



Infant Mortality in San Pablo de Heredia. Costa Rica
JANUARY, 2000 – JANUARY, 2001

Part two
A random study for the infant mortality associate risk
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INFANT MORTALITY IN SAN PABLO DE HEREDIA

CENTRAL AMERICAN INSTITUTE

Foundation

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A. Objectives And Rationale

1. Research Question: What factors contribute to the higher infant mortality rate in San Pablo de Heredia (22/1000) relative to the national rate (11.2/1000) of infant mortality in Costa Rica?

2. Specific Aims: based upon the result of the first part of this study where a qualitative analysis of the cases was done. Several aspects were found to generate an hypothesis of the risk factors associated to the Infant mortality : Congenital malformations, infections of the new born (respiratory and gastrointestinal infections) Must is me pointed out that the vast majority of the causes described are clearly associated to access to prenatal care. (Arias, R. Tristán, M.; Bloom, J Glass, Ryan 000)

1.) Identify the geographic location of families in San Pablo that have had at least one case of infant mortality in the last 3 years, 2.) identify social and economic characteristics of these families and devise medical histories, 3.) identify working conditions of the population and possible related maternal health risks, and 4.) as the research progresses, share study results so that changes can be made from within the community to lower risks of infant mortality.

3. Rationale: The main goal in this project is to identify local risk factors contributing to the high rate of infant mortality so that intervention can be devised to reduce infant death in the community. I hope we will eventually be able to provide these answers and interventions in order to benefit the community, and I also look forward to the opportunity to gain experience in epidemiological research and in the field of international public health

B. Background

Data from the Ministerio de Salud show that from 1970 to 1996 the average national infant mortality rate in Costa Rica was on a steady decline. Several cantons in rural areas maintained values that were higher than the national average. One area that draws attention, however, is the canton of San Pablo, a canton with a population of 25,000 and situated five kilometers from San Jose in the most developed area of the country that since 1995 has demonstrated an increase in infant mortality despite the fact that neighboring cantons did not demonstrate such a trend. (Data concerning infant mortality has been collected in this region by COLAMI (Comision local de analisis de Mortalidad Infantil), CORAMI (Comision Regional de analisis de Mortalidad Infantil) and CONAMI (Comision Nacional de analisis de Mortalidad Infantil).) Initial hypotheses concerning this paradox included diarrheal disease as a contributor to infant mortality, associated with the living conditions of a large population group of Nicaraguan migrant workers in the region.

In the last several decades infant mortality rates have been declining around the world, so that by 1994 at least 26 countries had infant mortality rates of less than 10/1000 and rates in the developing world varied from 20 to 190/1000. (Wegman) In the United States, birth defects are currently the leading cause of infant mortality. (MMWR) Infant mortality in developed countries has also been associated with maternal age <20 or >40, smoking during pregnancy, prenatal care begun only after the first trimester, mother not completing high school, unwed mother, and factors affecting the infant such as multiple births, low birth weight and SIDS. (MacDorman)

A wide variety of factors have been shown to be associated with infant mortality in the developing world, from maternal status such as education (Desai)(Pena), economic status and autonomy (Boehmer), to breast feeding and birthrates. (Hanson) In developing countries the major remaining risk factors for infant mortality are neonatal problems, diarrheal diseases, vaccine-preventable diseases, respiratory diseases and malnutrition. (Wegman, Foreign aid)(Ramos) In Brazil, for example, one study showed that low birth weight babies had a seven fold increased mortality rate when compared with normal weight babies, and that diarrheal morbidity was shown to be increased for LBW babies. (Lira)



Costa Rica has undergone rapid development in recent decades, making dramatic improvements in health, education and economic indicators. For example, the leading causes of death in 1995 were cardiovascular disease (12.4/10,000) and neoplasms (8.4/10,000), as in most developed nations. In 1995, 99.6% population had access to potable water and 95.7% had a sewage system. (PAHO) The national infant mortality rate (11.2/1000) is more similar to those of developed than to those of developing countries, as are the primary causes of infant deaths. At a national level, the leading cause of infant mortality is disorders originating in the perinatal period (6.4/10,000) and congenital anomalies (3.6/1000). Lung diseases account for 1.3/1000 and infectious and parasitic diseases for 0.6/1000 (only 4.4% of infant mortality). (PAHO) While several health and economic indicators would place Costa Rica on a similar stage as the most developed countries, development in Costa Rica is a recent phenomenon. The growth of cities has led to a migration from rural to urban areas that may greatly effect the health and economic demographics of the population. Mata's research in Costa Rica and Guatemala in 1980 led him to discuss the effects of population growth and the transition to urban, modern ways of life in Costa Rica as leading to crowding and underdevelopment that favor an interaction between malnutrition and infection. San Pablo's infant mortality rate of 22/1000, similar to that of some developing countries, may reflect this transition, considering San Pablo's location in one of the most developed regions of the country. (Mata)

One maternal risk factor that might be some what unique to Costa Rica involves the fact that rates of pesticide exposure in Costa Rica are the highest in Central America: 4 kg / inhabitant / year, or 6 to 10 times the world average. Especially at risk may be those working in banana, melon and rice production. (PAHO)

One study that serves as a particularly good model for this proposed research looked at 11 variables that might be associated with infant mortality to understand why infant mortality rates differ so substantially (14/1000 vs. 193/1000) among 140 municipalities in the state of Ceara, Brazil. The variables considered were adequate weight gain, exclusive breast feeding, prenatal care up-to-date, participation in growth monitoring, immunization up-to-date, decentralization of health services, female literacy rate, household income, adequate water supply, adequate sanitation, and GMP. Of these 11 factors, the three main factors that were shown to be significantly associated with infant mortality that could be targeted for intervention were exclusively breast feeding, prenatal care and female literacy. (Terra de Souza) Another study that might be critically helpful in determining eventual intervention in San Pablo evaluated

intervention to prevent infant mortality in Belo Horizonte City, Brazil. The researchers found that their study had a low capacity for identifying children or families at risk for infant mortality and identified more specific information on risk factors that could be helpful in intervention. (Lansky)

Collecting methods of the indicators described above often involve using Demographic and Health Surveys. One study that looked critically at the problems associated with collecting data on childhood illness and cause of death, found that Demographic and Health Surveys (DHS) are extremely useful as sources of data on child health and indicators in developing countries, but they are not likely to further enhance understanding of determinants of child survival. The authors recommended that in-depth studies of subsamples on specific topics using short questionnaires might produce more useful information than generalized DHS surveys. (Boerma) This recommendation should be helpful in terms of questionnaire design.

In preparation for this summer's research, I plan in the next several months to become proficient in the use of the Epiinfo program for data analysis

Reading List:

Infections and Inequalities Paul Farmer

Death Without Weeping

C. Research Methods

My study is to be part of a larger study that began in January 2000 and will continue through January 2001. The overall study encompasses two distinct stages: Stage 1 is the initial qualitative component aimed at identifying possible risk factors for further study and stage 2 aims to quantify the association between risk factors and exposures and the incidence of infant mortality. In stage 1 of the project, 28 families were identified through their hospital charts as having lost an infant in the last three years and a qualitative survey was administered for preliminary data on risk factors. Stage 1 is currently being completed by a medical student and medical resident who will use the information obtained to create an instrument (before June) for the second, quantitative, stage of the study. The second stage of the research, in which I will be involved, will be a case-control retrospective study. I will work with another medical student to administer the instrument, surveying study participants in their homes to identify risk factors for



infant mortality. I have included below my own version of a questionnaire, similar to the instrument that is currently being created. I hope to work with the medical student and resident in Costa Rica to combine the ideas that I have established with the questionnaire included here with their instrument to reach a finalized form.

The second stage of the study should include at least 50 families that have lost an infant (below the age of 1 year) in the last three years and 100-150 control families who have not. The control families will be chosen from families in which the mothers delivered in the same hospitals as the study subjects, but will otherwise be randomized to include families from a variety of socio-economic, racial, and occupational backgrounds. The canton of San Pablo is broken down into 5 sectors each containing between 4700 and 6000 people. The second stage of the study will be conducted using a representative sample of the population determined in one of two possible manners. The first is to make use of the Ficha Familiar, an instrument that contains statistics derived from home visits to families in San Pablo in 1999-2000, which to date has covered 75% of families. The second manner for determining a representative sample involves using the Geographic Information System to establish a zone of study with the highest risk potential. The decision concerning which data to use in determining a representative sample will be made at the conclusion of stage one of the research. [Note: Song et al.'s research that looked at high infant mortality rates in Des Moines also used the Geographic Information System (GIS) in order to identify specific areas of high infant mortality within the city. The researchers found the GIS useful in that they were able to traverse two- and three-dimensional data representations and zoom in on complex socio-economic and time-space patterns. (Song)]

Once the data has been collected, it will be entered in the questionnaire form into a spreadsheet and then analyzed using Epiinfo. All efforts will be made to keep the data entry up to date with the rate of data collection.

A case-control study is ideal for this situation because of its efficiency in terms of time and resources. A case-control study rather than a cohort study will be used because of the ability to select subjects on the basis of whether they have the outcome of interest, in this case families who have lost an infant in the last three years, rather than on the basis of having a certain exposure. This allows us to look at an outcome that has a rather low incidence (22/1000), and to study the effects of multiple exposures on infant mortality (such as lack of breast feeding, occupational exposures, maternal drug/alcohol/tobacco use, maternal age at



childbirth, maternal education and SES, number of siblings, congenital defects, low birth weight and poor prenatal care). This method of study, however, is inefficient for rare exposures, so that exposure to chemicals used in banana production will not show statistically significant association with infant mortality if only one mother in the study who lost an infant worked on a banana plantation, even if the cause of multiple infant deaths across the country were truly associated with or caused by maternal exposure to these chemicals. Another limitation of case-control studies is that they are prone to selection bias and recall bias. All efforts will be made to prevent against selection bias, but recall bias may be unavoidable if parents who experienced the loss of an infant have formed opinions of causation that might skew their memory of exposures. In addition, one criticism of any research involving oral interviews is that one must insure proper training of interviewers so that interview style does not influence results. The final main limitation of the proposed study is that the initial study population will have to be small due to time constraints. If it becomes necessary, a third stage of the study will be constructed to look at infant mortality in San Pablo in a population based manner, but that third stage might have to occur at a later date.

Intervention is to be determined at a later point, based on the data gathered. Depending on the predominating risk factors for infant mortality, intervention may include community education concerning sanitation, breast-feeding, the importance of prenatal care and family planning. As research results indicate, local authorities may be contacted to discuss the prevention of the use of pesticides and toxic substances in the workplace. Information obtained concerning risk factors may be reported to the Ministerio de Salud and to the local EBAIS.

I am in close contact via e-mail with Dr. Tristan and am receiving regular updates indicating that stage 1 of the research is being completed as planned. In the case that circumstances change on my arrival, however, I would first consider altering the protocol so that I might still be able to conduct research on infant mortality in San Pablo in a different manner. As a second contingency plan, I would look into becoming involved in the Costa Rican AIDS research project described to me by Dr. Tristan which is also being conducted through the International Health Central American Institute.



D. Personal Statement

One path in medicine that I am considering is a career in infectious disease and international medicine. I may also pursue a degree in public health at some later point. This project interests me because of its focus on epidemiology and community intervention. I chose to pursue the opportunity to be involved in research in Costa Rica primarily due to the opportunity to perfect my Spanish. I am currently at an ability level at which I can conduct a medical history in Spanish, but in order for me to feel confident that my Spanish is adequate to serve Spanish speaking patients in this country in a comfortable and culturally competent manner, I need to spend additional time immersed in a Spanish speaking environment. Costa Rica is politically stable (it does not even have a standing army) and personal safety should be only a minor concern.

E. Ethical Statement

Participants may suffer from being reminded of the loss of a loved one. In order to balance the possible negative effects of reopening mental wounds, it is important that study participants see personal value to being part of the study. Results of the research will be communicated to the subjects and members of the community through the physicians, nurses and primary care assistant technicians at the recently opened local clinic. In this manner it is hoped that the community can be educated so that infant mortality can be lessened and study participants may benefit personally by being able to better care for growing families or by decreasing the incidence of infant mortality for others in the community.

E. Budget

Adrienne Ruth expenses	\$ 2605
Equipment	\$ 1950
Materials	\$ 550
Professional Hours (Temporary Consultant for sample design)	\$ 1005
Sub Total	\$ 6110
IHCAI Administrative support	\$ 611
Total	\$ 6721

QUESTIONNAIRE

Maternal and Family History

Age of the mother: (<20, 20-25, 25-30, 30-40, >40)

Age of the mother at time of the death of the infant: (<20, 20-25, 25-30, 30-40, >40)

Civil state of the mother at time of infant birth: (married, single, divorced, widowed)

Occupation(s) of the mother during pregnancy: (agriculture, industry, commercial, computers, other:)

Combined annual household income: (<\$2000, \$2000 - \$9999, \$10,000 - \$19999, \$20,000 - \$30,000, >30,000)

Exposure to chemicals: (agrochemicals, ionizing radiation, chemical products in industry, other:)

Medication(s) taken during pregnancy:

Illnesses experienced during or before the pregnancy:

Drugs: (>2 doses/day, 1-2 doses/day, several doses/week, several doses/month, none)

Alcohol?

Tobacco?

Marijuana?

Cocaine?

Crack?

Heroin?

Anxiolytics (benzodiazepines or similar)?

Accident or trauma during the pregnancy?

Complication during the pregnancy?

Did the mother have prenatal care? (from beginning of first trimester, of 2nd trimester, of 3rd trimester, irregularly, none)

How many other pregnancies did the mother have? (7-8 or more, 5-6, 3-4, 1-2, 0)

Abortions or still births? (4 or more, 3, 2, 1, 0)

Siblings of the infant that died in childhood? (4 or more, 3, 2, 1, 0)

Have any of the other children been born with birth defects? (4 or more, 3, 2, 1, 0)



Infant History

Gestational age at the moment of birth:

Birth weight in kilograms:

Number of additional infants born of same pregnancy: (4 or more, 3, 2, 1, 0)

Was the infant breast fed?: (exclusively, partially, never)

Age at time of death: (0-30 days, 1-2 months, 2-5 months, 5-8 months, 8-12 months)

Primary cause of death: (birth defect, respiratory, GI infection, perinatal problem, other:_____.)

Other medical conditions associated with the death: (respiratory infection, diarrheal disease, vaccination-preventable infection, malnutrition, other:_____.)

Other congenital malformations:

Health care and vaccinations: (adequate, semi adequate, inadequate)

Paternal History

Age of the father at the moment of conception of the infant: (<20, 20-25, 25-30, 30-40, >40)

Occupation(s) of the father from one year before to the time of conception: (agriculture, industry, commercial, computers, other:_____.)

Exposures: (agricultural chemicals, chemicals for industry, ionizing radiation, other: .)

Living Conditions History

Did the primary home in which the infant lived have clean running water? (well water, piped water, bottled water, boiled and purified water, water known to be unsafe)

Did the home have sanitation services for garbage? (city dump, public garbage collection, none)

For human waste? (piped toilet, outhouse, none)

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