletal system....710-738	2	-	-	-	1	1	3	-	3	-	-	-
Congenital anomalies.....740-759	37	17	10	2	3	5	37	16	10	2	2	7
Nervous system.....740-743	8	4	1	1	1	1	3	1	-	-	1	1
Heart, circulatory system.....746, 747	20	10	5	1	2	2	16	8	6	-	1	1
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	8	3	4	-	-	1	1	-	1	-	-	-
Genito-urinary system.....752, 753	1	-	-	-	-	1	2	1	1	-	-	
Musculoskeletal system.....754-756	-	-	-	-	-	-	3	1	-	-	-	2
Down's disease.....759.3	-	-	-	-	-	-	11	4	2	2	-	3
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	1	1	-	-	-	-
Certain causes of perinatal mortality.....760-778	201	199	2	-	-	-	335	321	14	-	-	
Symptoms.....780-789	1	-	-	-	-	1	169	12	66	47	29	15
Sudden death.....795	9	5	4	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	2	-	1	-	-	1	-	-	-	-	-	-
External causes.....E800-E999	23	3	1	2	6	11	26	6	9	1	4	6

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group, Cartagena, Colombia, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	621	218	115	118	112	58	1202	356	223	254	237	132
Infective and parasitic diseases.....000-136	226	35	58	69	44	20	254	28	36	68	75	47
Amebiasis.....006	20	-	6	7	3	4	11	-	-	3	5	3
Diarrheal disease.....009	137	12	43	53	24	5	105	6	17	31	35	16
Other intestinal infectious diseases.....000-005, 007, 008	2	-	1	-	-	1	10	1	1	3	2	3
Tuberculosis.....010-019	4	-	-	2	1	1	2	-	-	-	1	1
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	8	-	2	1	4	1	1	-	-	-	1	-
Tetanus.....037	15	12	2	-	-	1	-	-	-	-	-	-
Septicemia.....038	13	11	1	-	-	1	48	16	10	12	8	2
Measles.....055	17	-	-	4	10	3	-	-	-	-	-	-
Congenital syphilis.....090	1	-	-	1	-	-	1	1	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	16	4	6	4	2	-
Helminthiases.....120-129	5	-	1	1	-	3	58	-	2	14	21	21
Other infective and parasitic diseases.....Rest of 000-136	4	-	2	-	2	-	2	-	-	1	-	1
Leukemia.....204-207	2	-	-	-	-	2	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	2	-	-	-	1	1	3	-	-	-	-	3
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	74	-	6	23	33	12	178	2	49	57	49	21
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	59	-	2	13	32	12	47	-	1	19	22	5
Nutritional marasmus.....268	10	-	4	6	-	-	29	-	13	8	7	1
Other nutritional deficiency.....269	5	-	-	4	1	-	102	2	35	30	20	15
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	3	1	2	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	6	2	-	1	1	2
Other diseases of blood and blood-forming organs.....282-289	2	1	-	-	1	-	20	-	3	8	6	3
Inflammatory diseases of central nervous system.....320-324	7	-	2	2	2	1	21	3	7	6	3	2
Other diseases of nervous system and sense organs.....310-315, 330-389	6	1	1	2	1	1	7	-	1	2	2	2
Diseases of circulatory system.....390-458	1	-	1	-	-	-	29	1	7	7	6	8
Pneumonia and influenza.....470-486	38	8	17	5	4	4	177	29	35	43	50	20
Other diseases of respiratory system.....460-466, 490-519	32	1	11	6	9	5	22	2	7	4	5	4
Diseases of digestive system.....520-577	9	1	5	-	1	2	38	5	8	6	12	7
Diseases of genito-urinary system.....580-629	4	-	1	1	1	1	35	5	15	9	4	2
Diseases of skin and subcutaneous tissue.....680-709	1	-	-	-	1	-	14	6	3	2	2	1
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	32	13	5	8	4	2	39	23	8	3	5	-
Nervous system.....740-743	8	3	-	1	3	1	3	1	2	-	-	-
Heart, circulatory system.....746, 747	9	3	3	3	-	-	15	6	3	1	5	-
Respiratory system.....748	1	-	-	-	-	1	-	-	-	-	-	-
Digestive system.....749-751	10	6	1	2	1	-	6	6	-	-	-	-
Genito-urinary system.....752, 753	1	-	1	-	-	-	3	3	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	1	-	-	1	-	-
Down's disease.....759.3	3	1	-	2	-	-	9	5	3	1	-	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	2	2	-	-	-	-
Certain causes of perinatal mortality.....760-778	149	148	-	-	1	-	240	235	5	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	101	9	36	33	15	8
Sudden death.....795	4	-	4	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	12	8	1	1	1	1	-	-	-	-	-	-
External causes.....E800-E999	20	2	3	1	8	6	15	5	1	5	2	2

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Chaco Province, Argentina - Resistencia, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	452	154	153	73	50	22	625	155	239	111	78	42
Infective and parasitic diseases 000-136	204	19	97	48	27	13	69	5	21	18	17	8
Amebiasis 006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease 009	159	12	92	33	14	8	44	2	8	15	13	6
Other intestinal infectious diseases 000-005, 007, 008	-	-	-	-	-	-	1	-	1	-	-	-
Tuberculosis 010-019	9	-	-	3	3	3	6	-	1	3	1	1
Diphtheria 032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough 033	1	-	-	1	-	-	1	-	-	-	1	-
Tetanus 037	5	4	1	-	-	-	-	-	-	-	-	-
Septicemia 038	3	2	1	-	-	-	2	1	1	-	-	-
Measles 055	21	-	1	8	10	2	1	-	-	-	1	-
Congenital syphilis 090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis 112	-	-	-	-	-	-	14	2	10	-	1	1
Helminthiases 120-129	1	1	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases Rest of 000-136	5	-	2	3	-	-	-	-	-	-	-	-
Leukemia 204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other 140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified 210-239	2	1	-	-	-	1	-	-	-	-	-	-
Nutritional deficiency 260-269	20	-	9	2	7	2	171	1	89	45	22	14
Vitamin deficiency 260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition 267	6	-	-	-	5	1	5	-	-	3	2	-
Nutritional marasmus 268	10	-	7	2	1	-	38	1	15	10	6	6
Other nutritional deficiency 269	4	-	2	-	1	1	128	-	74	32	14	8
Endocrine and metabolic diseases 240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias 280-281	-	-	-	-	-	-	2	2	-	-	-	-
Other diseases of blood and blood-forming organs 282-289	1	1	-	-	-	-	3	-	1	1	-	1
Inflammatory diseases of central nervous system 320-324	5	-	2	2	1	-	8	1	6	1	-	-
Other diseases of nervous system and sense organs 310-315, 330-389	3	-	2	-	1	-	8	-	3	1	1	3
Diseases of circulatory system 390-458	1	-	1	-	-	-	4	-	1	-	1	2
Pneumonia and influenza 470-486	42	7	18	11	6	-	82	12	37	16	13	4
Other diseases of respiratory system 460-466, 490-519	12	1	5	4	1	1	16	-	6	3	5	2
Diseases of digestive system 520-577	2	1	-	-	-	1	4	-	4	-	-	-
Diseases of genito-urinary system 580-629	4	-	3	1	-	-	5	-	1	2	1	1
Diseases of skin and subcutaneous tissue 680-709	1	1	-	-	-	-	5	-	2	1	2	-
Diseases of musculoskeletal system 710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies 740-759	19	6	9	1	2	1	8	2	2	3	1	-
Nervous system 740-743	4	2	2	-	-	-	2	-	-	2	-	-
Heart, circulatory system 746, 747	7	3	2	1	-	1	2	-	1	1	-	-
Respiratory system 748	1	-	-	-	1	-	-	-	-	-	-	-
Digestive system 749-751	4	1	3	-	-	-	1	1	-	-	-	-
Genito-urinary system 752, 753	-	-	-	-	-	-	1	-	1	-	-	-
Musculoskeletal system 754-756	-	-	-	-	-	-	1	-	-	-	1	-
Down's disease 759.3	3	-	2	-	1	-	1	1	-	-	-	-
Other and unspecified anomalies 744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality 760-778	113	113	-	-	-	-	125	124	1	-	-	-
Symptoms 780-789	8	-	5	1	2	-	111	8	63	20	14	6
Sudden death 795	2	1	1	-	-	-	-	-	-	-	-	-
Other ill-defined conditions 790-792, 796	2	-	1	-	1	-	-	-	-	-	-	-
External causes E800-E999	11	3	-	3	2	3	4	-	2	-	1	1

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Chaco Province, Argentina - Rural Departments, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	433	115	149	66	65	38	434	75	144	83	88	44
Infective and parasitic diseases.....000-136	204	21	73	50	40	20	62	4	18	13	15	12
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	144	8	63	39	28	6	44	2	11	10	12	9
Other intestinal infectious diseases.....000-005,007,008	1	-	-	-	-	1	-	-	-	-	-	-
Tuberculosis.....010-019	4	-	-	1	-	3	1	-	-	-	-	1
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	15	1	6	2	3	3	2	-	1	-	1	-
Tetanus.....037	7	7	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	2	1	-	1	-	-	5	2	2	-	1	-
Measles.....055	26	-	4	7	8	7	3	-	-	1	-	2
Congenital syphilis.....090	4	4	-	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	6	-	4	1	1	-
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	1	-	-	-	1	-	1	-	-	1	-	-
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203,208,209	2	-	-	-	1	1	1	-	-	-	1	-
Neoplasms, benign and unspecified.....210-239	1	-	1	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	9	-	4	1	4	-	155	2	63	33	41	16
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	5	-	1	1	3	-	5	-	1	-	4	-
Nutritional marasmus.....268	2	-	2	-	-	-	12	-	4	1	5	2
Other nutritional deficiency.....269	2	-	1	-	1	-	138	2	58	32	32	14
Endocrine and metabolic diseases.....240-258,270-279	1	1	-	-	-	-	-	-	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	1	1	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	1	-	-	-	1	-
Inflammatory diseases of central nervous system.....320-324	8	-	6	-	-	2	14	1	6	2	2	3
Other diseases of nervous system and sense organs.....310-315,330-389	8	-	5	1	1	1	3	-	2	-	-	1
Diseases of circulatory system.....390-458	-	-	-	-	-	-	2	-	1	-	-	1
Pneumonia and influenza.....470-486	62	12	33	7	7	3	53	5	17	12	13	6
Other diseases of respiratory system.....460-466,490-519	23	1	12	3	5	2	6	-	-	4	1	1
Diseases of digestive system.....520-577	2	-	1	-	-	1	1	-	-	1	-	-
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	1	-	-	1	-	-
Diseases of skin and subcutaneous tissue.....680-709	4	2	2	-	-	-	2	-	1	1	-	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	10	6	1	1	1	1	3	1	1	-	-	1
Nervous system.....740-743	1	1	-	-	-	-	-	-	-	-	-	-
Heart, circulatory system.....746,747	6	4	1	-	1	-	1	-	-	-	-	1
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	1	1	-	-	-	-	-	-	-	-	-	-
Genito-urinary system.....752,753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	-	-	-	-	-	-
Down's disease.....759.3	2	-	-	1	-	1	2	1	1	-	-	-
Other and unspecified anomalies.....744,745,757,758,rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	62	61	1	-	-	-	60	58	2	-	-	-
Symptoms.....780-789	8	2	4	-	2	-	68	3	32	16	14	3
Sudden death.....795	5	1	3	-	-	1	-	-	-	-	-	-
Other ill-defined conditions.....790-792,796	14	5	3	2	1	3	-	-	-	-	-	-
External causes.....E800-E999	10	3	-	1	3	3	1	-	1	-	-	-

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Kingston Area, Jamaica - Kingston, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	920	507	136	133	74	70	1544	912	213	199	126	94
Infective and parasitic diseases.....000-136	245	74	62	75	26	8	188	97	33	27	21	10
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	173	30	51	70	19	3	79	16	19	24	16	4
Other intestinal infectious diseases.....000-005, 007, 008	3	1	2	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	3	-	-	-	2	1	2	-	-	-	1	1
Diphtheria.....032	3	-	-	-	2	1	-	-	-	-	-	-
Whooping cough.....033	12	1	6	2	2	1	-	-	-	-	-	-
Tetanus.....037	7	7	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	33	31	2	-	-	-	79	63	8	2	2	4
Measles.....055	3	-	-	2	1	-	-	-	-	-	-	-
Congenital syphilis.....090	4	3	1	-	-	-	-	-	-	-	-	-
Moniliasis.....112	1	1	-	-	-	-	25	17	6	1	1	-
Helminthiases.....120-129	-	-	-	-	-	-	1	-	-	-	1	-
Other infective and parasitic diseases.....Rest of 000-136	3	-	-	1	-	2	2	1	-	-	-	1
Leukemia.....204-207	4	-	1	-	1	2	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	7	1	1	-	1	4	5	2	1	-	-	2
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	26	-	3	9	12	2	134	3	36	53	25	17
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	15	-	-	4	9	2	2	-	-	-	-	2
Nutritional marasmus.....268	11	-	3	5	3	-	31	1	7	13	6	4
Other nutritional deficiency.....269	-	-	-	-	-	-	101	2	29	40	19	11
Endocrine and metabolic diseases.....240-258, 270-279	2	1	1	-	-	-	2	1	-	-	-	1
Deficiency anemias.....280-281	1	-	-	-	1	-	15	2	3	5	4	1
Other diseases of blood and blood-forming organs.....282-289	10	-	1	2	3	4	22	-	7	3	7	5
Inflammatory diseases of central nervous system.....320-324	13	4	2	4	2	1	13	2	3	5	2	1
Other diseases of nervous system and sense organs.....310-315, 330-389	14	1	-	2	3	8	24	15	2	2	1	4
Diseases of circulatory system.....390-458	4	-	-	-	-	4	59	7	15	10	13	14
Pneumonia and influenza.....470-486	69	19	20	13	6	11	139	44	22	31	26	16
Other diseases of respiratory system.....460-466, 490-519	13	-	2	5	5	1	29	5	12	3	4	5
Diseases of digestive system.....520-577	14	3	4	1	2	4	16	7	5	3	-	1
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	9	1	3	4	-	1
Diseases of skin and subcutaneous tissue.....680-709	5	2	-	2	-	1	11	2	5	-	2	2
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	1	-	-	-	-	1
Congenital anomalies.....740-759	80	38	18	12	6	6	75	45	16	8	3	3
Nervous system.....740-743	14	6	2	3	1	2	1	-	1	-	-	-
Heart, circulatory system.....746, 747	38	15	10	6	5	2	33	22	6	4	-	1
Respiratory system.....748	1	-	-	-	-	1	-	-	-	-	-	-
Digestive system.....749-751	18	13	4	1	-	-	6	6	-	-	-	-
Genito-urinary system.....752, 753	4	1	1	2	-	-	12	7	3	1	-	-
Musculoskeletal system.....754-756	1	1	-	-	-	-	2	1	-	1	-	-
Down's disease.....759.3	3	1	1	-	-	1	14	5	3	2	3	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	1	1	-	-	-	-	7	4	3	-	-	-
Certain causes of perinatal mortality.....760-778	354	349	1	2	-	2	672	656	14	-	-	-
Symptoms.....780-789	1	1	-	-	-	-	108	16	29	41	17	5
Sudden death.....795	22	7	14	1	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	6	3	1	2	-	-	-	-	-	-	-	-
External causes.....E800-E999	30	4	5	3	6	12	22	7	7	4	1	3

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Kingston Area, Jamaica - St. Andrew Parish, Rural, First Year of Investigation

Cause	Underlying cause						Associated cause					
		Age group						Age group				
	Total	Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years	Total	Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	83	27	17	13	12	14	124	42	21	19	23	19
Infective and parasitic diseases.....000-136	14	2	3	5	3	1	20	1	5	7	5	2
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	11	1	2	5	3	-	14	-	5	6	2	1
Other intestinal infectious diseases.....000-005, 007, 008	-	-	-	-	-	-	1	-	-	-	1	-
Tuberculosis.....010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	1	-	1	-	-	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	1	1	-	-	-	-	2	1	-	-	-	1
Measles.....055	-	-	-	-	-	-	-	-	-	-	-	-
Congenital syphilis.....090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	1	-	-	-	1	-
Helminthiases.....120-129	1	-	-	-	-	1	1	-	-	-	1	-
Other infective and parasitic diseases.....Rest of 000-136	-	-	-	-	-	-	1	-	-	1	-	-
Leukemia.....204-207	1	-	-	-	-	1	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	12	-	2	7	3	-	22	-	4	4	7	7
Vitamin deficiency.....260-266	1	-	-	-	1	-	-	-	-	-	-	-
Protein malnutrition.....267	7	-	-	5	2	-	2	-	-	1	1	-
Nutritional marasmus.....268	4	-	2	2	-	-	9	-	1	2	4	2
Other nutritional deficiency.....269	-	-	-	-	-	-	11	-	3	1	2	5
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	4	2	-	1	1	-
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	-	-	-	-	-	-
Inflammatory diseases of central nervous system.....320-324	3	-	-	-	2	1	3	1	1	-	1	-
Other diseases of nervous system and sense organs.....310-315, 330-389	1	-	-	-	-	1	2	-	-	-	2	-
Diseases of circulatory system.....390-458	-	-	-	-	-	-	4	-	1	1	2	-
Pneumonia and influenza.....470-486	10	-	6	1	1	2	17	4	4	4	2	3
Other diseases of respiratory system.....460-466, 490-519	1	-	1	-	-	-	2	-	1	-	-	1
Diseases of digestive system.....520-577	-	-	-	-	-	-	2	-	1	-	-	1
Diseases of genito-urinary system.....580-629	2	-	-	-	1	1	2	-	-	-	-	2
Diseases of skin and subcutaneous tissue.....680-709	1	-	-	-	-	1	1	-	-	-	1	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	11	2	3	-	2	4	6	3	2	-	-	1
Nervous system.....740-743	2	-	-	-	-	2	-	-	-	-	-	-
Heart, circulatory system.....746, 747	2	-	2	-	-	-	4	3	1	-	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	3	2	-	-	1	-	-	-	-	-	-	-
Genito-urinary system.....752, 753	1	-	-	-	-	1	-	-	-	-	-	-
Musculoskeletal system.....754-756	1	-	-	-	1	-	-	-	-	-	-	-
Down's disease.....759.3	2	-	1	-	-	1	1	-	-	-	-	1
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	1	-	1	-	-	-
Certain causes of perinatal mortality.....760-778	20	20	-	-	-	-	30	29	1	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	7	1	1	2	2	1
Sudden death.....795	3	1	2	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	-	-	-	-	-	-	1	-	-	-	-	1
External causes.....E800-E999	4	2	-	-	-	2	1	1	-	-	-	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

La Paz Area, Bolivia - La Paz, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	1913	547	430	320	390	226	2281	596	420	407	563	295
Infective and parasitic diseases.....000-136	782	60	137	194	252	139	256	31	41	36	91	57
Amebiasis.....006	1	-	-	-	-	1	1	-	-	-	-	1
Diarrheal disease.....009	438	43	107	116	134	38	192	12	33	32	75	40
Other intestinal infectious diseases.....000-005, 007, 008	2	-	-	-	1	1	1	-	1	-	-	-
Tuberculosis.....010-019	42	1	-	9	14	18	11	-	-	1	4	6
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	32	1	9	10	7	5	1	-	-	-	-	1
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	14	12	2	-	-	-	17	16	1	-	-	-
Measles.....055	236	-	13	53	95	75	8	-	-	1	4	3
Congenital syphilis.....090	2	1	-	1	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	17	3	5	2	6	1
Helminthiases.....120-129	1	-	-	1	-	-	5	-	-	-	1	4
Other infective and parasitic diseases.....Rest of 000-136	14	2	6	4	1	1	3	-	1	-	1	1
Leukemia.....204-207	2	-	-	-	1	1	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	5	-	-	-	-	5	1	-	-	-	-	1
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	2	1	1	-	-	-
Nutritional deficiency.....260-269	50	-	19	7	18	6	589	33	136	140	185	95
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	27	-	5	5	13	4	30	-	1	4	16	9
Nutritional marasmus.....268	20	-	12	2	4	2	60	1	9	19	20	11
Other nutritional deficiency.....269	3	-	2	-	1	-	499	32	126	117	149	75
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	2	1	-	1	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	4	2	1	-	-	1
Other diseases of blood and blood-forming organs.....282-289	2	-	1	-	1	-	6	-	-	2	1	3
Inflammatory diseases of central nervous system.....320-324	15	1	4	2	6	2	17	3	4	1	5	4
Other diseases of nervous system and sense organs.....310-315, 330-389	8	-	3	1	1	3	13	2	-	2	6	3
Diseases of circulatory system.....390-458	3	-	3	-	-	-	15	1	6	2	4	2
Pneumonia and influenza.....470-486	505	143	191	69	72	30	484	66	98	107	133	80
Other diseases of respiratory system.....460-466, 490-519	68	7	27	15	11	8	34	1	9	11	6	7
Diseases of digestive system.....520-577	7	1	2	-	2	2	20	4	7	3	4	2
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	6	-	3	-	3	-
Diseases of skin and subcutaneous tissue.....680-709	5	3	1	1	-	-	10	4	2	1	1	2
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	24	11	9	2	1	1	21	13	2	2	2	2
Nervous system.....740-743	4	1	1	1	-	1	-	-	-	-	-	-
Heart, circulatory system.....746, 747	10	4	4	1	1	-	6	2	1	1	1	1
Respiratory system.....748	-	-	-	-	-	-	1	1	-	-	-	-
Digestive system.....749-751	10	6	4	-	-	-	6	5	1	-	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	3	2	-	-	1	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	2	1	-	1	-	-
Down's disease.....759.3	-	-	-	-	-	-	3	2	-	-	-	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	292	288	4	-	-	-	411	399	12	-	-	-
Symptoms.....780-789	7	1	4	2	-	-	383	33	97	98	122	33
Sudden death.....795	9	1	6	1	1	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	98	26	17	23	16	16	-	-	-	-	-	-
External causes.....E800-E999	31	5	2	3	8	13	7	2	1	1	-	3

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

La Paz Area, Bolivia - Viacha, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	69	22	12	10	19	6	65	14	7	14	24	6
Infective and parasitic diseases.....000-136	25	-	2	8	12	3	4	-	1	1	1	1
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	14	-	1	5	6	2	4	-	1	1	1	1
Other intestinal infectious diseases.....000-005, 007, 008	-	-	-	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	3	-	-	1	2	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	-	-	-	-	-	-	-	-	-	-	-	-
Measles.....055	8	-	1	2	4	1	-	-	-	-	-	-
Congenital syphilis.....090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	-	-	-	-	-	-
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	-	-	-	-	-	-	-	-	-	-	-	-
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	-	-	-	-	-	-	20	-	3	5	10	2
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	-	-	-	-	-	-	4	-	-	-	4	-
Nutritional marasmus.....268	-	-	-	-	-	-	5	-	2	2	1	-
Other nutritional deficiency.....269	-	-	-	-	-	-	11	-	1	3	5	2
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	-	-	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	-	-	-	-	-	-
Inflammatory diseases of central nervous system.....320-324	-	-	-	-	-	-	-	-	-	-	-	-
Other diseases of nervous system and sense organs.....310-315, 330-389	1	-	-	1	-	-	1	-	-	-	-	1
Diseases of circulatory system.....390-458	-	-	-	-	-	-	-	-	-	-	-	-
Pneumonia and influenza.....470-486	19	7	6	1	4	1	19	1	2	5	9	2
Other diseases of respiratory system.....460-466, 490-519	6	-	3	-	2	1	2	-	-	1	1	-
Diseases of digestive system.....520-577	-	-	-	-	-	-	-	-	-	-	-	-
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	-	-	-	-	-	-
Diseases of skin and subcutaneous tissue.....680-709	-	-	-	-	-	-	-	-	-	-	-	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	-	-	-	-	-	-	-	-	-	-	-	-
Nervous system.....740-743	-	-	-	-	-	-	-	-	-	-	-	-
Heart, circulatory system.....746, 747	-	-	-	-	-	-	-	-	-	-	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	-	-	-	-	-	-	-	-	-	-	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	-	-	-	-	-	-
Down's disease.....759.3	-	-	-	-	-	-	-	-	-	-	-	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	14	14	-	-	-	-	13	13	-	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	6	-	1	2	3	-
Sudden death.....795	-	-	-	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	2	1	1	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	2	-	-	-	1	1	-	-	-	-	-	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group, Medellín, Colombia, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	692	191	151	121	131	98	1308	340	270	220	273	205
Infective and parasitic diseases.....000-136	303	20	80	76	77	50	217	27	34	30	69	57
Amebiasis.....006	10	-	1	1	3	5	2	-	-	-	1	1
Diarrheal disease.....009	212	12	76	60	39	25	88	6	13	15	32	22
Other intestinal infectious diseases.....000-005, 007, 008	8	-	3	4	1	-	16	-	2	3	6	5
Tuberculosis.....010-019	10	-	-	-	5	5	8	-	1	-	1	6
Diphtheria.....032	1	-	-	-	-	1	1	-	-	-	-	1
Whooping cough.....033	1	-	-	1	-	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	7	6	-	1	-	-	46	20	9	7	8	2
Measles.....055	37	-	-	5	24	8	2	-	-	-	2	-
Congenital syphilis.....090	2	2	-	-	-	-	3	-	2	1	-	-
Moniliasis.....112	-	-	-	-	-	-	12	1	5	2	3	1
Helminthiases.....120-129	5	-	-	-	3	2	37	-	2	1	16	18
Other infective and parasitic diseases.....Rest of 000-136	10	-	-	4	2	4	2	-	-	1	-	1
Leukemia.....204-207	2	-	-	-	1	1	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	4	-	-	-	-	4	1	-	-	-	-	1
Neoplasms, benign and unspecified.....210-239	1	-	-	-	-	1	1	1	-	-	-	-
Nutritional deficiency.....260-269	54	-	6	9	18	21	257	3	72	65	71	46
Vitamin deficiency.....260-266	-	-	-	-	-	-	3	1	-	1	-	1
Protein malnutrition.....267	32	-	-	2	15	15	23	-	-	-	12	11
Nutritional marasmus.....268	13	-	6	5	2	-	63	-	32	21	9	1
Other nutritional deficiency.....269	9	-	-	2	1	6	168	2	40	43	50	33
Endocrine and metabolic diseases.....240-258, 270-279	3	-	1	1	-	1	1	-	-	1	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	6	3	-	1	1	1
Other diseases of blood and blood-forming organs.....282-289	1	-	-	1	-	-	11	-	2	1	5	3
Inflammatory diseases of central nervous system.....320-324	8	1	6	1	-	-	14	2	5	1	3	3
Other diseases of nervous system and sense organs.....310-315, 330-389	9	-	3	1	3	2	29	-	5	7	10	7
Diseases of circulatory system.....390-458	2	-	-	2	-	-	37	1	8	10	6	12
Pneumonia and influenza.....470-486	42	7	14	13	7	1	195	21	48	47	55	24
Other diseases of respiratory system.....460-466, 490-519	20	-	11	5	3	1	18	-	4	3	4	7
Diseases of digestive system.....520-577	6	1	2	-	2	1	28	3	6	1	7	11
Diseases of genito-urinary system.....580-629	4	-	3	1	-	-	21	-	4	3	7	7
Diseases of skin and subcutaneous tissue.....680-709	7	-	5	2	-	-	18	-	8	4	3	3
Diseases of musculoskeletal system....710-738	1	-	-	-	1	-	1	-	1	-	-	-
Congenital anomalies.....740-759	48	15	14	7	8	4	34	8	6	9	5	6
Nervous system.....740-743	7	3	3	-	-	1	4	3	1	-	-	-
Heart, circulatory system.....746, 747	20	7	4	4	2	3	13	3	1	3	1	5
Respiratory system.....748	-	-	-	-	-	-	1	-	-	1	-	-
Digestive system.....749-751	11	5	3	1	2	-	5	1	2	2	-	-
Genito-urinary system.....752, 753	2	-	-	-	2	-	1	-	-	-	-	-
Musculoskeletal system.....754-756	1	-	-	-	1	-	2	-	1	-	-	-
Down's disease.....759.3	6	-	3	2	1	-	5	-	-	3	1	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	1	-	1	-	-	-	3	1	1	-	1	-
Certain causes of perinatal mortality.....760-778	141	140	1	-	-	-	268	255	13	-	-	-
Symptoms.....780-789	1	-	-	-	1	-	134	12	48	36	23	15
Sudden death.....795	11	5	5	-	1	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	1	-	-	-	-	1	-	-	-	-	-	-
External causes.....E800-E999	23	2	-	2	9	10	17	4	6	1	4	2

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group, Monterrey, Mexico, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	2321	856	727	326	229	183	4448	1354	1410	712	543	429
Infective and parasitic diseases.....000-136	993	139	405	213	132	104	701	123	175	134	148	121
Amebiasis.....006	93	5	36	24	15	13	30	1	6	9	11	3
Diarrheal disease.....009	573	76	325	116	34	22	293	40	66	64	73	50
Other intestinal infectious diseases.....000-005, 007, 008	33	8	15	5	3	2	20	3	6	3	5	3
Tuberculosis.....010-019	42	-	3	11	11	17	27	-	1	8	6	12
Diphtheria.....032	2	-	-	-	-	2	-	-	-	-	-	-
Whooping cough.....033	17	-	6	1	6	4	1	-	-	-	1	-
Tetanus.....037	12	12	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	42	35	5	1	1	-	197	68	69	28	17	15
Measles.....055	151	-	10	47	58	36	30	-	1	8	12	9
Congenital syphilis.....090	1	-	1	-	-	-	1	-	-	-	-	1
Moniliasis.....112	3	3	-	-	-	-	45	11	20	10	2	2
Helminthiases.....120-129	5	-	-	-	2	3	50	-	5	3	19	23
Other infective and parasitic diseases.....Rest of 000-136	19	-	4	8	2	5	7	-	1	1	2	3
Leukemia.....204-207	2	-	-	-	1	1	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	2	-	-	-	-	2	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	3	-	-	-	2	1	1	-	1	-	-	-
Nutritional deficiency.....260-269	65	1	14	16	22	12	752	30	347	163	113	99
Vitamin deficiency.....260-266	-	-	-	-	-	-	1	-	-	-	1	-
Protein malnutrition.....267	35	-	-	5	20	10	47	-	1	11	19	16
Nutritional marasmus.....268	20	-	10	7	2	1	135	2	53	39	19	22
Other nutritional deficiency.....269	10	1	4	4	-	1	569	28	293	113	74	61
Endocrine and metabolic diseases.....240-258, 270-279	3	-	2	-	-	1	3	1	-	2	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	14	5	2	1	3	3
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	50	2	17	13	9	9
Inflammatory diseases of central nervous system.....320-324	39	3	20	10	6	-	80	13	38	12	16	1
Other diseases of nervous system and sense organs.....310-315, 330-389	20	2	9	5	1	3	56	7	13	15	8	13
Diseases of circulatory system.....390-458	3	-	1	1	-	1	63	7	31	7	10	8
Pneumonia and influenza.....470-486	270	82	119	35	23	11	697	119	245	150	108	75
Other diseases of respiratory system.....460-466, 490-519	107	4	49	22	21	11	62	4	19	14	16	9
Diseases of digestive system.....520-577	11	2	5	2	-	2	101	14	41	14	13	19
Diseases of genito-urinary system.....580-629	10	-	4	2	-	4	75	7	39	16	7	6
Diseases of skin and subcutaneous tissue.....680-709	12	6	4	1	1	-	40	14	13	4	7	2
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	1	-	-	1	-	-
Congenital anomalies.....740-759	149	68	55	9	8	9	77	26	29	11	3	8
Nervous system.....740-743	55	32	13	3	3	4	11	7	2	1	-	1
Heart, circulatory system.....746, 747	46	11	28	3	2	2	22	4	12	2	1	3
Respiratory system.....748	3	2	-	-	-	1	-	-	-	-	-	-
Digestive system.....749-751	25	11	8	1	3	2	9	2	3	3	-	1
Genito-urinary system.....752, 753	2	1	1	-	-	-	5	3	-	1	-	-
Musculoskeletal system.....754-756	4	3	-	1	-	-	5	4	1	-	-	-
Down's disease.....759.3	6	2	4	-	-	-	21	4	9	4	2	2
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	8	6	1	1	-	-	4	2	2	-	-	-
Certain causes of perinatal mortality.....760-778	508	502	6	-	-	-	900	873	26	1	-	-
Symptoms.....780-789	12	3	6	1	1	1	713	97	347	147	73	49
Sudden death.....795	16	2	11	2	1	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	60	38	9	4	3	6	-	-	-	-	-	-
External causes.....E800-E999	36	4	8	3	7	14	62	12	27	7	9	7

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group, Recife, Brazil, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	2,035	564	599	337	313	222	4,341	888	1,257	787	803	606
Infective and parasitic diseases.....000-136	1,088	95	432	218	198	145	898	89	193	175	250	191
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	634	75	385	115	39	20	458	19	92	103	141	103
Other intestinal infectious diseases.....000-005, 007, 008	13	2	7	1	2	1	7	1	3	-	1	2
Tuberculosis.....010-019	33	-	5	7	8	13	23	-	3	4	5	11
Diphtheria.....032	13	-	-	4	7	2	-	-	-	-	-	-
Whooping cough.....033	18	-	5	4	6	3	1	-	-	-	1	-
Tetanus.....037	11	8	3	-	-	-	-	-	-	-	-	-
Septicemia.....038	8	5	2	-	1	-	125	50	41	16	9	9
Measles.....055	327	-	16	84	129	98	5	-	2	-	1	2
Congenital syphilis.....090	10	4	6	-	-	-	2	-	1	1	-	-
Moniliasis.....112	-	-	-	-	-	-	82	19	42	10	9	2
Helminthiases.....120-129	9	-	-	-	5	4	181	-	5	35	81	60
Other infective and parasitic diseases.....Rest of 000-136	12	1	3	3	1	4	14	-	4	6	2	2
Leukemia.....204-207	1	-	-	-	1	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	84	-	8	23	31	22	900	20	339	218	186	137
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	60	-	-	16	25	19	142	-	-	34	58	50
Nutritional marasmus.....268	23	-	8	6	6	3	261	-	85	91	52	33
Other nutritional deficiency.....269	1	-	-	1	-	-	497	20	254	93	76	54
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	38	5	26	5	-	2
Deficiency anemias.....280-281	-	-	-	-	-	-	24	2	3	6	7	6
Other diseases of blood and blood-forming organs.....282-289	2	1	-	1	-	-	65	-	14	15	24	12
Inflammatory diseases of central nervous system.....320-324	27	1	7	6	7	6	24	4	10	5	1	4
Other diseases of nervous system and sense organs.....310-315, 330-389	25	1	7	5	6	6	65	2	27	8	10	18
Diseases of circulatory system.....390-458	1	-	-	-	-	1	57	1	14	12	15	15
Pneumonia and influenza.....470-486	216	35	85	44	30	22	785	75	227	165	194	124
Other diseases of respiratory system.....460-466, 490-519	53	2	17	9	21	4	120	1	32	29	40	18
Diseases of digestive system.....520-577	11	4	3	3	1	-	68	5	31	12	6	14
Diseases of genito-urinary system.....580-629	4	-	2	-	-	2	33	6	11	7	3	6
Diseases of skin and subcutaneous tissue.....680-709	27	9	8	6	1	3	55	5	23	10	9	8
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	51	28	12	7	1	3	51	24	10	13	1	3
Nervous system.....740-743	15	5	4	3	1	2	5	2	2	1	-	-
Heart, circulatory system.....746, 747	18	10	5	3	-	-	15	8	2	3	1	1
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	10	5	3	1	-	1	8	5	1	2	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	7	4	1	2	-	-
Musculoskeletal system.....754-756	3	3	-	-	-	-	1	1	-	-	-	-
Down's disease.....759.3	-	-	-	-	-	-	12	1	4	5	-	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	5	5	-	-	-	-	3	3	-	-	-	-
Certain causes of perinatal mortality.....760-778	377	375	2	-	-	-	603	579	23	1	-	-
Symptoms.....780-789	3	-	-	2	1	-	540	59	273	106	55	47
Sudden death.....795	4	3	-	1	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	39	6	14	9	9	1	-	-	-	-	-	-
External causes.....E800-E999	22	4	2	3	6	7	15	11	1	-	2	1

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Ribeirão Prêto Area, Brazil - Ribeirão Prêto, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	251	108	73	30	21	19	555	179	191	73	55	57
Infective and parasitic diseases.....000-136	106	15	50	17	12	12	71	4	22	9	14	22
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	68	11	40	13	3	1	34	1	11	6	7	9
Other intestinal infectious diseases.....000-005, 007, 008	2	1	1	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	3	-	-	-	3	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	2	1	1	-	-	-	8	2	4	-	1	1
Measles.....055	24	-	4	4	5	11	1	-	-	-	1	-
Congenital syphilis.....090	-	-	-	-	-	-	3	-	2	-	1	-
Moniliasis.....112	-	-	-	-	-	-	6	1	4	1	-	-
Helminthiases.....120-129	-	-	-	-	-	-	17	-	-	2	3	12
Other infective and parasitic diseases.....Rest of 000-136	7	2	4	-	1	-	2	-	1	-	1	-
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	3	-	-	1	-	2	96	-	45	25	12	14
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	3	-	-	1	-	2	9	-	-	-	4	5
Nutritional marasmus.....268	-	-	-	-	-	-	23	-	8	10	3	2
Other nutritional deficiency.....269	-	-	-	-	-	-	64	-	37	15	5	7
Endocrine and metabolic diseases.....240-258, 270-279	1	1	-	-	-	-	-	-	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	2	2	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	2	-	1	-	-	1	2	-	2	-	-	-
Inflammatory diseases of central nervous system.....320-324	5	-	3	2	-	-	6	-	2	2	1	1
Other diseases of nervous system and sense organs.....310-315, 330-389	2	-	2	-	-	-	16	1	6	4	3	2
Diseases of circulatory system.....390-458	-	-	-	-	-	-	12	-	5	3	3	1
Pneumonia and influenza.....470-486	27	5	8	6	7	1	91	19	37	11	10	14
Other diseases of respiratory system.....460-466, 490-519	3	-	2	1	-	-	12	1	5	2	3	1
Diseases of digestive system.....520-577	1	-	1	-	-	-	8	2	5	-	1	-
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	4	-	4	-	-	-
Diseases of skin and subcutaneous tissue.....680-709	3	1	1	-	-	1	5	1	4	-	-	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	16	7	5	3	1	-	9	5	4	-	-	-
Nervous system.....740-743	1	-	1	-	-	-	1	-	1	-	-	-
Heart, circulatory system.....746, 747	8	3	2	2	1	-	2	1	1	-	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	4	2	1	1	-	-	1	1	-	-	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	3	2	1	-	-	-
Musculoskeletal system.....754-756	1	1	-	-	-	-	1	1	-	-	-	-
Down's disease.....759.3	2	1	1	-	-	-	1	-	1	-	-	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	78	78	-	-	-	-	136	134	2	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	77	9	44	15	7	2
Sudden death.....795	1	1	-	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	-	-	-	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	3	-	-	-	1	2	8	1	4	2	1	-

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Ribeirão Prêto Area, Brazil - Franca, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	257	116	72	25	20	24	472	202	138	51	39	42
Infective and parasitic diseases.....000-136	107	29	43	14	11	10	42	9	10	8	6	9
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	92	28	41	11	8	4	28	3	10	7	3	5
Other intestinal infectious diseases.....000-005, 007, 008	1	-	1	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	1	-	-	-	1	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	
Septicemia.....038	2	1	-	-	-	1	6	5	-	-	1	-
Measles.....055	6	-	-	1	1	4	-	-	-	-	-	-
Congenital syphilis.....090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	3	1	-	1	1	-
Helminthiases.....120-129	-	-	-	-	-	-	5	-	-	-	1	4
Other infective and parasitic diseases.....Rest of 000-136	5	-	1	2	1	1	-	-	-	-	-	-
Leukemia.....204-207	1	-	-	-	1	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	12	-	3	5	-	4	72	3	38	12	11	8
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	4	-	-	1	-	3	-	-	-	-	-	-
Nutritional marasmus.....268	8	-	3	4	-	1	11	-	9	1	-	1
Other nutritional deficiency.....269	-	-	-	-	-	-	61	3	29	11	11	7
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	-	-	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	9	1	3	2	-	3
Inflammatory diseases of central nervous system.....320-324	7	-	1	-	2	4	7	-	1	1	3	2
Other diseases of nervous system and sense organs.....310-315, 330-389	6	1	4	1	-	-	3	-	1	-	1	1
Diseases of circulatory system.....390-458	-	-	-	-	-	-	3	-	-	-	2	1
Pneumonia and influenza.....470-486	21	5	8	2	4	2	45	5	20	7	7	6
Other diseases of respiratory system.....460-466, 490-519	8	2	3	2	1	-	8	-	2	3	2	1
Diseases of digestive system.....520-577	-	-	-	-	-	-	7	2	3	1	-	1
Diseases of genito-urinary system.....580-629	2	-	2	-	-	-	1	-	1	-	-	-
Diseases of skin and subcutaneous tissue.....680-709	4	3	1	-	-	-	3	1	1	-	-	1
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	11	6	4	-	-	1	11	7	2	-	-	2
Nervous system.....740-743	1	-	1	-	-	-	-	-	-	-	-	-
Heart, circulatory system.....746, 747	4	3	-	-	-	1	3	2	1	-	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	5	3	2	-	-	-	4	2	1	-	-	1
Genito-urinary system.....752, 753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	-	-	-	-	-	
Down's disease.....759.3	1	-	1	-	-	-	4	3	-	-	-	
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	69	69	-	-	-	-	143	138	4	1	-	-
Symptoms.....780-789	1	-	-	-	-	1	111	33	50	16	6	6
Sudden death.....795	1	-	-	-	-	1	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	3	-	2	1	-	-	-	-	-	-	-	-
External causes.....E800-E999	4	1	1	-	1	1	7	3	2	-	1	1

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Ribeirao Prêto Area, Brazil - Rural Communities, First Year of Investigation

Cause	Underlying cause						Associated cause					
		Age group						Age group				
	Total	Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years	Total	Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	107	45	33	10	8	11	196	62	67	27	21	19
Infective and parasitic diseases 000-136	44	5	21	8	5	5	18	2	5	5	4	2
Amebiasis 006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease 009	31	3	19	4	3	2	11	2	3	2	3	1
Other intestinal infectious diseases 000-005, 007, 008	2	1	1	-	-	-	-	-	-	-	-	-
Tuberculosis 010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria 032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough 033	1	-	-	1	-	-	-	-	-	-	-	-
Tetanus 037	1	1	-	-	-	-	-	-	-	-	-	-
Septicemia 038	-	-	-	-	-	-	2	-	-	2	-	-
Measles 055	6	-	-	2	2	2	-	-	-	-	-	-
Congenital syphilis 090	1	-	1	-	-	-	-	-	-	-	-	-
Moniliasis 112	-	-	-	-	-	-	2	-	2	-	-	-
Helminthiases 120-129	-	-	-	-	-	-	3	-	-	1	1	1
Other infective and parasitic diseases Rest of 000-136	2	-	-	1	-	1	-	-	-	-	-	-
Leukemia 204-207	1	-	-	-	-	1	-	-	-	-	-	-
Malignant neoplasms, other 140-203, 208, 209	2	-	-	-	-	2	1	-	-	-	-	1
Neoplasms, benign and unspecified 210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency 260-269	2	-	-	-	1	1	44	-	23	8	5	8
Vitamin deficiency 260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition 267	2	-	-	-	1	1	2	-	-	-	2	-
Nutritional marasmus 268	-	-	-	-	-	-	8	-	4	1	-	3
Other nutritional deficiency 269	-	-	-	-	-	-	34	-	19	7	3	5
Endocrine and metabolic diseases 240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias 280-281	-	-	-	-	-	-	1	1	-	-	-	-
Other diseases of blood and blood-forming organs 282-289	-	-	-	-	-	-	1	-	1	-	-	-
Inflammatory diseases of central nervous system 320-324	1	-	-	-	-	1	2	-	1	-	1	-
Other diseases of nervous system and sense organs 310-315, 330-389	4	-	3	1	-	-	5	-	4	1	-	-
Diseases of circulatory system 390-458	-	-	-	-	-	-	4	-	2	1	1	-
Pneumonia and influenza 470-486	11	4	6	-	1	-	24	4	7	4	5	4
Other diseases of respiratory system 460-466, 490-519	2	-	1	-	1	-	3	1	-	2	-	-
Diseases of digestive system 520-577	-	-	-	-	-	-	3	1	2	-	-	-
Diseases of genito-urinary system 580-629	-	-	-	-	-	-	-	-	-	-	-	-
Diseases of skin and subcutaneous tissue 680-709	-	-	-	-	-	-	2	-	-	1	-	1
Diseases of musculoskeletal system 710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies 740-759	6	4	1	1	-	-	3	3	-	-	-	-
Nervous system 740-743	-	-	-	-	-	-	-	-	-	-	-	-
Heart, circulatory system 746, 747	2	1	1	-	-	-	2	2	-	-	-	-
Respiratory system 748	-	-	-	-	-	-	1	1	-	-	-	-
Digestive system 749-751	3	3	-	-	-	-	-	-	-	-	-	-
Genito-urinary system 752, 753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system 754-756	-	-	-	-	-	-	-	-	-	-	-	-
Down's disease 759.3	1	-	-	1	-	-	-	-	-	-	-	-
Other and unspecified anomalies 744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality 760-778	31	31	-	-	-	-	46	45	1	-	-	-
Symptoms 780-789	-	-	-	-	-	-	38	4	21	5	5	3
Sudden death 795	1	1	-	-	-	-	-	-	-	-	-	-
Other ill-defined conditions 790-792, 796	-	-	-	-	-	-	-	-	-	-	-	-
External causes E800-E999	2	-	1	-	-	1	1	1	-	-	-	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

San Juan Province, Argentina - San Juan, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	133	68	45	9	6	5	291	157	85	26	13	10
Infective and parasitic diseases.....000-136	42	12	17	8	4	1	43	19	18	6	-	-
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	27	8	14	4	-	1	18	7	9	2	-	-
Other intestinal infectious diseases.....000-005, 007, 008	-	-	-	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	-	-	-	-	-	-	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	2	-	2	-	-	-	-	-	-	-	-	-
Tetanus.....037	1	1	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	3	3	-	-	-	-	8	4	4	-	-	-
Measles.....055	6	-	-	3	3	-	-	-	-	-	-	-
Congenital syphilis.....090	1	-	1	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	16	8	5	3	-	-
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	2	-	-	1	1	-	1	-	-	1	-	-
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	1	-	1	-	-	-	1	-	1	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	2	-	2	-	-	-	27	3	15	5	2	2
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional marasmus.....268	2	-	2	-	-	-	6	-	4	1	-	1
Other nutritional deficiency.....269	-	-	-	-	-	-	21	3	11	4	2	1
Endocrine and metabolic diseases.....240-258, 270-279	1	-	-	-	-	1	1	-	-	-	-	1
Deficiency anemias.....280-281	-	-	-	-	-	-	3	2	1	-	-	-
Other diseases of blood and blood-forming organs.....282-289	1	-	-	-	-	1	5	1	3	1	-	-
Inflammatory diseases of central nervous system.....320-324	4	-	3	-	-	1	1	-	-	-	-	1
Other diseases of nervous system and sense organs.....310-315, 330-389	1	-	1	-	-	-	3	-	-	1	1	1
Diseases of circulatory system.....390-458	-	-	-	-	-	-	4	-	3	-	-	1
Pneumonia and influenza.....470-486	13	4	9	-	-	-	31	12	11	4	3	1
Other diseases of respiratory system.....460-466, 490-519	3	-	2	1	-	-	6	1	3	1	1	-
Diseases of digestive system.....520-577	1	-	1	-	-	-	8	3	3	-	2	-
Diseases of genito-urinary system.....580-629	1	-	1	-	-	-	-	-	-	-	-	-
Diseases of skin and subcutaneous tissue.....680-709	2	1	1	-	-	-	4	2	2	-	-	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	6	1	4	-	1	-	6	2	2	2	-	-
Nervous system.....740-743	1	-	1	-	-	-	-	-	-	-	-	-
Heart, circulatory system.....746, 747	4	-	3	-	1	-	3	1	1	1	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	1	1	-	-	-	-	1	-	1	-	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	1	1	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	-	-	-	-	-	-
Down's disease.....759.3	-	-	-	-	-	-	1	-	-	1	-	
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	51	50	1	-	-	-	105	104	1	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	38	8	20	6	2	2
Sudden death.....795	-	-	-	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	-	-	-	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	4	-	2	-	1	1	5	-	2	-	2	1

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

San Juan Province, Argentina - Suburban Departments, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	360	153	115	49	28	15	754	334	245	113	49	13
Infective and parasitic diseases 000-136	112	23	43	30	13	3	115	35	45	26	7	2
Amebiasis 006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease 009	71	19	35	12	5	-	56	14	21	14	6	1
Other intestinal infectious diseases 000-005, 007, 008	1	-	1	-	-	-	-	-	-	-	-	-
Tuberculosis 010-019	2	-	1	1	-	-	1	-	-	1	-	-
Diphtheria 032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough 033	3	-	2	1	-	-	-	-	-	-	-	-
Tetanus 037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia 038	3	3	-	-	-	-	13	6	5	2	-	-
Measles 055	22	-	2	11	7	2	3	-	-	1	1	1
Congenital syphilis 090	1	1	-	-	-	-	-	-	-	-	-	-
Moniliasis 112	-	-	-	-	-	-	41	15	19	7	-	-
Helminthiases 120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases Rest of 000-136	9	-	2	5	1	1	1	-	-	1	-	-
Leukemia 204-207	2	-	-	1	1	-	-	-	-	-	-	-
Malignant neoplasms, other 140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified 210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency 260-269	19	-	11	6	1	1	86	6	49	18	11	2
Vitamin deficiency 260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition 267	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional marasmus 268	17	-	10	6	1	-	21	1	10	7	2	1
Other nutritional deficiency 269	2	-	1	-	-	1	65	5	39	11	9	1
Endocrine and metabolic diseases 240-258, 270-279	1	1	-	-	-	-	1	1	-	-	-	-
Deficiency anemias 280-281	-	-	-	-	-	-	8	7	1	-	-	-
Other diseases of blood and blood-forming organs 282-289	1	-	1	-	-	-	10	1	4	5	-	-
Inflammatory diseases of central nervous system 320-324	11	1	7	1	1	1	10	-	4	4	1	1
Other diseases of nervous system and sense organs 310-315, 330-389	5	-	1	-	3	1	16	2	8	3	2	1
Diseases of circulatory system 390-458	-	-	-	-	-	-	5	-	3	1	1	-
Pneumonia and influenza 470-486	45	9	28	5	2	1	95	29	30	21	11	4
Other diseases of respiratory system 460-466, 490-519	19	1	12	3	2	1	20	-	10	4	5	1
Diseases of digestive system 520-577	4	1	1	-	2	-	21	5	10	5	1	-
Diseases of genito-urinary system 580-629	1	-	-	1	-	-	-	-	-	-	-	-
Diseases of skin and subcutaneous tissue 680-709	3	1	1	1	-	-	5	3	1	1	-	-
Diseases of musculoskeletal system 710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies 740-759	16	10	4	-	1	1	13	8	4	1	-	-
Nervous system 740-743	3	3	-	-	-	-	1	-	-	1	-	-
Heart, circulatory system 746, 747	6	2	4	-	-	-	5	4	1	-	-	-
Respiratory system 748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system 749-751	4	2	-	-	1	1	4	3	1	-	-	-
Genito-urinary system 752, 753	-	-	-	-	-	-	1	1	-	-	-	-
Musculoskeletal system 754-756	3	3	-	-	-	-	-	-	-	-	-	-
Down's disease 759.3	-	-	-	-	-	-	2	-	2	-	-	-
Other and unspecified anomalies 744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality 760-778	104	104	-	-	-	-	218	213	5	-	-	-
Symptoms 780-789	-	-	-	-	-	-	125	22	70	22	9	2
Sudden death 795	4	1	3	-	-	-	-	-	-	-	-	-
Other ill-defined conditions 790-792, 796	1	-	1	-	-	-	-	-	-	-	-	-
External causes E800-E999	12	1	2	1	2	6	6	2	1	2	1	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

San Juan Province, Argentina - Rural Departments, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	546	189	197	63	58	39	1062	409	352	124	111	66
Infective and parasitic diseases.....000-136	208	38	84	37	29	20	162	67	56	16	14	9
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	136	31	69	26	7	3	83	21	34	11	12	5
Other intestinal infectious diseases.....000-005, 007, 008	2	-	2	-	-	-	-	-	-	-	-	-
Tuberculosis.....010-019	5	-	-	-	-	5	1	-	-	-	-	1
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	8	-	3	1	3	1	1	-	-	-	1	-
Tetanus.....037	1	1	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	6	5	-	-	-	1	16	11	5	-	-	-
Measles.....055	42	-	6	9	19	8	3	-	-	-	1	2
Congenital syphilis.....090	1	-	1	-	-	-	1	-	-	1	-	-
Moniliasis.....112	1	1	-	-	-	-	57	35	17	4	-	1
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	6	-	3	1	-	2	-	-	-	-	-	-
Leukemia.....204-207	1	-	-	-	-	1	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	31	2	20	4	4	1	149	9	7	27	20	16
Vitamin deficiency.....260-266	-	-	-	-	-	-	1	-	-	1	-	-
Protein malnutrition.....267	3	-	-	1	1	1	1	-	-	-	1	-
Nutritional marasmus.....268	27	1	20	3	3	-	30	1	23	2	2	2
Other nutritional deficiency.....269	1	1	-	-	-	-	117	8	54	24	17	14
Endocrine and metabolic diseases.....240-258, 270-279	-	-	-	-	-	-	1	1	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	5	4	1	-	-	-
Other diseases of blood and blood-forming organs.....282-289	1	-	-	-	1	-	15	-	13	1	-	1
Inflammatory diseases of central nervous system.....320-324	12	-	5	4	-	3	14	-	4	5	3	2
Other diseases of nervous system and sense organs.....310-315, 330-389	2	-	1	-	-	1	17	3	6	4	1	3
Diseases of circulatory system.....390-458	1	-	-	-	1	-	10	-	3	1	2	4
Pneumonia and influenza.....470-486	80	21	46	4	6	3	151	33	47	25	31	15
Other diseases of respiratory system.....460-466, 490-519	37	1	19	9	7	1	28	1	17	4	4	2
Diseases of digestive system.....520-577	4	1	2	-	-	1	37	2	21	7	5	2
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	5	-	-	3	2	-
Diseases of skin and subcutaneous tissue.....680-709	2	-	1	1	-	-	10	5	3	1	1	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	17	4	7	1	2	3	9	2	3	1	3	-
Nervous system.....740-743	4	-	1	-	1	2	-	-	-	-	-	-
Heart, circulatory system.....746, 747	3	1	1	-	-	1	2	-	1	-	1	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	9	3	5	1	-	-	-	-	-	-	-	-
Genito-urinary system.....752, 753	1	-	-	-	1	-	-	-	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	1	1	-	-	-	-
Down's disease.....759.3	-	-	-	-	-	-	6	1	2	1	2	-
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	118	118	-	-	-	-	240	238	2	-	-	-
Symptoms.....780-789	2	-	2	-	-	-	198	40	96	29	21	12
Sudden death.....795	12	3	8	1	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	2	1	1	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	16	-	1	2	8	5	11	4	3	-	4	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

San Salvador Area, El Salvador - San Salvador, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	1334	361	411	248	193	121	2419	604	701	460	421	233
Infective and parasitic diseases.....000-136	705	81	259	177	115	73	357	49	64	79	103	62
Amebiasis.....006	25	-	6	9	6	4	4	-	-	1	1	2
Diarrheal disease.....009	512	44	237	133	62	36	201	12	42	55	66	26
Other intestinal infectious diseases.....000-005,007,008	9	3	5	-	1	-	7	1	2	2	2	-
Tuberculosis.....010-019	6	-	-	2	-	4	3	-	-	1	-	2
Diphtheria.....032	8	-	-	-	1	7	-	-	-	-	-	-
Whooping cough.....033	5	-	1	1	2	1	2	-	-	1	1	-
Tetanus.....037	12	11	1	-	-	-	-	-	-	-	-	-
Septicemia.....038	21	16	3	2	-	-	56	32	10	4	6	4
Measles.....055	92	1	3	30	42	16	2	-	-	-	1	1
Congenital syphilis.....090	5	4	1	-	-	-	3	-	1	-	2	-
Moniliasis.....112	2	1	1	-	-	-	23	4	6	7	6	-
Helminthiases.....120-129	2	-	-	-	-	2	53	-	1	8	18	26
Other infective and parasitic diseases.....Rest of 000-136	6	1	1	-	1	3	3	-	2	-	-	1
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203,208,209	2	-	-	-	1	1	1	-	-	-	-	1
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	58	-	7	13	29	9	422	8	140	102	100	72
Vitamin deficiency.....260-266	-	-	-	-	-	-	2*	-	-	-	1	1
Protein malnutrition.....267	30	-	1	5	18	6	51	-	1	4	23	23
Nutritional marasmus.....268	27	-	6	7	11	3	86	-	22	27	25	12
Other nutritional deficiency.....269	1	-	-	1	-	-	283	8	117	71	51	36
Endocrine and metabolic diseases.....240-258,270-279	1	-	-	-	1	-	1	-	1	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	-	-	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	1	-	-	-	-	1	42	1	17	10	8	6
Inflammatory diseases of central nervous system.....320-324	10	1	4	4	1	-	22	3	8	3	6	2
Other diseases of nervous system and sense organs.....310-315,330-389	7	-	-	1	4	2	19	4	5	4	4	2
Diseases of circulatory system.....390-458	-	-	-	-	-	-	54	3	28	8	8	7
Pneumonia and influenza.....470-486	118	20	58	23	11	6	386	70	122	82	78	34
Other diseases of respiratory system.....460-466,490-519	71	2	34	16	15	4	37	-	16	4	13	4
Diseases of digestive system.....520-577	5	-	1	-	2	2	56	7	21	13	11	4
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	13	-	4	4	4	1
Diseases of skin and subcutaneous tissue.....680-709	7	3	2	-	1	1	17	4	7	1	3	2
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	53	22	21	4	2	4	40	14	18	5	2	1
Nervous system.....740-743	16	11	4	-	-	1	8	5	2	-	-	1
Heart, circulatory system.....746,747	17	5	7	1	1	3	15	1	10	3	1	
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	10	5	5	-	-	-	3	1	1	-	1	-
Genito-urinary system.....752,753	1	-	-	1	-	-	3	2	1	-	-	
Musculoskeletal system.....754-756	2	-	2	-	-	-	2	2	-	-	-	-
Down's disease.....759.3	5	-	2	2	1	-	9	3	4	2	-	-
Other and unspecified anomalies.....744,745,757,758,rest of 759	2	1	1	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	224	222	2	-	-	-	418	400	18	-	-	-
Symptoms.....780-789	2	-	2	-	-	-	527	39	228	144	81	35
Sudden death.....795	10	3	5	1	1	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792,796	43	6	12	9	7	9	-	-	-	-	-	-
External causes.....E800-E999	17	1	4	-	3	9	7	2	4	1	-	-

Underlying cause 267

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

San Salvador Area, El Salvador - Rural Communities, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	486	94	100	90	104	98	812	100	152	154	201	205
Infective and parasitic diseases 000-136	288	31	70	68	70	49	219	12	20	32	64	91
Amebiasis 006	5	-	-	2	2	1	-	-	-	-	-	-
Diarrheal disease 009	208	12	62	53	47	34	116	6	12	20	29	49
Other intestinal infectious diseases 000-005, 007, 008	4	-	3	-	-	1	2	-	-	-	-	2
Tuberculosis 010-019	2	-	-	-	1	1	4	-	-	1	2	1
Diphtheria 032	2	-	-	-	2	-	-	-	-	-	-	-
Whooping cough 033	6	-	2	2	1	1	1	-	-	1	-	-
Tetanus 037	17	16	1	-	-	-	-	-	-	-	-	-
Septicemia 038	3	1	1	1	-	-	12	6	2	1	-	3
Measles 055	37	-	1	10	16	10	1	-	-	-	-	1
Congenital syphilis 090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis 112	2	2	-	-	-	-	13	-	5	2	3	3
Helminthiases 120-129	-	-	-	-	-	-	67	-	-	6	30	31
Other infective and parasitic diseases Rest of 000-136	2	-	-	-	1	1	3	-	1	1	-	1
Leukemia 204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other 140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified 210-239	2	-	-	-	-	2	-	-	-	-	-	-
Nutritional deficiency 260-269	56	-	3	6	14	33	179	5	36	38	56	44
Vitamin deficiency 260-266	-	-	-	-	-	-	2	-	-	-	2	-
Protein malnutrition 267	49	-	1	6	9	33	38	-	-	2	14	22
Nutritional marasmus 268	7	-	2	-	5	-	32	-	3	6	18	5
Other nutritional deficiency 269	-	-	-	-	-	-	107	5	33	30	22	17
Endocrine and metabolic diseases 240-258, 270-279	-	-	-	-	-	-	-	-	-	-	-	-
Deficiency anemias 280-281	-	-	-	-	-	-	1	-	-	-	1	-
Other diseases of blood and blood-forming organs 282-289	1	-	-	-	-	1	5	-	1	1	-	3
Inflammatory diseases of central nervous system 320-324	4	-	-	2	-	2	5	3	1	-	1	-
Other diseases of nervous system and sense organs 310-315, 330-389	5	-	-	1	2	2	5	1	1	1	2	-
Diseases of circulatory system 390-458	-	-	-	-	-	-	5	-	-	-	2	3
Pneumonia and influenza 470-486	30	9	10	4	5	2	117	8	18	28	32	31
Other diseases of respiratory system 460-466, 490-519	18	1	12	2	2	1	18	3	3	8	2	2
Diseases of digestive system 520-577	-	-	-	-	-	-	9	-	-	1	3	5
Diseases of genito-urinary system 580-629	3	2	-	-	-	1	3	-	2	1	-	-
Diseases of skin and subcutaneous tissue 680-709	1	1	-	-	-	-	14	1	4	2	2	5
Diseases of musculoskeletal system 710-738	1	-	-	-	-	1	-	-	-	-	-	-
Congenital anomalies 740-759	14	7	3	3	-	1	11	1	6	1	1	2
Nervous system 740-743	6	5	1	-	-	-	1	-	-	1	-	-
Heart, circulatory system 746, 747	5	1	1	2	-	1	6	-	5	-	-	1
Respiratory system 748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system 749-751	1	-	1	-	-	-	2	-	1	-	-	1
Genito-urinary system 752, 753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system 754-756	2	1	-	1	-	-	1	1	-	-	-	-
Down's disease 759.3	-	-	-	-	-	-	1	-	-	-	1	-
Other and unspecified anomalies 744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality 760-778	41	41	-	-	-	-	54	52	2	-	-	-
Symptoms 780-789	6	1	1	2	2	-	163	14	56	41	33	19
Sudden death 795	-	-	-	-	-	-	-	-	-	-	-	-
Other ill-defined conditions 790-792, 796	9	1	1	1	5	1	-	-	-	-	-	-
External causes E800-E999	7	-	-	1	4	2	4	-	2	-	2	-

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Santiago Area, Chile - Santiago, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	915	309	380	109	69	48	1637	646	599	208	116	68
Infective and parasitic diseases.....000-136	225	28	127	47	13	10	213	69	95	30	11	8
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	179	12	113	41	8	5	125	25	67	20	10	3
Other intestinal infectious diseases.....000-005,007,008	3	-	1	1	-	1	1	-	1	-	-	-
Tuberculosis.....010-019	2	-	1	-	-	1	3	-	1	-	-	2
Diphtheria.....032	1	-	-	-	-	1	-	-	-	-	-	-
Whooping cough.....033	1	-	1	-	-	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	17	14	3	-	-	-	74	43	21	6	1	3
Measles.....055	7	-	2	2	3	-	1	-	-	1	-	-
Congenital syphilis.....090	2	1	1	-	-	-	1	-	1	-	-	-
Moniliasis.....112	-	-	-	-	-	-	2	1	-	1	-	-
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	13	1	5	3	2	2	6	-	4	2	-	-
Leukemia.....204-207	4	-	-	-	-	4	-	-	-	-	-	-
Malignant neoplasms, other....140-203,208,209	3	-	-	-	-	3	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	2	-	1	-	1	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	36	-	18	10	5	3	242	6	147	50	26	13
Vitamin deficiency.....260-266	-	-	-	-	-	-	2	-	2	-	-	-
Protein malnutrition.....267	5	-	1	-	3	1	4	-	-	1	1	2
Nutritional marasmus.....268	26	-	15	9	2	-	53	-	29	17	3	4
Other nutritional deficiency.....269	5	-	2	1	-	2	183	6	116	32	22	7
Endocrine and metabolic diseases.....240-258,270-279	7	-	3	2	2	-	6	5	-	1	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	13	6	1	-	1	5
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	9	-	6	2	-	1
Inflammatory diseases of central nervous system.....320-324	39	6	14	7	6	6	12	4	5	3	-	-
Other diseases of nervous system and sense organs.....310-315,330-389	19	-	7	5	5	2	29	1	15	4	5	4
Diseases of circulatory system.....390-458	-	-	-	-	-	-	46	5	14	10	11	6
Pneumonia and influenza.....470-486	170	30	112	17	10	1	217	50	97	41	20	9
Other diseases of respiratory system.....460-466,490-519	47	1	34	8	2	2	43	1	24	7	10	1
Diseases of digestive system.....520-577	3	1	2	-	-	-	18	2	9	5	-	2
Diseases of genito-urinary system.....580-629	3	-	3	-	-	-	22	-	16	4	1	1
Diseases of skin and subcutaneous tissue.....680-709	7	6	1	-	-	-	21	4	11	4	2	-
Diseases of musculoskeletal system....710-738	1	1	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	77	25	29	8	7	8	69	31	21	2	10	5
Nervous system.....740-743	17	7	4	2	1	3	12	5	1	-	4	2
Heart, circulatory system.....746,747	34	10	15	4	3	2	28	13	11	1	2	1
Respiratory system.....748	1	1	-	-	-	-	2	2	-	-	-	-
Digestive system.....749-751	10	2	6	1	-	1	4	2	2	-	-	-
Genito-urinary system.....752,753	-	-	-	-	-	-	3	1	1	-	-	1
Musculoskeletal system.....754-756	3	1	1	-	1	-	2	-	1	1	-	-
Down's disease.....759.3	7	2	2	1	1	1	15	6	5	-	3	1
Other and unspecified anomalies.....744,745,757,758,rest of 759	5	2	1	-	1	1	3	2	-	-	1	-
Certain causes of perinatal mortality.....760-778	208	206	2	-	-	-	445	434	10	1	-	-
Symptoms.....780-789	1	-	-	1	-	-	191	19	112	40	12	8
Sudden death.....795	21	2	18	1	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792,796	1	-	1	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	41	3	8	3	18	9	41	9	16	4	7	5

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Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group,

Santiago Area, Chile - Suburban Communities, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	103	28	44	21	6	4	149	37	64	30	8	10
Infective and parasitic diseases.....000-136	28	4	13	8	1	2	17	1	9	6	-	1
Amebiasis.....006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease.....009	22	3	10	7	1	1	9	-	4	4	-	1
Other intestinal infectious diseases.....000-005, 007, 008	3	-	2	1	-	-	1	-	-	1	-	-
Tuberculosis.....010-019	1	-	-	-	-	1	-	-	-	-	-	-
Diphtheria.....032	-	-	-	-	-	-	-	-	-	-	-	-
Whooping cough.....033	-	-	-	-	-	-	-	-	-	-	-	-
Tetanus.....037	-	-	-	-	-	-	-	-	-	-	-	-
Septicemia.....038	1	1	-	-	-	-	7	1	5	1	-	-
Measles.....055	-	-	-	-	-	-	-	-	-	-	-	-
Congenital syphilis.....090	-	-	-	-	-	-	-	-	-	-	-	-
Moniliasis.....112	-	-	-	-	-	-	-	-	-	-	-	-
Helminthiases.....120-129	-	-	-	-	-	-	-	-	-	-	-	-
Other infective and parasitic diseases.....Rest of 000-136	1	-	1	-	-	-	-	-	-	-	-	-
Leukemia.....204-207	-	-	-	-	-	-	-	-	-	-	-	-
Malignant neoplasms, other....140-203, 208, 209	-	-	-	-	-	-	-	-	-	-	-	-
Neoplasms, benign and unspecified.....210-239	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiency.....260-269	2	-	1	1	-	-	32	1	16	9	3	3
Vitamin deficiency.....260-266	-	-	-	-	-	-	-	-	-	-	-	-
Protein malnutrition.....267	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional marasmus.....268	2	-	1	1	-	-	10	-	5	2	2	1
Other nutritional deficiency.....269	-	-	-	-	-	-	22	1	11	7	1	2
Endocrine and metabolic diseases.....240-258, 270-279	1	1	-	-	-	-	1	1	-	-	-	-
Deficiency anemias.....280-281	-	-	-	-	-	-	-	-	-	-	-	-
Other diseases of blood and blood-forming organs.....282-289	-	-	-	-	-	-	-	-	-	-	-	-
Inflammatory diseases of central nervous system.....320-324	4	-	3	-	-	1	4	1	3	-	-	-
Other diseases of nervous system and sense organs.....310-315, 330-389	5	-	3	2	-	-	1	-	-	1	-	-
Diseases of circulatory system.....390-458	-	-	-	-	-	-	6	1	2	-	2	1
Pneumonia and influenza.....470-486	26	4	14	6	2	-	23	2	11	7	3	-
Other diseases of respiratory system.....460-466, 490-519	3	-	1	1	1	-	6	1	3	-	-	2
Diseases of digestive system.....520-577	-	-	-	-	-	-	9	4	4	-	-	1
Diseases of genito-urinary system.....580-629	-	-	-	-	-	-	2	-	1	1	-	-
Diseases of skin and subcutaneous tissue.....680-709	-	-	-	-	-	-	1	-	1	-	-	-
Diseases of musculoskeletal system....710-738	-	-	-	-	-	-	-	-	-	-	-	-
Congenital anomalies.....740-759	7	1	3	2	1	-	6	1	3	1	-	1
Nervous system.....740-743	-	-	-	-	-	-	-	-	-	-	-	-
Heart, circulatory system.....746, 747	1	-	1	-	-	-	3	1	2	-	-	-
Respiratory system.....748	-	-	-	-	-	-	-	-	-	-	-	-
Digestive system.....749-751	3	1	1	1	-	-	1	-	1	-	-	-
Genito-urinary system.....752, 753	-	-	-	-	-	-	-	-	-	-	-	-
Musculoskeletal system.....754-756	-	-	-	-	-	-	-	-	-	-	-	-
Down's disease.....759.3	3	-	1	1	1	-	2	-	-	1	-	1
Other and unspecified anomalies.....744, 745, 757, 758, rest of 759	-	-	-	-	-	-	-	-	-	-	-	-
Certain causes of perinatal mortality.....760-778	18	17	1	-	-	-	23	21	2	-	-	-
Symptoms.....780-789	-	-	-	-	-	-	16	2	8	5	-	1
Sudden death.....795	2	-	2	-	-	-	-	-	-	-	-	-
Other ill-defined conditions.....790-792, 796	2	-	2	-	-	-	-	-	-	-	-	-
External causes.....E800-E999	5	1	1	1	1	1	2	1	1	-	-	-

Provisional Data

Appendix Table I

Inter-American Investigation of Mortality in Childhood

Underlying and Associated Causes of Death in Children Under 5 Years of Age by Age Group, São Paulo, Brazil, First Year of Investigation

Cause	Underlying cause						Associated cause					
	Total	Age group					Total	Age group				
		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years		Under 28 days	28 days -5 mos.	6-11 mos.	1 year	2-4 years
All causes	2203	968	720	229	140	146	4359	1672	1643	503	279	262
Infective and parasitic diseases 000-136	782	214	358	101	53	56	659	137	288	110	66	58
Amebiasis 006	-	-	-	-	-	-	-	-	-	-	-	-
Diarrheal disease 009	565	171	311	64	11	8	345	61	163	69	28	24
Other intestinal infectious diseases 000-005, 007, 008	15	6	8	-	-	1	9	-	4	1	2	2
Tuberculosis 010-019	14	-	2	3	4	5	8	-	-	1	3	4
Diphtheria 032	6	-	1	1	1	3	-	-	-	-	-	-
Whooping cough 033	21	-	10	4	4	3	1	-	-	1	-	-
Tetanus 037	6	6	-	-	-	-	-	-	-	-	-	-
Septicemia 038	21	16	5	-	-	-	64	23	28	6	3	4
Measles 055	81	-	4	21	29	27	3	-	-	2	-	1
Congenital syphilis 090	9	6	3	-	-	-	1	-	1	-	-	-
Moniliasis 112	7	7	-	-	-	-	157	52	79	18	7	1
Helminthiases 120-129	3	-	-	1	-	2	49	-	2	5	20	22
Other infective and parasitic diseases Rest of 000-136	34	2	14	7	4	7	22	1	11	7	3	-
Leukemia 204-207	7	-	-	-	3	4	-	-	-	-	-	-
Malignant neoplasms, other 140-203, 208, 209	9	-	-	-	-	9	2	-	-	1	-	1
Neoplasms, benign and unspecified 210-239	2	1	-	-	-	1	-	-	-	-	-	-
Nutritional deficiency 260-269	74	2	17	25	24	6	623	64	345	107	55	52
Vitamin deficiency 260-266	-	-	-	-	-	-	3	-	-	1	2	-
Protein malnutrition 267	22	-	-	2	15	5	16	-	2	4	5	5
Nutritional marasmus 268	44	1	15	20	7	1	136	5	84	27	7	13
Other nutritional deficiency 269	8	1	2	3	2	-	468	59	259	75	41	34
Endocrine and metabolic diseases 240-258, 270-279	5	1	-	2	-	2	4	1	3	-	-	-
Deficiency anemias 280-281	-	-	-	-	-	-	5	4	1	-	-	-
Other diseases of blood and blood-forming organs 282-289	2	-	1	1	-	-	90	4	46	23	13	4
Inflammatory diseases of central nervous system 320-324	45	7	19	11	6	2	38	7	21	6	2	2
Other diseases of nervous system and sense organs 310-315, 330-389	93	9	52	20	3	9	53	8	25	6	7	7
Diseases of circulatory system 390-458	10	-	4	2	2	2	85	9	30	18	10	18
Pneumonia and influenza 470-486	329	109	145	42	21	12	575	154	221	86	63	51
Other diseases of respiratory system 460-466, 490-519	58	5	32	4	9	8	70	4	30	11	14	11
Diseases of digestive system 520-577	14	6	6	-	-	2	58	9	37	6	-	6
Diseases of genito-urinary system 580-629	33	4	21	6	-	2	50	10	26	7	2	5
Diseases of skin and subcutaneous tissue 680-709	3	1	2	-	-	-	36	5	21	6	3	1
Diseases of musculoskeletal system 710-738	1	-	-	1	-	-	1	-	1	-	-	-
Congenital anomalies 740-759	119	55	41	9	5	9	86	31	34	6	7	8
Nervous system 740-743	32	14	12	2	1	3	11	2	8	1	-	-
Heart, circulatory system 746, 747	55	26	19	4	2	4	31	11	14	2	2	2
Respiratory system 748	-	-	-	-	-	-	2	2	-	-	-	-
Digestive system 749-751	22	10	7	3	2	-	13	6	4	1	2	-
Genito-urinary system 752, 753	2	1	1	-	-	-	3	1	1	1	-	-
Musculoskeletal system 754-756	1	-	-	-	-	1	7	2	-	1	-	4
Down's disease 759.3	5	2	2	-	-	1	18	7	7	-	3	1
Other and unspecified anomalies 744, 745, 757, 758, rest of 759	2	2	-	-	-	-	1	-	-	-	-	1
Certain causes of perinatal mortality 760-778	546	536	9	1	-	-	1033	983	50	-	-	-
Symptoms 780-789	2	2	-	-	-	-	867	232	456	109	34	36
Sudden death 795	10	2	6	-	1	1	-	-	-	-	-	-
Other ill-defined conditions 790-792, 796	16	8	4	2	2	-	-	-	-	-	-	-
External causes E800-E999	43	6	3	2	11	21	24	10	8	1	3	2

Provisional Data

Appendix Table II

Underlying and Associated Causes of Infant Deaths with Rates per 1,000 Live Births in Central Cities and Other Areas*, First Year of Investigation

Cause	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate
	Cali				Cartagena				Chaco-Resistencia				Chaco-Rural				Kingston			
All causes	659	53.1	1055	85.1	451	48.0	833	88.6	380	76.0	505	101.0	330	84.6	302	77.4	776	41.9	1324	71.6
Infective and parasitic diseases 000-136	261	21.0	139	11.2	162	17.2	132	14.0	164	32.8	44	8.8	144	36.9	35	9.0	211	11.4	157	8.5
Nutritional deficiency 260-269	37	3.0	148	11.9	29	3.1	108	11.5	11	2.2	135	27.0	5	1.3	98	25.1	12	0.6	92	5.0
Diseases of nervous system and sense organs 310-315,320-389	16	1.3	16	1.3	8	0.9	19	2.0	6	1.2	12	2.4	12	3.1	11	2.8	13	0.7	29	1.6
Diseases of respiratory system 460-519	86	6.9	191	15.4	48	5.1	120	12.8	46	9.2	74	14.8	68	17.4	38	9.7	59	3.2	117	6.3
Congenital anomalies 740-759	29	2.3	28	2.3	26	2.8	34	3.6	16	3.2	7	1.4	8	2.1	2	0.5	68	3.7	69	3.7
Certain perinatal causes 760-778	201	16.2	335	27.0	148	15.7	240	25.5	113	22.6	125	25.0	62	15.9	60	15.4	352	19.0	670	36.2
Maternal conditions 760-763	33	2.7	8	0.6	19	2.0	8	0.9	7	1.4	1	0.2	6	1.5	1	0.3	63	3.4	29	1.6
Difficult labor, birth injury 764-768,772	40	3.2	26	2.1	24	2.6	9	1.0	29	5.8	8	1.6	14	3.6	2	0.5	45	2.4	40	2.2
Conditions of placenta, cord 770,771	11	0.9	5	0.4	23	2.4	6	0.6	8	1.6	3	0.6	3	0.8	1	0.3	12	0.6	10	0.5
Hemolytic disease 774,775	5	0.4	1	0.1	6	0.6	-	-	3	0.6	-		2	0.5	-		10	0.5	2	0.1
Anoxic, hypoxic conditions 776	69	5.6	86	6.9	32	3.4	66	7.0	24	4.8	21	4.2	13	3.3	11	2.8	87	4.7	127	6.9
Immaturity 777	7	0.6	171	13.8	11	1.2	128	13.6	12	2.4	83	16.6	13	3.3	39	10.0	23	1.2	360	19.5
Other perinatal causes 769,778	36	2.9	38	3.1	33	3.5	23	2.4	30	6.0	9	1.8	11	2.8	6	1.5	112	6.1	102	5.5
Other causes	29	2.3	198	16.0	30	3.2	180	19.1	24	4.8	108	21.6	31	7.9	58	14.9	61	3.3	190	10.3
	La Paz				Medellín				Monterrey				Recife				Ribeirão Prêto-City			
All causes	1297	76.3	1423	83.7	463	46.3	830	83.0	1909	57.7	3475	105.0	1500	91.5	2932	178.8	211	46.9	443	98.4
Infective and parasitic diseases 000-136	391	23.0	108	6.4	176	17.6	91	9.1	757	22.9	432	13.1	745	45.4	457	27.9	82	18.2	35	7.8
Nutritional deficiency 260-269	26	1.5	309	18.2	15	1.5	140	14.0	31	1.0	540	16.3	31	1.9	577	35.2	1	0.2	70	15.6
Diseases of nervous system and sense organs 310-315,320-389	11	0.6	12	0.7	12	1.2	20	2.0	49	1.5	98	3.0	27	1.6	56	3.4	7	1.6	15	3.3
Diseases of respiratory system 460-519	452	26.6	292	17.2	50	5.0	123	12.3	311	9.4	551	16.6	192	11.7	529	32.3	22	4.9	75	16.7
Congenital anomalies 740-759	22	1.3	17	1.0	36	3.6	23	2.3	132	4.0	66	2.0	47	2.9	47	2.9	15	3.3	9	2.0
Certain perinatal causes 760-778	292	17.2	411	24.2	141	14.1	268	26.8	508	15.3	900	27.2	377	23.0	603	36.8	78	17.3	136	30.2
Maternal conditions 760-763	31	1.8	10	0.6	17	1.7	16	1.6	49	1.5	39	1.2	14	0.9	10	0.6	6	1.3	2	0.4
Difficult labor, birth injury 764-768,772	67	3.9	16	0.9	25	2.5	27	2.7	109	3.3	66	2.0	72	4.4	24	1.5	12	2.7	6	1.3
Conditions of placenta, cord 770,771	25	1.5	19	1.1	21	2.1	4	0.4	69	2.1	29	0.9	35	2.1	11	0.7	6	1.3	1	0.2
Hemolytic disease 774,775	3	0.2	1	0.1	5	0.5	-		9	0.3	3	0.1	5	0.3	-		1	0.2	-	
Anoxic, hypoxic conditions 776	80	4.7	69	4.1	31	3.1	65	6.5	90	2.7	232	7.0	144	8.8	110	6.7	23	5.1	33	7.3
Immaturity 777	22	1.3	243	14.3	4	0.4	124	12.4	40	1.2	411	12.4	32	2.0	356	21.7	1	0.2	78	17.3
Other perinatal causes 769,778	64	3.8	53	3.1	38	3.8	32	3.2	142	4.3	120	3.6	75	4.6	92	5.6	29	6.4	16	3.6
Other causes	103	6.1	274	16.1	33	3.3	165	16.5	121	3.7	889	26.9	81	4.9	663	40.4	6	1.3	103	22.9
	Ribeirão Prêto-França				San Juan-City				San Juan-Suburban				San Juan-Rural				San Salvador-City			
All causes	213	84.2	391	154.5	122	42.7	268	93.7	317	83.4	692	182.1	449	98.0	885	193.2	1020	76.7	1765	132.7
Infective and parasitic diseases 000-136	86	34.0	27	10.7	37	12.9	43	15.0	96	25.3	106	27.9	159	34.7	139	30.3	517	38.9	192	14.4
Nutritional deficiency 260-269	8	3.2	53	21.3	2	0.7	23	8.0	17	4.5	73	19.2	26	5.7	113	24.7	20	1.5	250	18.8
Diseases of nervous system and sense organs 310-315,320-389	7	2.8	3	1.2	4	1.4	1	0.3	10	2.6	21	5.5	10	2.2	22	4.8	10	0.8	27	2.0
Diseases of respiratory system 460-519	22	8.7	37	14.6	16	5.6	32	11.2	58	15.3	94	24.7	100	21.8	127	27.7	153	11.5	294	22.1
Congenital anomalies 740-759	10	4.0	9	3.6	5	1.7	6	2.1	14	3.7	13	3.4	12	2.6	6	1.3	47	3.5	37	2.8
Certain perinatal causes 760-778	69	27.3	143	56.5	51	17.8	105	36.7	104	27.4	218	57.4	118	25.8	240	52.4	224	16.8	418	31.4
Maternal conditions 760-763	5	2.0	1	0.4	8	2.8	3	1.0	4	1.1	7	1.8	8	1.7	11	2.4	35	2.6	20	1.5
Difficult labor, birth injury 764-768,772	20	7.9	7	2.8	19	6.6	7	2.4	20	5.3	26	6.8	36	7.9	17	3.7	53	4.0	30	2.3
Conditions of placenta, cord 770,771	4	1.6	1	0.4	7	2.4	7	2.4	11	2.9	3	0.8	11	2.4	5	1.1	19	1.4	10	0.8
Hemolytic disease 774,775	2	0.8	-		3	1.0	1	0.3	6	1.6	-		3	0.7	1	0.2	7	0.5	3	0.2
Anoxic, hypoxic conditions 776	27	10.7	34	13.4	7	2.4	23	8.0	29	7.6	46	12.1	27	5.9	51	11.1	47	3.5	79	5.9
Immaturity 777	-		77	30.4	1	0.3	40	14.0	1	0.3	96	25.3	3	0.7	119	26.0	2	0.2	231	17.4
Other perinatal causes 769,778	11	4.3	23	9.1	6	2.1	24	8.4	34	8.9	40	10.5	30	6.6	36	7.9	61	4.6	45	3.4
Other causes	11	4.3	119	47.0	7	2.4	58	19.9	18	4.7	167	43.9	24	5.2	238	52.0	49	3.7	547	41.1
	San Salvador-Rural				Santiago				São Paulo											
All causes	284	101.4	406	145.0	798	50.5	1453	92.0	1917	69.0	3827	137.7								
Infective and parasitic diseases 000-136	169	60.4	64	22.9	202	12.8	194	12.3	673	24.2	535	19.2								
Nutritional deficiency 260-269	9	3.2	79	28.2	28	1.8	203	12.8	44	1.6	525	18.9								
Diseases of nervous system and sense organs 310-315,320-389	3	1.1	7	2.5	39	2.5	32	2.0	118	4.2	73	2.6								
Diseases of respiratory system 460-519	38	13.6	68	24.3	202	12.8	220	13.9	337	12.1	506	18.2								
Congenital anomalies 740-759	13	4.6	8	2.9	62	3.9	54	3.4	105	3.8	71	2.6								
Certain perinatal causes 760-778	41	14.6	54	19.3	208	13.2	445	28.2	546	19.6	1033	37.2								
Maternal conditions 760-763	9	3.2	-		17	1.1	28	1.8	56	2.0	35	1.3								
Difficult labor, birth injury 764-768,772	9	3.2	1	0.4	50	3.2	37	2.3	108	3.9	50	1.8								
Conditions of placenta, cord 770,771	5	1.8	1	0.4	23	1.5	10	0.6	50	1.8	14	0.5								
Hemolytic disease 774,775	-		1	0.4	15	0.9	7	0.4	16	0.6	11	0.4								
Anoxic, hypoxic conditions 776	10	3.6	16	5.7	50	3.2	110	7.0	171	6.2	215	7.7								
Immaturity 777	1	0.4	33	11.8	1	0.1	196	12.4	30	1.1	560	20.1								
Other perinatal causes 769,778	7	2.5	2	0.7	52	3.3	57	3.6	115	4.1	148	5.3								
Other causes	11	3.9	126	45.0	57	3.6	305	19.3	94	3.4	1084	39.0								

*Excluding 4 areas with insufficient deaths for analysis: Ribeirão Prêto-Rural; Santiago-Suburban; St. Andrew Parish, rural; Vischa.

Appendix Table III

Underlying and Associated Causes of Neonatal Deaths with Rates per 1,000 Live Births in 13 Projects, First Year of Investigation

Cause	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate	Underlying Number	Underlying Rate	Associated Number	Associated Rate
	Cali				Cartagena				Chaco Province				Kingston Area				La Paz Area			
All causes	297	24.0	459	37.0	218	23.2	356	37.9	269	30.2	230	25.8	534	26.4	954	47.2	569	32.7	610	35.1
Diarrheal disease 009	19	1.5	2	0.2	12	1.3	6	0.6	20	2.2	4	0.4	31	1.5	16	0.8	43	2.5	12	0.7
Other infectious diseases.... Rest of 000-136	21	1.7	35	2.8	23	2.4	22	2.3	20	2.2	5	0.6	45	2.2	82	4.1	17	1.0	19	1.1
Diseases of respiratory system 460-519	27	2.2	51	4.1	9	1.0	31	3.3	21	2.4	17	1.9	19	0.9	53	2.6	157	9.0	68	3.9
Congenital anomalies 740-759	17	1.4	16	1.3	13	1.4	23	2.4	12	1.3	3	0.3	40	2.0	48	2.4	11	0.6	13	0.7
Certain perinatal causes 760-778	199	16.0	321	25.9	148	15.7	235	25.0	174	19.6	182	20.4	369	18.3	685	33.9	302	17.4	412	23.7
Maternal conditions 760-763	32	2.6	7	0.6	19	2.0	8	0.9	13	1.5	2	0.2	65	3.2	30	1.5	33	1.9	10	0.6
Difficult labor, birth injury.. 764-768,772	40	3.2	24	1.9	24	2.6	9	1.0	43	4.8	10	1.1	48	2.4	42	2.1	69	4.0	17	1.0
Conditions of placenta, cord 770,771	11	0.9	5	0.4	23	2.4	6	0.6	11	1.2	4	0.4	12	0.6	11	0.5	25	1.4	19	1.1
Hemolytic disease 774,775	4	0.3	1	0.1	6	0.6	-		5	0.6	-		10	0.5	2	0.1	3	0.2	1	0.1
Anoxic, hypoxic conditions 776	69	5.6	86	6.9	32	3.4	66	7.0	37	4.2	32	3.6	96	4.8	130	6.4	87	5.0	72	4.1
Immaturity 777	7	0.6	161	13.0	11	1.2	123	13.1	24	2.7	119	13.4	24	1.2	363	18.0	22	1.3	243	14.0
Other perinatal causes 769,778	36	2.9	37	3.0	33	3.5	23	2.4	41	4.6	15	1.7	114	5.6	107	5.3	63	3.6	50	2.9
Other causes	14	1.1	34	2.7	13	1.4	39	4.1	22	2.5	19	2.1	30	1.5	70	3.5	39	2.2	86	4.9
	Medellín				Monterrey				Recife				Ribeirão Prêto Area				San Juan Province			
All causes	191	19.1	340	34.0	856	25.9	1354	40.9	564	34.4	888	54.1	269	30.4	443	50.1	410	36.5	900	80.1
Diarrheal disease 009	12	1.2	6	0.6	76	2.3	40	1.2	75	4.6	19	1.2	42	4.7	6	0.7	58	5.2	42	3.7
Other infectious diseases.... Rest of 000-136	8	0.8	21	2.1	63	1.9	83	2.5	20	1.2	70	4.3	7	0.8	9	1.0	15	1.3	79	7.0
Diseases of respiratory system 460-519	7	0.7	21	2.1	86	2.6	123	3.7	37	2.3	76	4.6	16	1.8	30	3.4	36	3.2	76	6.8
Congenital anomalies 740-759	15	1.5	8	0.8	68	2.1	26	0.8	28	1.7	24	1.5	17	1.9	15	1.7	15	1.3	12	1.1
Certain perinatal causes 760-778	140	14.0	255	25.5	502	15.2	873	26.4	375	22.9	579	35.3	178	20.1	317	35.8	272	24.2	555	49.4
Maternal conditions 760-763	16	1.6	14	1.4	49	1.5	36	1.1	14	0.9	9	0.5	12	1.4	4	0.5	20	1.8	21	1.9
Difficult labor, birth injury.. 764-768,772	25	2.5	25	2.5	109	3.3	62	1.9	72	4.4	23	1.4	36	4.1	15	1.7	75	6.7	50	4.4
Conditions of placenta, cord 770,771	21	2.1	4	0.4	69	2.1	29	0.9	35	2.1	11	0.7	12	1.4	2	0.2	29	2.6	15	1.3
Hemolytic disease 774,775	5	0.5	-		9	0.3	3	0.1	5	0.3	-		3	0.3	-		12	1.1	1	0.1
Anoxic, hypoxic conditions 776	31	3.1	65	6.5	90	2.7	232	7.0	144	8.8	110	6.7	64	7.2	79	8.9	63	5.6	120	10.7
Immaturity 777	4	0.4	116	11.6	37	1.1	396	12.0	32	2.0	338	20.6	1	0.1	176	19.9	4	0.4	249	22.2
Other perinatal causes 769,778	38	3.8	31	3.1	139	4.2	115	3.5	73	4.5	88	5.4	50	5.6	41	4.6	69	6.1	99	8.8
Other causes	9	0.9	29	2.9	61	1.8	209	6.3	29	1.8	120	7.3	9	1.0	66	7.5	14	1.2	136	12.1
	San Salvador Area				Santiago Area				São Paulo											
All causes	455	28.3	704	43.7	337	19.6	683	39.7	968	34.8	1672	60.1								
Diarrheal disease 009	56	3.5	18	1.1	15	0.9	25	1.5	171	6.2	61	2.2								
Other infectious diseases.... Rest of 000-136	56	3.5	43	2.7	17	1.0	45	2.6	43	1.5	76	2.7								
Diseases of respiratory system 460-519	32	2.0	81	5.0	35	2.0	54	3.1	114	4.1	158	5.7								
Congenital anomalies 740-759	29	1.8	15	0.9	26	1.5	32	1.9	55	2.0	31	1.1								
Certain perinatal causes 760-778	263	16.3	452	28.1	223	13.0	455	26.4	536	19.3	983	35.4								
Maternal conditions 760-763	44	2.7	19	1.2	18	1.0	29	1.7	55	2.0	34	1.2								
Difficult labor, birth injury.. 764-768,772	61	3.8	31	1.9	52	3.0	36	2.1	103	3.7	48	1.7								
Conditions of placenta, cord 770,771	24	1.5	11	0.7	24	1.4	10	0.6	49	1.8	14	0.5								
Hemolytic disease 774,775	7	0.4	4	0.2	16	0.9	6	0.3	15	0.5	10	0.4								
Anoxic, hypoxic conditions 776	57	3.5	95	5.9	54	3.1	114	6.6	171	6.2	214	7.7								
Immaturity 777	3	0.2	247	15.3	2	0.1	204	11.8	29	1.0	521	18.7								
Other perinatal causes 769,778	67	4.2	45	2.8	57	3.3	56	3.3	114	4.1	142	5.1								
Other causes	19	1.2	95	5.9	21	1.2	72	4.2	49	1.8	363	13.1								

Appendix Table IV

Underlying and Associated Causes of Deaths of Children 1-4 Years with Rates per 1,000 Population in 11 Cities and 3 Other Areas*, First Year of Investigation

Cause	Underlying		Associated		Underlying		Associated		Underlying		Associated		Underlying		Associated		Underlying		Associated	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate	Number	Rate
	Cali				Cartagena				Chaco-Resistencia				Chaco-Rural				Kingston			
All causes	305	6.2	533	10.9	170	4.7	369	10.3	72	4.4	120	7.3	103	7.6	132	9.7	144	2.2	220	3.3
Infective and parasitic diseases.. 000-136	152	3.1	148	3.0	64	1.8	122	3.4	40	2.4	25	1.5	60	4.4	27	2.0	34	0.5	31	0.5
Diarrheal disease 009	83	1.7	81	1.6	29	0.8	51	1.4	22	1.3	19	1.2	34	2.5	21	1.5	22	0.3	20	0.3
Measles 055	40	0.8	3	0.1	13	0.4	-		12	0.7	1	0.1	15	1.1	2	0.1	1	0.0	-	
Tuberculosis 010-019	6	0.1	7	0.1	2	0.1	2	0.1	6	0.4	2	0.1	3	0.2	1	0.1	3	0.0	2	0.0
Other Rest of 000-136	23	0.5	57	1.2	20	0.6	69	1.9	-		3	0.2	8	0.6	3	0.2	8	0.1	9	0.1
Nutritional deficiency 260-269	69	1.4	119	2.4	45	1.3	70	1.9	9	0.5	36	2.2	4	0.3	57	4.2	14	0.2	42	0.6
Diseases of nervous system and sense organs 310-315,320-389	16	0.3	19	0.4	5	0.1	9	0.3	2	0.1	4	0.2	4	0.3	6	0.4	14	0.2	8	0.1
Diseases of respiratory system 460-519	24	0.5	136	2.8	22	0.6	79	2.2	8	0.5	24	1.5	17	1.2	21	1.5	23	0.3	51	0.8
External causes E800-999	17	0.3	10	0.2	14	0.4	4	0.1	5	0.3	2	0.1	6	0.4	-		18	0.3	4	0.1
Other causes	27	0.5	101	2.1	20	0.6	85	2.4	8	0.5	29	1.8	12	0.9	21	1.5	41	0.6	84	1.3
	La Paz				Medellín				Monterrey				Recife				San Juan-Rural			
All causes	616	9.6	858	13.4	229	5.9	478	12.4	412	3.9	972	9.1	535	10.1	1409	26.5	97	6.1	177	11.1
Infective and parasitic diseases.. 000-136	391	6.1	148	2.3	127	3.3	126	3.3	236	2.2	269	2.5	343	6.4	441	8.3	49	3.1	23	1.4
Diarrheal disease 009	72	2.7	115	1.8	64	1.7	54	1.4	56	0.5	123	1.2	59	1.1	244	4.6	10	0.6	17	1.1
Measles 055	70	2.7	7	0.1	32	0.8	2	0.1	94	0.9	21	0.2	227	4.3	3	0.1	27	1.7	3	0.2
Tuberculosis 010-019	32	0.5	10	0.2	10	0.3	7	0.2	28	0.3	18	0.2	21	0.4	16	0.3	5	0.3	1	0.1
Other Rest of 000-136	17	0.3	16	0.2	21	0.5	63	1.6	58	0.5	107	1.0	36	0.7	178	3.3	7	0.4	2	0.1
Nutritional deficiency 260-269	24	0.4	280	4.4	39	1.0	117	3.0	34	0.3	212	2.0	53	1.0	323	6.1	5	0.3	36	2.2
Diseases of nervous system and sense organs 310-315,320-389	12	0.2	18	0.3	5	0.1	23	0.6	10	0.1	38	0.4	25	0.5	33	0.6	4	0.2	9	0.6
Diseases of respiratory system 460-519	121	1.9	226	3.5	12	0.3	90	2.3	66	0.6	208	2.0	77	1.4	376	7.1	17	1.1	52	3.2
External causes E800-999	21	0.3	3	0.0	19	0.5	6	0.2	21	0.2	16	0.2	13	0.2	3	0.1	13	0.8	4	0.2
Other causes	47	0.7	183	2.9	27	0.7	116	3.0	45	0.4	229	2.2	24	0.5	233	4.4	9	0.6	53	3.3
	San Salvador-City				San Salvador-Rural				Santiago				São Paulo							
All causes	314	6.3	654	13.1	202	23.0	406	46.1	117	1.8	184	2.9	286	2.8	541	5.2				
Infective and parasitic diseases.. 000-136	188	3.8	165	3.3	119	13.5	155	17.6	23	0.4	19	0.3	109	1.1	124	1.2				
Diarrheal disease 009	98	2.0	92	1.8	81	9.2	78	8.9	13	0.2	13	0.2	19	0.2	52	0.5				
Measles 055	58	1.2	2	0.0	26	3.0	3	0.3	3	0.0	-		56	0.5	1	0.0				
Tuberculosis 010-019	4	0.1	2	0.0	2	0.2	3	0.3	1	0.0	2	0.0	9	0.1	7	0.1				
Other Rest of 000-136	28	0.6	69	1.4	10	1.1	71	8.1	6	0.1	4	0.1	25	0.2	64	0.2				
Nutritional deficiency 260-269	38	0.8	172	3.4	47	5.3	100	11.4	8	0.1	39	0.6	30	0.3	107	1.0				
Diseases of nervous system and sense organs 310-315,320-389	7	0.1	14	0.3	6	0.7	3	0.3	19	0.3	9	0.1	20	0.2	18	0.2				
Diseases of respiratory system 460-519	36	0.7	129	2.6	10	1.1	67	7.6	15	0.2	40	0.6	50	0.5	139	1.3				
External causes E800-999	12	0.2	-		6	0.7	2	0.2	27	0.4	12	0.2	32	0.3	5	0.0				
Other causes	33	0.7	174	3.5	14	1.6	79	9.0	25	0.4	65	1.0	45	0.4	148	1.4				

*Areas excluded are Ribeirão Prêto and San Juan, and 6 other areas, Ribeirão Prêto-Franca, Ribeirão Prêto-Rural, San Juan-Suburban, Santiago-Suburban, St. Andrew Parish, Rural and Vinchs

Appendix Table V

Immaturity as Contributory Cause or Consequence of Underlying Cause of Neonatal Deaths in 13 Projects, First Year of Investigation

Underlying cause	Total deaths	Immaturity: Contributory Number	Contributory Per cent	Consequence Number	Consequence Per cent
Cali					
All causes	297	97	32.7	64	21.5
Diarrheal disease 009	19	9	47.4	-	
Other infectious diseases... Rest of 000-136	21	9	42.9	-	
Diseases of respiratory system 460-519	27	12	44.4	-	
Congenital anomalies 740-759	17	1	5.9	-	
Certain perintal causes 760-778	199	64	32.2	64	32.2
Maternal conditions 760-763	32	-		27	84.4
Difficult labor, birth injury..764-768,772	40	13	32.5	1	2.5
Conditions of placenta, cord 770,771	11	-		8	72.7
Hemolytic disease 774,775	4	-		-	
Anoxic, hypoxic conditions 776	69	49	71.0	-	
Immaturity 777	7	-		-	
Other perinatal causes 769,778	36	2	5.6	28	77.8
Other causes	14	2	14.3	-	
Cartagena					
All causes	218	62	28.4	61	28.0
Diarrheal disease 009	12	10	83.3	-	
Other infectious diseases... Rest of 000-136	23	4	17.4	-	
Diseases of respiratory system 460-519	9	5	*	-	
Congenital anomalies 740-759	13	3	23.1	-	
Certain perintal causes 760-778	148	37	25.0	61	41.2
Maternal conditions 760-763	19	-		13	68.4
Difficult labor, birth injury..764-768,772	24	9	37.5	-	
Conditions of placenta, cord 770,771	23	-		20	87.0
Hemolytic disease 774,775	6	1	*	2	*
Anoxic, hypoxic conditions 776	32	26	81.2	-	
Immaturity 777	11	-		-	
Other perinatal causes 769,778	33	1	3.0	26	78.8
Other causes	13	3	23.1	-	
Chaco Province					
All causes	269	65	24.2	54	20.1
Diarrheal disease 009	20	8	40.0	-	
Other infectious diseases... Rest of 000-136	20	6	30.0	-	
Diseases of respiratory system 460-519	21	6	28.6	-	
Congenital anomalies 740-759	12	2	16.7	-	
Certain perintal causes 760-778	174	42	24.1	20	11.5
Maternal conditions 760-763	13	-		10	76.9
Difficult labor, birth injury..764-768,772	43	12	27.9	1	2.3
Conditions of placenta, cord 770,771	11	-		9	81.8
Hemolytic disease 774,775	5	1	*	-	
Anoxic, hypoxic conditions 776	37	27	73.0	-	
Immaturity 777	24	-		-	
Other perinatal causes 769,778	41	2	4.9	34	82.9
Other causes	22	1	4.5	-	
Kingston Area					
All causes	534	200	37.5	163	30.5
Diarrheal disease 009	31	27	87.1	-	
Other infectious diseases... Rest of 000-136	45	34	75.6	-	
Diseases of respiratory system 460-519	19	13	68.4	-	
Congenital anomalies 740-759	40	10	25.0	-	
Certain perintal causes 760-778	369	110	29.8	163	44.2
Maternal conditions 760-763	65	-		61	93.8
Difficult labor, birth injury..764-768,772	48	20	41.7	1	2.1
Conditions of placenta, cord 770,771	12	2	16.7	8	66.7
Hemolytic disease 774,775	10	8	80.0	-	
Anoxic, hypoxic conditions 776	96	74	77.1	-	
Immaturity 777	24	-		-	
Other perinatal causes 769,778	114	6	5.3	93	81.6
Other causes	30	6	20.0	-	
La Paz Area					
All causes	569	167	29.3	76	13.4
Diarrheal disease 009	43	16	37.2	-	
Other infectious diseases... Rest of 000-136	17	7	41.2	-	
Diseases of respiratory system 460-519	157	47	29.9	-	
Congenital anomalies 740-759	11	1	9.1	-	
Certain perinatal causes 760-778	302	94	31.1	76	25.2
Maternal conditions 760-763	33	-		25	75.8
Difficult labor, birth injury..764-768,772	69	28	40.6	-	
Conditions of placenta, cord 770,771	25	7	28.0	8	32.0
Hemolytic disease 774,775	3	2	*	-	
Anoxic, hypoxic conditions 776	87	52	59.8	-	
Immaturity 777	22	-		-	
Other perinatal causes 769,778	63	5	7.9	43	68.3
Other causes	39	2	5.2	-	
Medellin					
All causes	191	51	26.7	65	34.0
Diarrheal disease 009	12	4	33.3	-	
Other infectious diseases... Rest of 000-136	8	4	*	-	
Diseases of respiratory system 460-519	7	1	*	-	
Congenital anomalies 740-759	15	4	26.7	-	
Certain perinatal causes 760-778	140	36	25.7	65	46.4
Maternal conditions 760-763	16	-		15	93.8
Difficult labor, birth injury..764-768,772	25	11	44.0	-	
Conditions of placenta, cord 770,771	21	1	4.8	14	66.7
Hemolytic disease 774,775	5	-		1	*
Anoxic, hypoxic conditions 776	31	23	74.2	-	
Immaturity 777	4	-		-	
Other perinatal causes 769,778	38	1	2.6	35	92.1
Other causes	9	2	*	-	
Monterrey					
All causes	856	193	22.5	203	23.7
Diarrheal disease 009	76	28	36.8	-	
Other infectious diseases... Rest of 000-136	63	32	50.8	-	
Diseases of respiratory system 460-519	86	21	24.4	-	
Congenital anomalies 740-759	68	18	26.5	-	
Certain perinatal causes 760-778	502	92	18.3	203	40.4
Maternal conditions 760-763	49	-		36	73.5
Difficult labor, birth injury..764-768,772	109	29	26.6	3	2.8
Conditions of placenta, cord 770,771	69	3	4.3	44	63.8
Hemolytic disease 774,775	9	1	*	2	*
Anoxic, hypoxic conditions 776	90	58	64.4	-	
Immaturity 777	37	-		-	
Other perinatal causes 769,778	139	1	0.7	118	84.9
Other causes	61	2	3.3	-	
Recife					
All causes	564	251	44.5	87	15.4
Diarrheal disease 009	75	29	38.7	-	
Other infectious diseases... Rest of 000-136	20	8	40.0	-	
Diseases of respiratory system 460-519	37	22	59.5	-	
Congenital anomalies 740-759	28	14	50.0	-	
Certain perinatal causes 760-778	375	171	45.6	87	23.2
Maternal conditions 760-763	14	-		12	85.7
Difficult labor, birth injury..764-768,772	72	38	52.8	-	
Conditions of placenta, cord 770,771	35	9	25.7	18	51.4
Hemolytic disease 774,775	5	4	*	-	
Anoxic, hypoxic conditions 776	144	112	77.8	-	
Immaturity 777	32	-		-	
Other perinatal causes 769,778	73	8	11.0	57	78.1
Other causes	29	7	24.1	-	
Ribeirao Prêto Area					
All causes	269	112	41.6	64	23.8
Diarrheal disease 009	42	28	66.7	-	
Other infectious diseases... Rest of 000-136	7	4	*	-	
Diseases of respiratory system 460-519	16	7	43.8	-	
Congenital anomalies 740-759	17	4	23.5	-	
Certain perinatal causes 760-778	178	68	38.2	64	36.0
Maternal conditions 760-763	12	-		12	100.0
Difficult labor, birth injury..764-768,772	36	10	27.8	-	
Conditions of placenta, cord 770,771	12	-		9	75.0
Hemolytic disease 774,775	3	2	*	1	*
Anoxic, hypoxic conditions 776	64	55	85.9	-	
Immaturity 777	1	-		-	
Other perinatal causes 769,778	50	1	2.0	42	84.0
Other causes	9	1	*	-	
San Juan Province					
All causes	410	166	40.5	83	20.2
Diarrheal disease 009	58	46	79.3	-	
Other infectious diseases... Rest of 000-136	15	8	53.3	-	
Diseases of respiratory system 460-519	36	19	52.8	-	
Congenital anomalies 740-759	15	3	20.0	-	
Certain perinatal causes 760-778	272	90	33.1	83	30.5
Maternal conditions 760-763	20	-		18	90.0
Difficult labor, birth injury..764-768,772	75	28	37.3	2	2.7
Conditions of placenta, cord 770,771	29	7	24.1	10	34.5
Hemolytic disease 774,775	12	5	41.7	-	
Anoxic, hypoxic conditions 776	63	43	68.3	-	
Immaturity 777	4	-		-	
Other perinatal causes 769,778	69	7	10.1	53	76.8
Other causes	14	-		-	-
San Salvador Area					
All causes	455	145	31.9	102	22.4
Diarrheal disease 009	56	14	25.0	-	
Other infectious diseases... Rest of 000-136	56	20	35.7	-	
Diseases of respiratory system 460-519	32	11	34.4	-	
Congenital anomalies 740-759	29	7	24.1	-	
Certain perinatal causes 760-778	263	90	34.2	102	38.8
Maternal conditions 760-763	44	-		38	86.4
Difficult labor, birth injury..764-768,772	61	37	60.7	1	1.6
Conditions of placenta, cord 770,771	24	5	20.8	11	45.8
Hemolytic disease 774,775	7	1	*	-	
Anoxic, hypoxic conditions 776	57	40	70.2	-	
Immaturity 777	3	-		-	
Other perinatal causes 769,778	67	7	10.4	52	77.6
Other causes	19	3	15.8	-	
Santiago Area					
All causes	337	124	36.8	80	23.7
Diarrheal disease 009	15	6	40.0	-	
Other infectious diseases... Rest of 000-136	17	13	76.5	-	
Diseases of respiratory system 460-519	35	18	51.4	-	
Congenital anomalies 740-759	26	15	57.7	-	
Certain perinatal causes 760-778	223	64	28.7	80	35.9
Maternal conditions 760-763	18	-		15	83.3
Difficult labor, birth injury..764-768,772	52	25	48.1	-	
Conditions of placenta, cord 770,771	24	-		14	58.3
Hemolytic disease 774,775	16	6	37.5	3	18.8
Anoxic, hypoxic conditions 776	54	29	53.7	-	
Immaturity 777	2	-		-	
Other perinatal causes 769,778	57	4	7.0	48	84.2
Other causes	21	8	38.1	-	
São Paulo					
All causes	968	346	35.7	175	18.1
Diarrheal disease 009	171	78	45.6	-	
Other infectious diseases... Rest of 000-136	43	18	41.9	-	
Diseases of respiratory system 460-519	114	56	49.1	-	
Congenital anomalies 740-759	55	14	25.5	-	
Certain perinatal causes 760-778	536	165	30.8	175	32.6
Maternal conditions 760-763	55	-		43	78.2
Difficult labor, birth injury..764-768,772	103	41	39.8	1	1.0
Conditions of placenta, cord 770,771	49	8	16.3	31	63.3
Hemolytic disease 774,775	15	4	26.7	-	
Anoxic, hypoxic conditions 776	171	104	60.8	-	
Immaturity 777	29	-		-	
Other perinatal causes 769,778	114	8	7.0	100	87.7
Other causes	49	15	30.6	-	

Appendix Table VI

Deaths from Measles by Month of Year in 13 Projects, First Year of Investigation

Project	Total	1968							1969							
		June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Recife	327		17	21	46	32	44	40	33	32	19	15	14	14		
La Paz Area	244		37	37	47	28	34	16	19	5	9	4	6	2		
San Salvador Area	129				4	7	9	6	8	16	13	22	18	12	11	3
Monterrey	151			17	14	15	14	6	8	6	25	17	8	9	12	
São Paulo	81	4	9	3	6	5	6	13	6	8	3	6	12			
San Juan Province	70			-	3	18	19	19	9	2	-	-	-	-	-	
Cali	49		2	1	-	4	3	5	6	5	4	8	5	6		
Chaco Province	47			11	12	6	5	6	5	1	-	-	-	-	1	
Medellín	37		1	1	1	-	2	1	6	6	3	5	7	4		
Ribeirão Prêto Area	36		2	7	6	6	3	3	4	2	1	-	-	2		
Cartagena	17		3	3	5	-	1	-	-	-	1	-	2	1		
Santiago Area	7		-	-	1	-	-	-	1	1	1	-	2	1		
Kingston Area	3	1	-	1	-	-	-	-	-	-	-	1	-			

Appendix Table VII

Congenital Anomalies as Underlying or Associated Cause of Death for Two Age Groups in 13 Projects, First Year of Investigation

System and type of anomaly	Cali		Carta-gena		Chaco Province		Kingston Area		La Paz Area		Medellín		Monte-rrey		Recife		Ribeirão Prêto Area		San Juan Province		San Sal-vador Area		Santiago Area		São Paulo	
	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.	-1 yr.	1-4 yrs.
Nervous system																										
Anencephalus.....740	1	-	1	-	1	-	-	-	1	-	-	-	16	2	1	-	-	-	1	-	2	-	1	-	5	-
Spina bifida.....741	3	2	1	1	2	-	3	-	2	-	2	-	29	4	7	-	2	-	1	2	22	2	6	1	8	-
Congenital hydrocephalus....742	3	1	3	3	3	-	9	5	-	1	6	1	**12	2	5	3	-	-	3	1	2	-	6	3	15	1
Other.....743	-	1	2	-	1	-	-	-	-	-	*2	-	1	-	3	-	1	-	1	-	**3	-	6	**5	8	3
Deaf mutism.....388	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eye.....744	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Ear, face, and neck.....745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-
Circulatory system																										
Heart.....746	24	5	12	1	13	3	**42	6	12	3	19	8	*58	7	*26	2	16	2	19	3	*27	6	*45	6	60	6
Other.....747	2	-	*1	1	-	-	14	2	-	-	**2	-	1	-	4	-	3	-	1	-	*5	-	**7	1	4	2
Respiratory system.....748	-	-	-	1	-	1	-	1	1	-	1	-	2	1	-	-	1	-	-	-	-	-	3	-	2	-
Digestive system																										
Cleft palate and cleft lip..749	2	-	6	-	3	-	3	1	6	-	6	1	3	1	4	-	3	1	6	-	4	2	3	-	*8	1
Others of upper alimentary tract.....750	4	-	-	-	-	-	5	-	*2	-	-	-	4	1	2	-	3	-	2	-	3	-	2	-	*6	2
Other.....751	2	1	8	*2	3	-	16	-	8	-	7	1	21	4	11	1	7	-	8	2	7	-	*11	1	15	*1
Inguinal hernia.....550	3	-	-	-	-	-	-	-	-	-	-	1	-	1	1	-	2	-	1	-	1	-	1	-	4	-
Other hernia.....551	2	-	-	-	2	-	1	-	-	-	-	-	1	-	*9	-	*1	-	1	-	-	-	1	-	*5	-
Genito-urinary system																										
Genital organs.....752	-	-	1	-	-	-	*1	-	-	1	-	-	1	1	*1	-	-	-	-	-	-	-	1	-	2	-
Urinary system.....753	2	1	*3	-	1	-	12	2	2	-	1	3	5	-	4	-	2	-	2	1	4	-	1	1	3	-
Redundant prepuce and phimosis.....605	1	1	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	1	-	-	-	-	-	*4	1
Musculoskeletal system																										
Clubfoot.....754	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Others of limbs.....755	1	1	1	-	-	-	-	-	1	-	1	*1	2	-	-	-	1	-	-	-	1	-	1	-	-	-
Other.....756	-	1	-	-	-	1	2	1	1	-	1	1	7	-	4	-	1	-	4	-	5	-	3	1	2	3
Skin, hair, and nails.....757	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other and unspecified 758	-	-	-	-	-	-	1	-	-	-	1	-	1	-	5	-	-	-	-	-	-	-	-	-	-	-
Down's disease.....759.3	8	3	12	-	6	2	13	7	2	1	8	3	23	4	10	2	8	1	7	2	13	2	19	8	18	5
Other syndromes affecting multiple systems....Rest of 759	-	-	1	-	-	-	8	-	-	-	-	1	10	-	3	-	-	-	-	-	2	-	4	1	2	1

*One duplicate category in same system.
**Six duplicate categories in same system.

Appendix Table VIII

Number and Percentage of Deaths from All Causes under 5 Years of Age with Autopsies in Central Cities and Other Areas, First Year of Investigation

Central city	Total deaths	With autopsy		Other area	Total deaths	With autopsy	
		Number	Per cent			Number	Per cent
Cali	964	100	10.4	Chaco, rural	433	10	2.3
Cartagena	621	186	30.0	Franca	257	7	2.7
Kingston	920	440	47.8	Ribeirão Prêto, rural	107	13	12.1
La Paz	1913	61	3.2	San Juan, suburban	360	80	22.2
Medellín	692	50	7.2	San Juan, rural	546	62	11.4
Monterrey	2321	65	2.8	San Salvador, rural	486	12	2.5
Recife	2035	566	27.8	Santiago, suburban	103	17	16.5
Resistencia	452	80	17.7	St. Andrew, rural	83	35	42.2
Ribeirão Prêto	251	116	46.2	Viacha	69	-	
San Juan	133	27	20.3				
San Salvador	1334	83	6.2				
Santiago	915	167	18.3				
São Paulo	2203	434	19.7				

Appendix Table IX

Number and Percentage of Families of Deceased Children with Family Interviews in Central Cities and Other Areas, First Year of Investigation

Central city and other area	Total deaths	With family interview		With interview of mothers	
		Number	Per cent	Number	Per cent
Cali	964	667	69.2	533	55.3
Cartagena	621	410	66.0	358	57.6
Kingston	920	841	91.4	779	84.7
La Paz	1913	1078	56.4	575	30.1
Medellín	692	497	71.8	451	65.2
Monterrey	2321	1809	77.9	1646	70.9
Recife	2035	1817	89.3	1658	81.5
Resistencia	452	428	94.7	302	66.8
Ribeirão Prêto	251	226	90.0	215	85.7
San Juan	133	128	96.2	106	79.7
San Salvador	1334	1273	95.4	914	68.5
Santiago	915	743	81.2	647	70.7
São Paulo	2203	1867	84.7	1429	64.9
Other area					
Chaco, rural	433	420	97.0	240	55.4
Franca	257	210	81.7	198	77.0
Ribeirão Prêto, rural	107	97	90.7	92	86.0
San Juan, suburban	360	343	95.3	295	81.9
San Juan, rural	546	524	96.0	446	81.7
San Salvador, rural	486	464	95.5	349	71.8
Santiago, suburban	103	98	95.1	80	77.7
St. Andrew, rural	83	83	100.0	56	67.5
Viacha	69	53	76.8	33	47.8