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Center For Health Services Research (CHSR)

INFANT MORTALITY REVIEW AND SURVEILLANCE (IMRS) PROJECT

Summary Report

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EXECUTIVE SUMMARY

The Infant Mortality Review and Surveillance (IMRS) project sought to gather detailed information on infant deaths in Armenia on a systematic basis and to develop recommendations directed at improving the health and social systems at various levels in order to reduce poor birth outcomes.

The project was a combination of both Fetal and Infant Mortality Review programs and a case-based epidemiological investigation system. All the cases of infant deaths in Armenia that occurred between January and September 1999 were involved in the study. Information was gathered through several different means: death certificates and/or hospital records for all identified cases (N=381); active surveillance of community representatives for unidentified cases; data abstractions from all available medical records (N=269); home interviews with mothers that lost an infant (N=115); and reviews of selected cases by an Expert Review Team (N=30). The data summarized in this report includes information gathered mainly from 381 death certificates and/or hospital records and from 115 home interviews. A summary of recommendations of the Review Team is also provided.

The study suggests several possible risk factors for infant mortality in Armenia, including low birth weight (possibly a 6-fold increase of the risk); short gestational age (possibly a 7-fold increase of the risk); poor maternal weight gain during pregnancy (below normal in 70%); mothers' perception of their poor health (mentioned by 63%); poor nutrition during pregnancy (mentioned by 53%); lack of medical supervision during pregnancy (38% of cases vs. 2-13% of reference population); low availability of prenatal care (mentioned by 45%); frequent stressful life events during pregnancy; late initiation of prenatal care (in 2nd trimester for the majority of mothers); poor economic situation of family; low educational level of mother (family); and non-compliance of family with medical advice (52% of cases).

Some important characteristics of infant mortality in Armenia that were identified through this study were the large proportion of early neonatal deaths (60%) and the preponderance (more than one third) of infant deaths occurring during the first 48 hours of life. Study findings suggest only a small proportion (<2%) of deaths might go completely unregistered. Findings also show very low number of autopsies (18%), which limits identification of risk factors.

Several recommendations are suggested to improve measurement of infant mortality and to prevent further unnecessary infant deaths in Armenia. They include:

- ❑ Implementation of an ongoing infant mortality review and surveillance program throughout the country;
- ❑ Health education of women on family planning and on self-care during pregnancy;
- ❑ Training of health care providers in terms of dealing with high-risk pregnancies and deliveries;
- ❑ Improving the quality of neonatal intensive care and care of low-birth weight neonates;
- ❑ Provision of nutritional and financial support to socially vulnerable pregnant women and their families;
- ❑ Improvement of linkages between social and medical services provided to pregnant women.

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1. BACKGROUND

1.1 Statement of infant mortality problem

The recent decline of the infant mortality rate in Armenia is a promising statistic. Past programs implemented that have been geared towards reducing infant deaths have particularly targeted Acute Respiratory Illnesses (ARI) and Diarrheal Diseases (DD) which are preventable illnesses. As a result, there is a report of significant declines of these illnesses that contribute particularly to postneonatal deaths (infant deaths between 28 days and one year of life). However, the inconsistency in reporting, measurement, and classification of infant deaths in Armenia leads to suspicions about the true severity of the infant mortality problem and the validity of a decline. The effects of poor socioeconomic conditions may not impact on infant mortality (particularly postneonatal mortality) until years after social/economic systems start to deteriorate. Therefore, it may be possible that an increase in mortality rates may occur in coming years as the Republic of Armenia makes further economic transitions and becomes more self-reliant and less dependent on humanitarian aid. A review/surveillance system that examines infant deaths as they occur can assist in assessing factors that are related to poor birth outcomes and provide direct recommendations that can be implemented by the Ministry of Health.

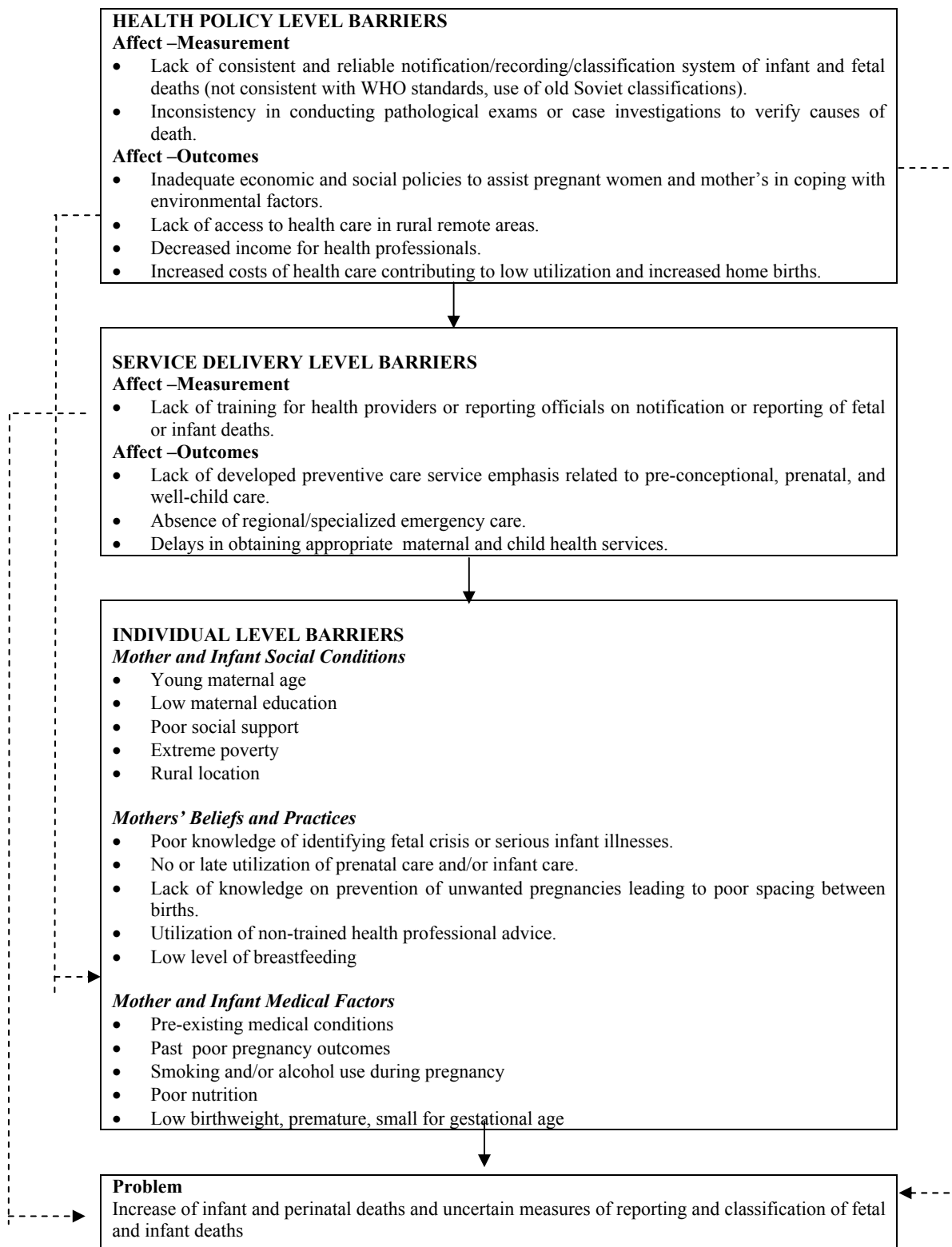
1.2 Purpose of project

The purpose of the Infant Mortality Review and Surveillance Project (IMRS) is to gather detailed information on infant deaths in order to develop recommendations aimed at improving the health system at various levels: health education, services and policy, in order to reduce poor birth outcomes.

1.3 Conceptual Framework

The traditional infant mortality review process is an analysis of: 1) individual, 2) health service delivery, and 3) health policy level barriers that exist. This analysis assists in developing recommendations to prevent further infant deaths. Risk factors that directly and indirectly contribute to infant mortality exist at all three of these levels. Several factors that are known to exist at these various levels are outlined in the following diagram (see Figure 1). This diagram also describes proposed relationships that exist among these variables.

Figure 1. Various Levels Impacting on Perinatal and Infant Mortality Directly and Indirectly



Sources: UNICEF Annual Report 1997, UNDP of Armenia

1.4 Infant mortality as a medical phenomenon

There are many known medical risk factors that contribute to certain infant deaths. These risk factors have been researched in great detail, mostly in developed countries. In developed and developing countries, infant mortality is attributed to different causes. In the developed world, infant mortality is fairly stable and many of the causes attached to these deaths are not necessarily preventable (e.g., congenital anomalies). Also, the development of high technology, in particular Neonatal Intensive Care Units (NICU) in the western world has changed the definition of a viable fetus. With the development of the NICU and surfactants over the last two decades, extremely premature and low birthweight infants are able to survive infancy and often well throughout childhood. However, in the developing world the impact of infectious diseases and lack of emergency services available to high risk women and infants decrease the chances of infant survival.

The traditional medical risk factors associated with poor birth outcomes have been the following:

maternal anemia	mode of delivery
suspected viral infections	late prenatal care
Rh sensitization	inadequate weight gain
multiple pregnancy	pre-existing conditions
mid or 3 rd trimester bleeding	ruptured membranes
toxemia	maternal age >35 or <17
past pregnancy complication	smoking
inadequate birth spacing	low birthweight
prematurity	small for gestational age
home delivery	lack of immunization
sleeping position	infant infections/illnesses

These problems put a woman at higher risk of having an infant or fetal death. However, these are not the only conditions that contribute to poor infant outcomes. These factors alone and together with each other and other social and health related issues put an infant at greater risk of death. Throughout the world these factors may exist in different arrays contributing to the picture of perinatal and infant mortality in a particular country. In Armenia, it is hypothesized that the home births, premature births, low birthweight and infant infections are medical risk factors that contribute to infant deaths [1]. In addition, it is important to examine social problems related to poor health delivery, education and practices that may contribute to infant deaths.

1.5 Infant mortality as a social phenomenon

Countries in transition, such as Armenia (and other former Soviet republics), may waiver between the experiences of developed and developing countries. Originally these countries had a developed health system and infrastructure in place that has deteriorated over the years, due to economic instability, as these countries struggle to re-develop as independent republics.

As a result, the public health situation of countries in transition becomes unstable and difficult to measure. In addition, policies and programs that are effective in developed and developing countries may be less applicable in these ever changing societies. The Republic of Armenia has suffered through many problems in the past decades with respect to the 1988 earthquake, the economic blockade due to the Nagorno-Karabagh conflict, and the massive emigration of its population. The economic hardships that are occurring in all of the former Soviet republics are compounded in Armenia with these additional problems. This situation makes it more difficult to develop strategies and programs that are expected to impact health outcomes that are based on unstable changes in the demography of the population.

As a result social/economic factors also play a significant role in the infant mortality problem. Health education is an example of a component of the paradigm that can impact infant mortality. Health education programs regarding pre-conceptional care, prenatal care and well-child care practices are necessary to combat complications and diseases that adversely affect perinatal and infant health. Poor health education in combination with poor social/economic hardships can contribute to poor the health practices indicated below:

- Poor knowledge of identifying fetal crisis or serious infant illnesses
- No or late utilization of prenatal and/or infant care
- Lack of knowledge on prevention of unwanted pregnancies leading to poor spacing between births
- Utilization of non-trained health professional or poor compliance with health professional advice
- Low level of breastfeeding

These factors may occur due to poor health delivery, access to services, utilization of services, and/or poor quality of care that may be a direct result of the poor economic situation in Armenia.

2. PROJECT SIGNIFICANCE

2.1 Case reviews as a multilevel approach

The utilization of case reviews to investigate infant deaths provides health professionals a tool to assess successes and failures at various levels of the health system. Identifying poor health practice or utilization may demonstrate the need to implement changes at the health service level in order to prevent outcomes of a similar nature from occurring in the future. For example, at the individual level, women in Armenia may make the decision of having a home birth, however, the implications behind this decision may be driven by failure at a higher level. In this case a woman with pregnancy complications may perceive the cost of delivering at a maternity home to be too much and, as a result, choose to deliver at home with an untrained birth attendant who may not be qualified to handle a high risk delivery.

The use of a case review process would allow health professionals to assess higher level barriers and make recommendations based on them. As more and more cases are reviewed throughout the year, trends and similarities in cases may show that a particular problem is

significant and changes in the health delivery system need to be implemented. This approach is also timely in that it confronts issues as they arise. This approach is more necessary among countries in transition in that it confronts issues related to poor birth outcomes as they quickly develop or change in these societies.

2.2 Benefits of mortality review/surveillance program

There are many ways infant mortality can be investigated. Analysis of vital statistics at the end of the year provides a picture of the number of infant deaths and its possible causes. Vital statistics can even present data stratified by maternal age, marital status, as well as other demographic measures which are useful in getting a deeper understanding of what factors contribute to infant deaths. Conducting a research investigation is another approach that helps examine trends in mortality rates over time or by region, taking into consideration relevant risk factors and, perhaps, associations between these risk factors. These approaches are effective ways of examining infant mortality, but they are limited. Examination of vital statistics is limited in that not all variables that contribute to poor birth outcomes can be measured accurately (e.g., infant care, satisfaction with care received, social factors). Research studies are able to examine a broad scenario of variables that contribute to infant deaths; however, countries in transition such as Armenia, are constantly changing, and study findings may quickly become outdated and irrelevant. The review/surveillance method provides rich, detailed data that can be used by a multidisciplinary team of maternal and child experts to identify a more wide range of factors that exist as they develop and change. The surveillance component of this approach is an epidemiological investigation that compares cases (dead infants) to controls (live infants) in order to identify associations among risk factors and apply recommendations based on the information which can be used towards health reform and training of health providers.

2.3 A multidisciplinary approach

The IMRS project proposes the use of a multidisciplinary team of local maternal and child health experts who systematically review and identify issues imbedded within its own social and political context. The information that is revealed becomes a “social autopsy” which can be conducted to examine various factors that contributed to the infant death. This Review Team is multidisciplinary in that it includes social scientists and health providers who work together to identify social and environmental conditions that interact with physiological factors and behavioral practices that contribute to infant deaths.

2.4 Measurement of infant mortality

In the Republic of Armenia inconsistencies in the reporting of infant deaths is thought to be a more serious issue in villages than in urban areas [1]. Death certificates are required in Armenia in order to perform a burial; however, it is not clear that death certificates are obtained for all burials, especially those in remote areas of Armenia.

Another important issue in measuring infant mortality accurately has to do with the classification of infant deaths. It is suspected that fetal deaths are still not reported properly in Armenia. In 1995, the Republic of Armenia started to report fetal deaths and neonatal deaths

according to the World Health Organization (WHO) guidelines. The old Soviet guidelines dictate that infants born under a set birthweight who are born and die within seven days should be classified as a stillbirth even though the infant was born alive. When adjustments are made related to WHO guidelines, the neonatal mortality rate rises. Another issue of concern is the under-reporting of stillbirths since reporting practices in rural areas may be inconsistent.

The measurement of cause of death is also a major concern in Armenia. Pathological exams are not conducted for all infant deaths in Armenia to provide a final diagnosis of suspicious or unknown infant or fetal deaths. Further study of measurement issues and reporting of infant deaths is necessary to truly identify the number of infant deaths.

2.5 History of infant mortality review programs

The utilization of mortality reviews has been useful in the past in identifying trends in mortality [2]. Infant mortality reviews (IMR) are rapidly becoming a trend in the United States in systematically identifying preventable deaths of infants from birth through the first year of life. These reviews can prove to be useful in countries outside of the US, especially in countries where reporting and classification of deaths may not be consistent.

Infant deaths are classified in two categories. The first is post-neonatal death (i.e., 28 days to one year) which consists of deaths considered to be highly attributable to exogenous causes (e.g., poor maternal nutrition, stressors). The second is neonatal death (i.e., first 28 days of life) which is primarily attributed to endogenous effects (e.g., genetic predisposition, infection during pregnancy).

Infant mortality reviews in a more global perspective can be used to identify trends and develop policy recommendations regarding prevention of future infant deaths. The infant mortality review process requires local health professionals, community members and social service providers to gather together to discuss factors that may have contributed to select infant deaths. The technical components of these reviews include information obtained from vital statistics, medical record audits and maternal interviews. The information gathered from this process includes data on demographic, socioeconomic, behavioral, medical, educational, environmental factors, and service delivery.

The experience of one Infant Mortality Review Program in Louisiana has assisted in developing recommendations that address issues related to deficiencies in health service delivery, administrative systems, and health education and support [3]. This program demonstrates a growth in interagency collaborations and problem solving among the maternal and child health service agencies and departments that have additionally observed a decline in infant mortality in their area. Other similar review programs have been utilized and sponsored by the American College of Obstetricians and Gynecologists (ACOG) throughout the United States. Limited information is available on the success of these programs. One complication regarding this process is the lack of sustainability and inconsistency in gathering data. As a result, there is little evaluation on the process and outcomes that are generated from these programs. In addition, there are no other known countries outside of the United States and in particular in Eastern Europe that have utilized this approach at

investigation infant deaths. Therefore, Armenia will serve as an example of the effectiveness of this approach in lowering infant mortality among countries in transition.

2.6 Public health significance of review/surveillance program

The importance of Infant Mortality Review Programs in improving public health is related to their ability to recommend timely health policy, delivery, and education that can impact on infant mortality directly and indirectly. The use of systematic investigations of cases of infant deaths assists health and social service professionals in targeting and improving health and human services to high risk groups with the goal of improving infant health outcomes. The improvement of infant health within a country results in great benefits to that society. The knowledge obtained from individual cases can hopefully be utilized to lower the risk of death among other infants in similar situations.

3. METHODOLOGY

3.1 Development of review team

The development of the Infant Mortality Review and Surveillance (IMRS) Review Team occurred with the guidance and support of the Republic of Armenia's Ministry of Health (see Appendix A for list of team members and credentials). Health and social service providers were identified according to their experience with maternal and infant health. In addition, a pediatrician working with infant vital statistics within the Department of Maternal and Child Protection was recruited to identify deaths and gather data on cases that are both registered and unregistered. One major difficulty with this component of the project was in gathering experts to review cases on a regular basis. Due to the experience and expertise of the group, limited time was made available to participate in this process as a team. The advantage of having top experts serve on the Review Team was that they are able to directly make recommendations and changes within their areas of expertise. The advantage of having representatives of these top experts was that their time was less limited; however, they may have less ability to make a direct impact and changes within their areas of expertise.

3.2 Overview of project methodology

The Infant Mortality Review and Surveillance Project (IMRS) that was conducted was a combination of both Fetal and Infant Mortality Review programs and a case-based epidemiological investigation system. Cases of infant deaths that occurred between January and September 1999 were identified through the vital statistical records gathered by the Ministry of Health (death certificates and hospital records). Three hundred and eighty one cases (registered and unregistered) were identified for this period.

There are three components of this project that resulted in findings that will be discussed in this report:

Total Sample of Deaths: The first is data on all infant deaths (total sample N=381) which includes basic information that is reported on death certificates and from hospital records (e.g., birthweight, gestational age, total number of deliveries).

Sample of Infant Death Medical Records and Home Interviews: The second component is the collection of data on infant deaths and live births for a case-control study. Only data related to infant cases will be discussed in this report as a sufficient sample size was not obtained to provide the case-control analysis. As a result, data is available from medical records for 269 cases; home interviews are available for 115 of those cases. Medical records included prenatal care consultation clinic records, maternity home charts, polyclinic infant records, and hospital medical histories. Trained community representatives conducted home interviews to gather further information on identified cases of infant deaths. A Case Review Group (CRG) consisted of local health professionals (an epidemiologist and pathologist) working as research analysts at the Center for Health Services Research, American University of Armenia, who reviewed cases and provided a summary of each case for the Review Team.

Sample of Select Cases Reviewed: The third component of this study is the review of select cases (n=30) by the Review Team consisting of top experts in maternal and infant health in Armenia to develop recommendations for improving birth outcomes. The review team has met six times (to date) to review case summaries of infant deaths and assess which deaths may have been preventable and factors that may have contributed to the death. The thirty cases selected represent equal numbers from each region drawn from the fifty cases with completed case summaries. The limited availability of the review team members did not permit review of all the cases.

Another component of this program that is not normally included in IMRs is the use of a *case-based system for investigation and evaluation* [4]. This approach provides a surveillance mechanism that continues as an ongoing activity to monitor poor birth outcomes and what contributes to them. To date, eight cases were identified by local community representatives in a three month period that were not originally identified by the Ministry of Health.

3.3 *Overview of research design*

Infant deaths that were identified from these three different sources (death certificates, hospital reports of unregistered deaths, and active surveillance of community representatives of additional unregistered deaths) contributed to three sets of data that are compared for this study. This information was used to develop a better understanding of infant deaths that occurred in Armenia during the study period.

3.4 *Research setting*

The setting covered by this research investigation is the entire Republic of Armenia. The country consists of 11 regions including the capitol city, Yerevan (see map that follows). The outer most northern and southern areas in Armenia are remote, mostly rural, and have less access to services. The regions of Tavoush, Shirak, Siunik and Gegharkuniik are considered regions with high infant mortality rates. The Ararat, Armavir and Kotayk regions are considered to be regions with lower infant mortality rates.



3.5 Research sample and sample size

Total sample: The sample for this study consisted of all reported infant deaths in Armenia occurring from January through September, 1999. There were 381 identified infant deaths in Armenia during the study period. At the time of the study, 340 (89%) of these cases were officially registered. Some reasons given for the poor registration of deaths were parent's decision not to complete paperwork, and delays in putting through paperwork. In some cases, births are not registered on time, and, as a result of the death, parents believe it is useless to register the birth. Data gathered from this source include birthweight, gestational age, duration of life of infant, maternal age, marital status, location of death, and cause(s) of death.

Sample of data abstracted from medical records: Of the 381 identified infant deaths 269 (71%) of their medical records were obtained for review and analysis. These medical records were obtained from women's consultation clinics, maternity homes, and pediatric polyclinics for all regions of Armenia. This data provides further information on the use of medical services and mother and infant medical history. It proved to be most useful to Review Team members who wanted information based on medical records to assess what may have contributed to the infant death.

Sample of data from home interviews: In addition, 115 home interviews were conducted with mothers of infants who died during the study period in order to gather further information on individual level factors (e.g., socio-economical, behavioral) that are related to the infant death.

Sample of cases reviewed by Review Team: Case summaries were developed for all cases which have both home interviews and medical records information collected (n=50). Cases were selected (n=30) for review by the Review Team from all regions of Armenia to develop further recommendations on the prevention of infant deaths and identify regional gaps in health delivery.

3.6 Research instruments

Survey instrument: The survey instrument that was used for home interviews with mothers was a modified version of the American College of Gynecologist's (ACOG) National FIMR Data Abstraction Forms (Appendix B). The instrument includes items related to prenatal care (utilization, quality and satisfaction), nutrition and health habits, intendedness of pregnancy, maternal demographics, environmental conditions and baby home health and medical care and further information on suspected issues related to cause of death or factors contributing to infant death. The survey instrument was translated into Armenian and given to Review Team members who modified survey questions, then the survey was back translated to English.

Medical abstraction forms: The medical abstraction forms (see Appendix C) included prenatal, delivery, newborn, and ambulatory infant care assessments obtained from medical and hospital records. These forms were translated into both Armenian and Russian and modified by team members and back translated to English. The purpose of these forms was to gather more detailed information for the Review Team to use in their assessments of infant deaths. Information gathered from medical records was used to supplement data that was not obtained for home interviews.

Review recommendation form: A separate form was used by Review Team members to systematically record recommendations and findings from the review team meeting (see Appendix D). This form was completed by a designated person from the Case Review Group and used to further develop recommendations on improving infant birth outcomes and health. The review team discussed each case for about half an hour, then answered questions related to strengths, and weaknesses and gaps in health and human services that may have impacted on the family who experienced an infant death.

3.7 Data collection

Interviewer training and experience: Home Interviewers were trained community representatives of the Armenian Relief Society. They were selected by the American University of Armenia's (AUA), Center for Health Services Research and trained to conduct the home interviews with the mothers in a sensitive and professional manner. These interviewers reside in throughout the regions of Armenia and were responsible for

interviewing and identifying cases in their areas. These interviewers were able to access remote areas and understand local dialects because they were familiar with these regional differences. Each interviewer had to either complete a 1-2 day training session on how to conduct the home interviews (See Appendix E, Training Manual in Armenian) or receive a one-to-one training session in order to be eligible to conduct home interviews. Women who completed this process were then allowed to conduct at least one interview with a trainer in order to assess appropriateness and competence in completing interviews on their own. These pre-tests were conducted within their own regions to get them familiar with the process of collecting data on such a sensitive topic. Overall, this method proved to be effective in that most of the interviewers were able to get mothers to provide valuable insight into their experiences. Most interviewers commented that they were well received and that mothers praised them for caring enough about them to ask about what had happened to their infant. In addition, as the interviewers are members of the Armenian Relief Society they were also in a position to refer women to necessary social services provided by this agency regionally.

Data abstractors: Data abstractors who completed the medical abstraction forms were health professionals (obstetrician/gynecologists and pediatrician) recommended by Ministry of Health officials to abstract data from medical records based on their areas of expertise.

3.8 Data analysis

The data that is summarized in this report includes information gathered from 381 death certificates and/or hospital records of cases of infant deaths identified in Armenia. In addition to this, 115 in-depth home interviews were conducted with the mothers of infants who died to get further information on sociological and behavioral factors that may have contributed to the infant deaths. Descriptive statistics are provided in this report from these sources. One final approach to examining infant deaths that was utilized in this study required a review of select infant deaths by top maternal and infant health experts in Armenia. A summary of their recommendations are also provided in this report.

4. RESULTS

4.1 Response rate

The overall response rate for home interviews that were conducted with mothers was thirty percent (30%). However, the true response rate is considered to be much higher since, on average, each regional representative reported at least twenty to thirty percent of addresses being incorrect thus, being ineligible. In addition, there were some regions that had a higher percentage of women who had moved out of the country since the death of their infant (e.g., Kotayk region with families mostly reported to be in Russia). In Yerevan, there was a higher percentage of wrong addresses, families who moved from their reported residence with no forwarding information, and refusal to participate.

4.2 Registration of infant deaths

As reporting of infant deaths is an area of concern in Armenia, cases of deaths that were not registered were also requested from the Ministry of Health to be included for analysis.

Eighty-nine percent of the total sample of deaths were registered during the study period. No further analysis is conducted for registration of infant deaths as this information is not available at this time. Further information will be provided upon availability.

4.3 Gender differences

Females on average were significantly more likely to have lived longer than males in the total sample of infant deaths (40 and 58 days respectively $p=.001$). This finding is consistent with past research on the higher survival rate of females in infancy. However, there were no statistically significant differences among females and males in relation to birthweight or prematurity.

4.4 Demographics of all samples

All three samples were fairly similar with respect to demographics. For example, about 70% of infant deaths in the total sample and sample with completed home interviews consisted of neonatal deaths (Table 6). Maternal age was similarly equally divided among women less than or equal to 24 years old and women 25 year or older. Cities were also more represented in the total sample and the sample with home interviews (58% and 65% respectively). The only major difference in demographics among samples was marital status. In the total sample, only 44% of women reported being married in comparison with 74% with medical records abstracted and 94% with home interviews. Information from discussions with the Review Team and the qualitative part of this study reveal that women are less likely to report being married on death certificates and hospital records in order to be able to receive financial support (PAROS eligibility) since they would be eligible as a single mother. During home interviews it seemed apparent that women felt more comfortable reporting being married to home interviewers. Another observation made during data collection from medical records abstraction showed that many women reported to health providers that they were married unofficially. Some reasons that were given related to 1) financial support available to single mothers, or 2) truly single mothers feeling embarrassed to report not being married because it is socially unacceptable in this society.

Table 1: Comparison of Sample Demographics (January - September 1999)

	Total Sample n = 381	Medical Abstraction n = 269	Home Interviews n = 115
<i>Maternal age</i>			
≤24 years	155 (40%)	115 (43%)	46 (42%)
≥25 years	153 (40%)	91 (34%)	51 (46%)
<i>Type of residence</i>			
City	222 (58%)	Not available	72 (65%)
Village	155 (41%)		38 (35%)
<i>Gender of infant</i>			
Male	231 (61%)	Not available	67 (61%)
Female	150 (39%)		35 (32%)
<i>Marital Status</i>			
Married	166 (44%)	194 (74%)	103 (94%)

<i>Unmarried</i>	103 (27%)	42 (16%)	5 (5%)
<i>Location of death</i>			
<i>Hospital</i>	314 (82%)	Not available	87 (79%)
<i>Home</i>	65 (17%)		19 (17%)
<i>Type of infant death</i>			
<i>Neonatal</i>	263 (69%)	Not available	73 (68%)
<i>Postneonatal</i>	118 (31%)		34 (32%)
<i>Average number of pregnancies</i>	2	3	3

4.5 Home interviews

A total of 115 home interviews were conducted with women who suffered from an infant loss during the study period. The home interview that was conducted by community representatives from each region consisted of nine sections and averaged between 45 to 90 minutes to complete. A review of data gathered will be summarized for each section below.

4.5.1 Information concerning infant death

The first section of the home interview contained both qualitative and quantitative questions related to the death of the infant. The interviewers were trained to ask the mother to provide information concerning what happened with the infant (in general) in order to allow time to develop rapport with the mother.

Infants from this sample had survived on average 45 days (Table 2). The majority of mothers surveyed reported that their infants died at the hospital or maternity home (81%). Seventeen percent of mothers (n=19) reported that their infant died at home. As mentioned earlier, 70% of this sample consisted of neonatal deaths. The average gestational age and birthweight for this sample (as recorded on the medical records) was 36 weeks and about 2400 grams (slightly pre-term and low birthweight). [See chart 1 and table 12]. Nine percent of this sample was born with very low birthweight (<1500 grams), forty-three percent were low birthweight (1500-2500 grams), and the remaining forty-seven percent were of normal birthweight (>2500 grams). A total of ten percent of this sample were of multiple births. In addition, mothers were asked if there was an autopsy done on their infant to determine cause of death. A total of only 18% reported having an autopsy done.

Table 2: Information Related to Infant Death (Home Interviews)

n=115		(%)
Average age of infant when died (in days) (range)	45 days (0-363)	---
Location where infant died		

Hospital/Maternity Home	92	81%
Home	19	17%
Other	3	2%
Type of infant death		
Neonatal (≤ 28 days)	78	70%
Postneonatal (> 28 days to 1 year)	34	30%
Average gestational age (range)	36 weeks (28-46)	
Average birthweight (range)	2398 grams (1200-4300)	---
Multiple birth (twins, etc.)		
Yes	11	10%
No	100	90%

4.5.2 Information on Prenatal Care

There are several components of prenatal care that were addressed in the home interview. These components included awareness of pregnancy, initiation of prenatal care, satisfaction with prenatal care, essential advice given by prenatal provider, and access to prenatal care services.

On average, mothers in this sample report being aware of their pregnancy at about 6 ½ weeks into their pregnancy (Table 8). On average, they initiated prenatal care visits at about 13 weeks into their pregnancy (second trimester). The majority of women reported receiving prenatal care from a health professional (72%). Fifty-five percent of these women said that they received prenatal care as early as they wanted.

Traditional components of prenatal care related to prenatal care provider advice were also measured. These components were topics that should be discussed during prenatal care visits, which are the following:

- 1 Breastfeeding infant
- 2 Signs and symptoms or premature labor
- 3 Effects of drugs and medications on pregnancy
- 4 Taking iron and vitamins during pregnancy
- 5 How long to wait before having another baby
- 6 Diseases and birth defects that run in families
- 7 Finding a health provider for infant when born
- 8 When to take infant for check-ups

The majority (56%) of women interviewed stated that their prenatal care provider discussed less than two of the above topics with them during prenatal care visits. In addition, women were asked if they were satisfied with components of the prenatal care they received. The majority (73%) reported being satisfied with three or more aspects of their prenatal care. These aspects include the following:

- 1 Amount of time had to wait to be seen after arriving for prenatal care
- 2 Amount of time spent with prenatal care provider at visit
- 3 Advice received on how to care for self
- 4 Hours consultation clinic was open for service
- 5 Treatment shown by clinic staff

Table 3: Components of Prenatal Care (Home Interviews)

Average number of weeks pregnant when mother found out she was pregnant (range)	6 ½ weeks (1-30 weeks)
Average number of weeks pregnant when first sought prenatal care	13 weeks (1-32 weeks)
Receive PNC from health professional	
Yes	82 (72%)
No	32 (28%)
Receive PNC as early as wanted	
Yes	62 (55%)
No	50 (45%)
Components of care received	
≤2 components	64 (56%)
3-5 components	22 (19%)
6-8 components	29 (25%)
Satisfaction with PNC	
≤2 components	31 (27%)
≥3 components	84 (73%)
Transportation for PNC	
Car	18 (19%)
Public transport	25 (27%)
Walked	46 (49%)
Average number of minutes to get to PNC	
Residing in city/town	29 minutes
Residing in village	64 minutes

Women were also asked how they accessed prenatal care during their last pregnancy. Forty-nine percent said that they walked to the prenatal care site and twenty-seven percent reported taking public transportation. Furthermore, women were asked how long it took them to get to their prenatal care site. On average, women who lived in villages took a significantly longer amount of time to get to their prenatal care site than those who lived in cities or towns ($p < .05$).

4.5.3 Intendedness of Pregnancy

Women were asked if they intended to get pregnant when they did and the measures they took to prevent pregnancy. Over ninety percent of women reported not using contraceptives before becoming pregnant (Table 9); however, only sixty-two percent reported wanting to be pregnant at that time. In addition, twenty-seven percent reported considering terminating that pregnancy. The majority of women (over 70%) reported not preparing for this pregnancy. One interesting finding is the percentage of women who are pregnant again; almost twenty percent of women report that they are currently pregnant. As part of the open-ended questions asked, many of these women explained that having another baby made them feel that they are making up for the loss of their infant. In many cases women were several months pregnant at the time of interview which meant that some of them were pregnant within six months of having and losing their infant.

Table 4: Intendedness of Pregnancy (Home Interviews)

	# (%)
Use contraceptives before becoming pregnant	
Yes	10 (9%)
No	102(91%)
Wanted to be pregnant at that time	55 (48%)
Wanted to be pregnant sooner	14 (14%)
Wanted to be pregnant later	22 (19%)
Didn't want to be pregnant then or in the future	16 (14%)
Don't know	2 (2%)
Ever considered not continuing pregnancy	
Yes	31 (27%)
No	84 (73%)
Prepare for pregnancy	
Yes	31 (27%)
No	84 (73%)
Average total number of children wanted	2.5
Pregnant again	
Yes	21 (19%)
No	83 (75%)

4.5.4 Nutrition

Nutrition plays a key factor in healthy pregnancies. With the poor economical situation in Armenia it is crucial to get an understanding of the nutritional status of women who suffered an infant loss. Women who were asked how much weight they had gained during their last

pregnancy, reported on average, gaining over seven kilograms. [See also table 13 and chart 2]. The majority of women (53%) also reported that there was a time when they couldn't afford to buy food.

Table 5: Nutrition (Home Interviews)

Average weight gain during pregnancy (range)	7.29 kg (-7kg to 30kg)
Was there a time during pregnancy when you cut back on amount of food you bought?	
Yes	29 (25%)
No	77 (68%)
Time when couldn't afford to buy food?	
Yes	61 (53%)
No	54 (47%)

4.5.5 Medication, Smoking and Alcohol Exposure

Women were also asked whether they took medications during their last pregnancy. Over thirty percent reported taking professionally prescribed medications during their pregnancy. In addition, women were asked if they smoked or drank during the last three months of pregnancy. Fourteen percent of women reported drinking some alcohol during the last three months of pregnancy. Smoking during pregnancy does not appear to be a issue according to study findings among Armenian women; however, over eighty percent of women reported exposure to cigarette smoke during pregnancy.

Table 6: Use of medication & smoking and alcohol exposure (Home Interview)

Took medications during pregnancy	
Yes	38 (34%)
No	77 (66%)
Smoked cigarette during last three months of pregnancy	
Yes	1 (1%)
No	85 (99%)
Exposed to cigarette smoke during pregnancy	
Yes	91 (82%)
No	20 (18%)
Drank alcohol during last three months of pregnancy	
Yes	16 (14%)
No	92 (84%)

4.5.6 Delivery Experience

The majority of women (93%) reported delivering their infant at a maternity home. This shows that among infant deaths there is a low level of home deliveries. Women were also asked what the length of stay was at the maternity home for themselves and their infants. They reported that on average they stayed in the maternity home five days and their infants stayed on average four days. However, it is important to note that over 50% of infants died within the first five days of life.

Table 7: Delivery Experience (Home Interview)

Where did you deliver baby	
Maternity home	107 (93%)
Home	8 (7%)
Average number of days at maternity home	
Mother (range)	
Infant (range)	5 (1 to 90 days) 4 (0 to 90 days)

4.5.7 Parent’s Demographic Information

On average the mother’s and father’s ages in this sample were 26 and 30 years respectively. [See also table 14 and chart 3]. Over ninety-five percent of the sample reported being married at the time they had their infant. A greater proportion of women have a higher level of education in comparison with their husbands’ (43% versus 32%). This shows that there still continues to be a high level of education provided to women in Armenia. Almost seventy percent (68%) of fathers were employed and over thirty percent (32%) of mothers were employed during the last pregnancy.

Table 8: Parent’s demographics (Home Interviews)

Average age of mother (range)	26 (17-42 years old)
Average age of father (range)	30 (20-52 years old)
Marital Status	
Unmarried	5 (4%)
Married	108 (96%)
Educational level mother	
Completed secondary school or less	66 (57%)
≥Incomplete higher education or more	49 (43%)
Educational level father	
Completed secondary school or less	75 (66%)
≥Incomplete higher education or more	38 (32%)
% Mother employed	32%
% Father employed	68%

Relationship with father of infant	
Good/Excellent	63 (81%)
Poor/Satisfactory	15 (19%)
Satisfaction with father of infant’s financial contribution	
Very or somewhat satisfied	67 (61%)
Not satisfied	39 (36%)

4.5.8 Overall Health and Living Situation

The main advantage of conducting home interviews was the ability to get more detailed information on the social situation of women who suffered a recent infant loss. The majority of women rated their overall health during their last pregnancy as “poor” or “fair” (Table 13). Over fifty percent reported being dissatisfied with their overall living situation.

Table 9: Social Conditions of Women Suffering an Infant Loss (Home Interview)

<i>Overall health</i>	
How would you describe your overall health During your last pregnancy?	
Good/Excellent	42 (37%)
Poor/Fair	73 (63%)
<i>Living Situation</i>	
Rent house/apartment	9 (8%)
Own house/apartment	83 (73%)
Live with in-laws	22 (19%)
Satisfaction with overall living situation	
Satisfied	53 (48%)
Dissatisfied	58 (52%)
Gas or electricity turned off because couldn’t pay bill	
Yes	53 (47%)
No	59 (53%)
Time where there wasn’t water when needed	
Yes	46 (40%)
No	69 (60%)
<i>Stressful Life Events</i> (within the past year)	
Average number of stressful life events (range)	2 (1-10)
Most commonly reported stressful life events	

Had a lot of bills that couldn't be paid	57 (50%)
Husband or partner lost his job	35 (32%)
Close family member or friend died	31 (27%)
Close family member was sick and had to go to hospital	28 (25%)
Physical abuse during pregnancy	
Yes	13 (11%)
No	101 (89%)

In addition to questions about overall living situation, women were asked about their experiences with living without essentials (e.g., water, electricity). For example, forty-seven percent of women in this sample reported not having electricity because they could not afford to pay their bill. Also, forty percent of women reported not having water when they needed it. With the current shortages and financial problems that most of the population suffer, it appears that women who suffered an infant loss are also being exposed in high percentages to these extreme conditions during a vulnerable part of their lives.

The environmental stressors caused by not having essentials to survive coupled with stressful life events could contribute to poor health during pregnancy. Women reported having experienced at least two stressful life events during the past year. The most commonly reported stressors were related to financial difficulties and illness or death of a close friend or relative.

4.5.9 Infant Home and Health Care

The home interview had a supplemental questionnaire which was administered to women who brought their infants home from the maternity home. These questions were asked to get a better understanding of infant care.

On average, infants were brought home after nine days of being at the maternity home. Almost ninety percent of women report that they were prepared to care for their infant when they came home from the maternity home. The majority of women reported breastfeeding their baby within the first 24 hours after delivery and breastfed their babies on average for about nine weeks.

Fifty-eight percent of women reported that their infant was in a room where someone was smoking cigarettes daily.

All of the women in this study who brought their infant home reported laying those infants on their back or side most of the time when putting them to bed. This is in compliance with the American Academy of Pediatrics recommendations in order to prevent SIDS.

Over seventy percent of women reported that a physician made a home visit to check on the infant. However, the majority of women (52%) reported waiting several days or not ever

taking the infant to the hospital when advised by their health provider. No data was collected to ascertain the reason for this delay.

Table 10: Infant Care after Returning from Maternity Home (Home Interview)

Average number of days when came home from Maternity Home	9 days
Prepared to care for infant when came home	
Yes	31 (89%)
No	4 (11%)
Initiation of breastfeeding	
Within first day after delivery	24 (56%)
After second day	9 (21%)
Did not breastfeed child	9 (21%)
Average number of weeks breastfed baby	9 weeks
Infant exposed to smoke	
Yes	22 (58%)
No	16 (42%)
Sleeping position	
On side	31 (91%)
On back	3 (9%)
Home visit by health professional	
Yes	29 (74%)
No	10 (26%)
Compliance with health professional advice related to infant's health	
Immediately/Within several hours	12 (48%)
Waited several days/didn't take baby to hospital at all	13 (52%)

The findings from select home interviews and medical abstractions were provided to the Review Team to develop recommendations on preventing infant deaths and addressing gaps in health and human services. These findings are summarized in the section below.

4.6 Case Review Team Findings

One important component of this project was the review of select infant deaths by the country's top maternal and child health experts in Armenia. The purpose of this component is to develop recommendations and strategies on preventing further infant death. Members of this review team were involved in designing the research instruments and reviewed them after translation into Armenian and English. Also they recommended data abstractors for gathering data from the medical cards of infants who had died during the study period. The

Review Team met as a group to discuss select cases in detail that were representative of the situation in each region of Armenia. A total of thirty cases were reviewed and summarized for this report. A summary of the findings include the following:

- 1) assessment of appropriateness of care utilized for the mother and infant (prenatal care, labor and delivery, ambulatory care and social services).
- 2) identification of common problems seen among cases
- 3) recommendations on improving health outcomes (through health education, health delivery and health policies)

4.7 Assessment of services provided to families who experienced an infant death

The Review Team was asked to complete the following table for all cases they reviewed in order to assist in developing recommendations for decreasing infant deaths in Armenia.

Table 11: Summary of Review Team Assessment

n=30	Prenatal Care	Labor and Delivery	Newborn Care
Family received full array of services appropriate to their needs	8%	57%	61%
Minor additions to services would be useful to families	33%	30%	26%
Major additions to services would be useful to this families	54%	9%	13%

4.7.1 Common problems identified

The Review Team was then asked to answer the question of what specific problems they could identify that may have contributed to the infant death they were reviewing. The following is a summary of their responses:

Health Education (Individual level)

- Poor preparation for pregnancy (low pre-conceptional care)
- Poor spacing between pregnancies
- Late involvement in prenatal care services
- Poor weight gain and nutrition
- Poor knowledge of self care during pregnancy

Health Delivery (Provider level)

Delay in referrals to appropriate services
Absence of adequate diagnosis of “high risk” pregnancies
Inadequate training in neonatal resuscitation and reanimation procedures
Poor follow-up of pregnant women
Poor identification/diagnosis and treatment of intrauterine defects
& infections during pregnancy

Health and Social Policy level

Inadequate living conditions
Transportation difficulties in accessing prenatal care
Poor social and economic support of pregnant women and infants
Decrease in the appropriate provision of medical patronage

4.7.2 Recommendations for improving health and social services to prevent infant deaths

Review Team members were then asked to make recommendations specific to the above mentioned problems identified for each case. The following is a summary of recommendations and strategies identified for improving further infant deaths:

Preconceptional Care/Family Planning

- Provide education to women on how to prepare for pregnancy
- Provide health education related to adequate spacing between pregnancies
- Provide health education on contraceptive use and availability
- Provide health education to father’s on the impacts of STDs on pregnancy
- Increase knowledge of the negative impacts of repeated abortions as a form of contraception

Components of Prenatal Care

- Provide nutritional education classes during pregnancy
- Provide training to prenatal care providers on how to assess and access “high risk” pregnant women
- Train prenatal care providers to give appropriate advice to pregnant women on appropriate working conditions during pregnancy
- Increase awareness on the need to initiate timely prenatal care

Training of Health Providers

- Improve understanding of appropriate diagnosis and treatment of infections prior to pregnancy
- Appropriately identify and assess “high risk” pregnancies
- Provide timely referrals to specialized care necessary for “high risk” pregnant women
- Improve regional training for management of pre-term delivery
- Improve regional training of modern reanimation procedures in maternity homes and prevention of respiratory distress syndrome

-
- Provide medical genetic counseling
 - Improve qualifications of health providers working in prenatal care and labor and delivery services

Medical Diagnosis and Testing Mechanisms

- Improve regional system of detecting pathogenic organisms that adversely impact on pregnancies
- Improve regional diagnosis procedures for identifying fetal anomalies
- Conduct autopsies for all infants who died in hospitals
- Improve regional laboratories' capacities
- Increase utilization of ultrasound during pregnancy to diagnose and prevent congenital anomalies

Linkages Between Medical and Social Services

- Improve linkages between prenatal care and labor and delivery services
- Improve linkages between families and providers with medical social workers
- Re-develop concept of medical patronage to follow-up with pregnant women and provide appropriate referrals to medical and social services

Psycho-social Support for Women

- Improve mechanisms to provide women access to psychological and/or social support services during pregnancy to cope with stressors
- Identify and provide financial support/social services to families in extreme poverty
- Define pregnant women in poverty as eligible for further social and financial support
- Provide psychological and social support for women who lost an infant

Financial Support/Programs

- Provide food support programs for pregnant women in extreme poverty to improve nutrition and appropriate weight gain during pregnancy
- Identify pregnant women and women with infants in poverty as eligible for financial support

Access to Health Care

- Organize transportation system for transferring to specialized care
- Provide regional reanimation units
- Increase awareness of state order of free health services

5. DISCUSSION

The ideas presented hereafter are primarily based on the analysis of those 115 cases of infant deaths for which home interviews were conducted. Another important source for deriving conclusions was the analysis of 30 cases completed by Case Review Team. The information collected through medical abstract forms only was considered unsatisfactory for making substantiated judgments since it was limited and covered mainly medical aspects of the cases.

One of the main domains of interest of this study was identification of risk factors for infant mortality in Armenia. The study suggests several possible risk factors. The true significance of these factors can only be shown through comparison of target cases with an appropriate reference population, such as controls investigated in parallel with the cases during this study. Although the data on controls is currently being summarized and is not available for comparison yet, it still makes sense to highlight some findings of this study concerning the characteristics that could play an important role in predisposing to deaths in infancy.

Low birth-weight appears to be one of those characteristics, since it was very common among study population (52%) in contrast with overall infant population of Armenia, where its prevalence is only 8% [5], which is 6 times less. The other possible risk factor that was identified during the study and was closely connected with low birth-weight is **premature birth**. **Short gestational age** (≤ 37 weeks) was reported in more than half of the cases (52.4%), in 26.2% of the cases gestational age was ≤ 32 weeks. This is a very large proportion in comparison with the prevalence of premature births among general population of infants, which is more than 7 times less (equal to 7%) according to the MOH data. **Multiple births** (twins etc.) were also over-represented comprising 10% of all cases. This finding is also associated with low birth weight and might be one of possible risk factors of death in infancy.

Chart 1.

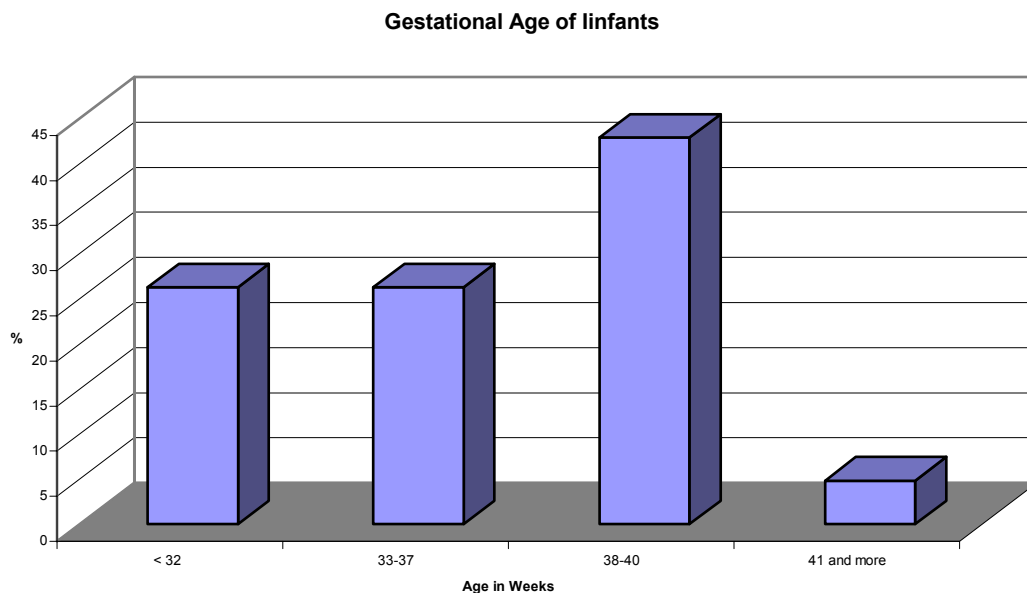


Table 12. Infants’ Gestational Age Distribution

Gestational age in weeks	Percentage of cases
< 32 and less	26.2
33-37	26.2
38-40	42.8
≥ 41	4.8

One of the risk factors closely associated with the previous ones could be **poor weight gain during pregnancy**. According to the study results, almost 50% of mothers gained 6 kg or less during their pregnancy, and almost 70% gained 9 kg or less. This is considerably lower than the average weight gain during pregnancy in industrialized countries according to the WHO Bulletin, which is equal to 10-12 kg. A large proportion of premature births can be partially attributed to the low weight gain during pregnancy in the study population. However, taking into consideration that the average weight gain should be around 8 kg at 32 weeks of pregnancy¹, and that only 26.2 of the study cases had gestational age of 32 weeks or less, it becomes apparent that low weight gain during pregnancy could have its independent role as a risk factor for infant mortality in Armenia. **Chart 2.**

Weight Gain During Pregnancy

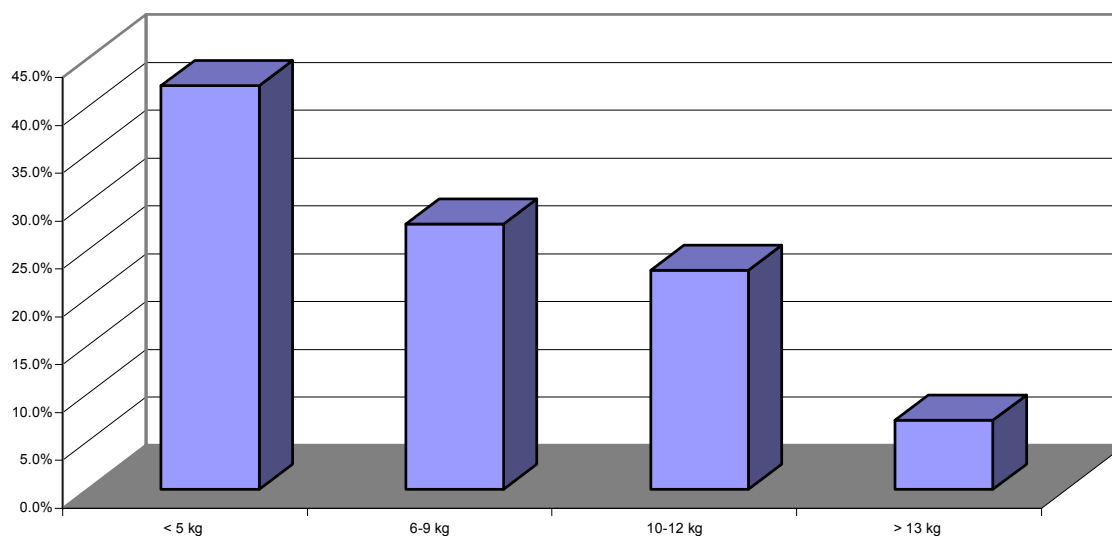


Table 13. Distribution of Weight Gain During Pregnancy

Weight Gain	Percent of women
5 kg and less	42.2%
6-9 kg	27.7%
10-12 kg	22.9%
13 kg and more	7.2%

Poor nutrition on the one hand and **poor health** on the other hand can be responsible for this low weight gain. Findings of the study suggest that both these factors could have place in the study population, since a substantial proportion of mothers (63%) rated their overall health during pregnancy as “poor” or “fair”, and 53% of them reported that there was a time during pregnancy when they could not afford to buy food.

Dissatisfaction with their own health could be connected with **limited availability of prenatal services**: 45% of mothers mentioned that they could not receive prenatal care as early as they wanted. **Low coverage with prenatal care** and **late initiation of it** are the other possible risk factors suggested by the study. The role of these factors becomes more obvious in comparison of this population with the other appropriate referent population, such as population of 700 mothers of infants randomly selected for the Infant Feeding Practices National Survey throughout Armenia in 1997 (Kim Hekimian). 97.8% of those mothers in Yerevan and 86.7% of them in Regions attended prenatal consultations vs. only 72% of mothers in this study population. 59% of those mothers in Yerevan and 46% of them in Regions received the first prenatal consultation during the first trimester of pregnancy vs. the majority of mothers in this study population that received first consultation in the second trimester. Although the 2-year interval between these two studies can introduce bias in interpretation of observed differences, the comparison gives a sense of the possible role of those factors in infant mortality.

It is interesting that the age distribution of mothers is almost the same in these two study populations. Hence, maternal age is not a probable risk factor for infant mortality.

Chart 3

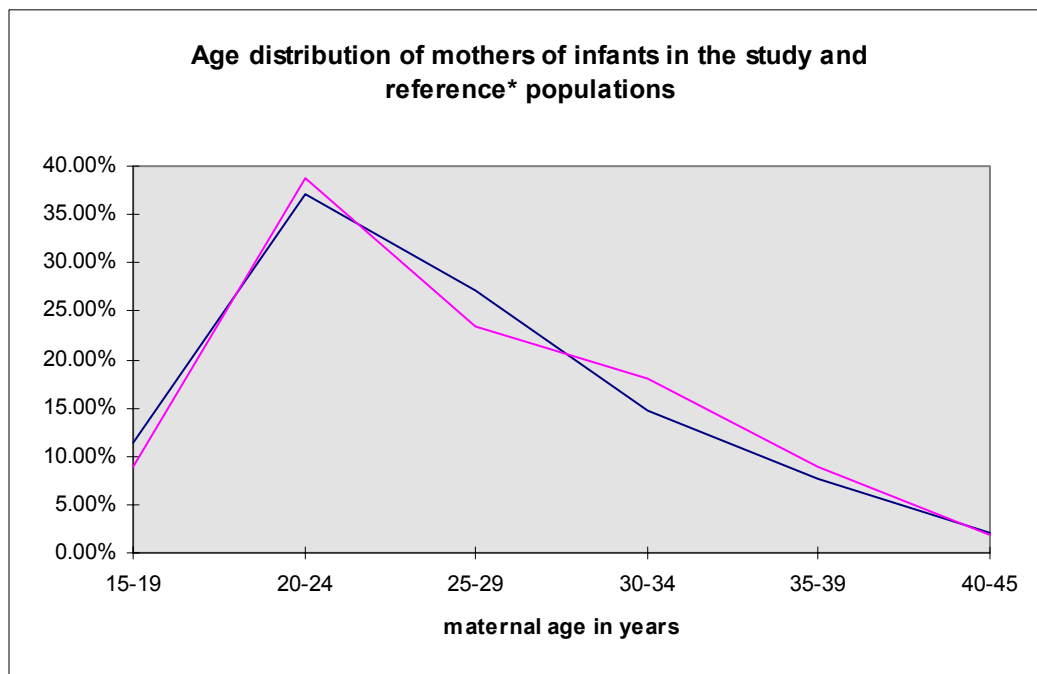


Table 14. Maternal age distribution in study and reference populations

Age of mothers of infants (Years)	Reference population, (IFP in Armenia, 1997), n=300	Study population, n = 115
15-19	11.40%	9%
20-24	37.10%	38.70%
25-29	27.10%	23.50%
30-34	14.70%	18%
35-39	7.70%	9%
40-45	2.00%	1.80%

Differences do exist between these two populations in terms of educational level of mothers. 43% of mothers in the study population had more than 10 years of education. Meanwhile, 62% of mothers had more than 10 years of education in the reference population. Thus, **low educational level of mother** might also be a risk factor also.

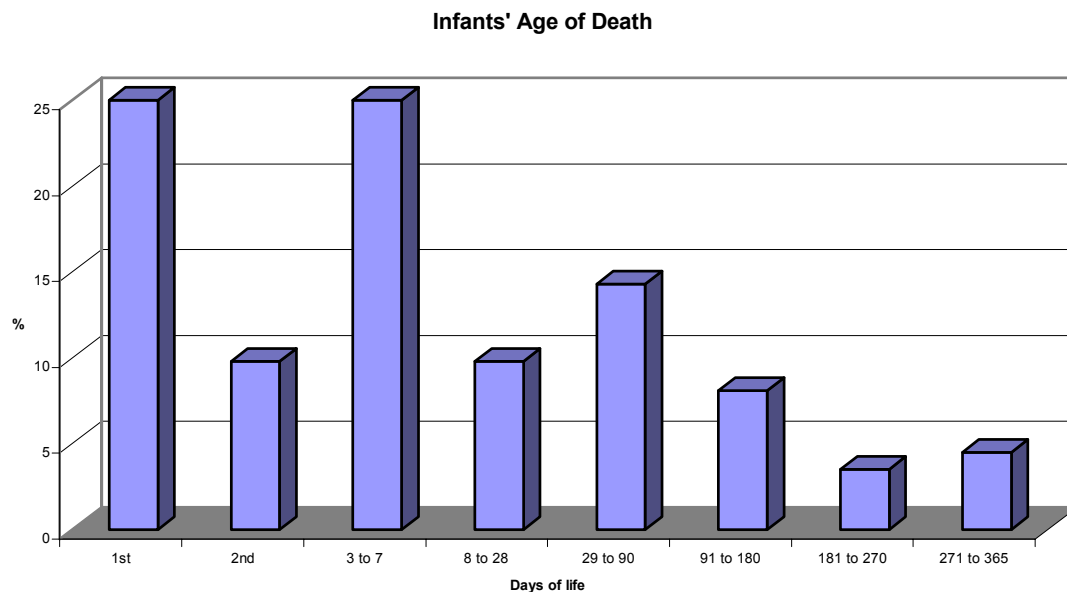
There are several findings that suggest the possible role of **poor economic situation** of the family as a predisposing factor for infant death. Some evidence of this are the mothers' dissatisfaction with their overall living situation in more than half of the cases, families' inability to pay for food, gas or electricity, as well as the necessity for mothers to walk long distances to get prenatal care because of limited availability of transport means for almost the half of the cases. The study results show **high frequency of stressful life events** (2 in average) during pregnancy. Consistent direct exposure of 58% of infants to cigarette smoke is another finding of the study. Although all of these could be possible risk factors, it is difficult to judge about their role since there is no reference population to compare with.

The study findings also characterize infant mortality in Armenia: 70% of infant deaths are taking place in the neonatal period (first 28 days of life); The overwhelming majority of neonatal deaths (85%) occur during the early neonatal period (first 7 days of life); and more than half of the early neonatal deaths happen during the first two days of life. Thus, pre-natal and intra-natal factors are responsible for the considerable proportion (one third) of deaths that occur during infancy.

Table 15. Distribution of Cases According to the Age of Death, n = 115

Age of death (Days of Life)	Percent of infants
1st	25
2nd	9.8
3 to 7	25
8 to 28	9.8
29 to 90	14.3
91 to 180	8.1
181 to 270	3.5
271 to 365	4.5

Chart 4



Non-compliance with health professional's advice was another common finding of the study. 52% of women were reluctant to take their infants to the hospital in the time interval advised. This might be one of the reasons for late hospitalization with negative consequences, and could be closely connected with both lack of appropriate level of health education and the financial difficulties that these families often experience.

One of the important findings of the study was **low percent of autopsies** of infant deaths. Only 18% of mothers reported having an autopsy done. This could be an evidence of poor investigation of causes of infant deaths by medical personnel, which in its turn may restrict the possibilities of learning from own experience for them.

The Review Team findings are consistent with the aforementioned findings of the study. They emphasized the importance of increasing the level of health education of mothers in the prenatal period; increasing the availability and quality of medical services provided in the periods of pregnancy and infancy; timely identification and follow-up of high-risk pregnancies; and adequate neonatal resuscitation and intensive care. The Review Team recommended also providing appropriate financial and social support to pregnant women and young families.

Another area of concern was the accuracy of registration of infant deaths in Armenia both through death certificates and through registration by medical services. This issue was partially addressed by this study. Although at the end point of the study only 89% (340cases) of all 381 cases identified through medical system during the project period were registered officially through death certificates, the true proportion of official registration is still unclear, since further registration is taking place continuously. One of the important findings of the study was that interviewers identified 8 additional cases of infant deaths that were not registered by medical services. This demonstrates that the proportion of unknown infant deaths is not excessive (about 2% only). However, the percentage of these deaths could be

much higher in certain areas because of possible disproportional distribution of unknown deaths. Further investigation is needed to clarify this issue.

In whole, the study was aimed to demonstrate advantages of having an ongoing infant mortality review and surveillance program in Armenia with parallel investigation of all infant death cases and appropriate controls. The findings described above show the necessity of improvement of timely registration and investigation of infant death cases in Armenia. The study highlights several determinants of infant deaths that should be promptly addressed by implementation of appropriate measures such as active identification and follow-up of high-risk pregnancies, provision of nutritional support to socially vulnerable pregnant women, health education during pregnancy, improvement of health care in neonatal period, etc. Ongoing surveillance program like the one that was implemented during this study has a potential to help in identifying trends in infant mortality and in introducing appropriate changes in the health system to prevent further unnecessary infant deaths.

6. CONCLUSIONS AND RECOMMENDATIONS

The study suggests several possible risk factors for infant mortality in Armenia, such as:

- Low birth weight (possibly 6-fold increased risk)
- Short gestational age (possibly 7-fold increased risk)
- Poor maternal weight gain during pregnancy (observed in 70% of cases)
- Poor maternal nutrition during pregnancy (63% poor/fair)
- Perception of poor health during pregnancy
- Lack of medical supervision during pregnancy
- Late initiation of prenatal care
- Low educational level of mother/family (less educated in comparison with 1997 reference population)
- Poor economic situation of family
- Frequent stressful life events during pregnancy
- Non-compliance of family with medical advice

The true significance of these factors could be identified after comparison of cases with controls involved in this study or through further research.

The study also identified some important characteristics of the infant mortality in Armenia:

- Large proportion of neonatal deaths (70%)
- Large proportion of early neonatal deaths (60%)
- More than one third of all deaths that occur during the first 48 hours of life.

In terms of measurement of infant deaths, the study findings suggest small proportion (2%) of completely unregistered deaths with possible variations between different regions.

Regarding investigation of cases of infant deaths, the study findings show a very low number of autopsies (18%) that may lead to unidentified causality of the big proportion of infant deaths.

Taking into consideration these findings and also the results of the Review Team discussions, we recommend undertaking following measures directed to control infant mortality and to prevent further unnecessary infant deaths in Armenia:

- Implementation of an ongoing infant mortality review and surveillance program
- Performance of consistent autopsies and pathological review of infant deaths
- Health education of women on family planning and self-care during pregnancy
- Training of prenatal care providers in terms of dealing with high-risk pregnancies
- Initiation of community outreach worker program directed to active identification of women who are not accessing health care services
- Training of neonatologists in terms of intensive care, resuscitation and care of low-birth weight neonates
- Improvement of medical diagnosis and testing mechanisms and capacities for timely identification of intra-uterine infections, genetic defects and fetal anomalies
- Improvement of linkages between social and medical services provided to pregnant women
- Provision of nutritional and financial support to socially vulnerable pregnant women and their families
- Provision of psychological and social support for pregnant women to cope with stresses

7. LIMITATIONS OF THE STUDY

At this point of time the main weakness of the study is absence of the comparison group, which makes almost impossible to judge about the significance of the possible risk factors identified during the study.

A low response rate (30%) could be a source of response bias in this study.

The limited sample size of home interviews because of low response rate could restrict the generalizability of the study findings.

The other limitation is that the findings of the study are concentrated on the issues that can be derived from the interviews with mothers. Although the medical abstract forms were completed for 269 cases, only 30 of them were used during review team discussions. Thus, the study findings are restricted in terms of omitting important medical information on the causality and history of diseases leading to death in infancy. Such information could be very useful in planning and implementing programs aimed to overcome some of common causes of deaths in infancy (such as diarrhea, acute respirator infections, other infections, injuries, etc.).

REFERENCES

1. Government of Armenia, UNICEF, SCF (1999). Situation Analysis of Children and Women in Armenia.
2. Durfee MJ, Gellert GA, Tilton-Durfee D. Origins and Clinical Relevance of Child Death Review Teams. *JAMA* 1992; 267:3172-5.
3. Infant Mortality Review Report, An Analysis of the Infant Mortality Rate in New Orleans. January 1998.
4. Armenian H. A Case-Based System for Investigation and Evaluation of Patient Care Outcomes (working paper).
5. MOH annual report data, 1998.
6. Akre J, Infant Feeding, The Physiological Basis, Supplement to volum 67, 1989, of the Bulletin of the World Health Organization, p.11.
7. Hekimian K, Infant Feeding Practices In Armenia: Report on Comparative Study and National Survey, June 1997.