SOCIOECONOMIC STATUS OF HOUSEHOLD AND CHILD MORBIDITY IN ARMENIA

Research Grant Proposal

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Yerevan 1999

Acknowledgements

I would like to express my sincere gratitude to Dr.Haroutune Armenian for his support and helpful discussions. The preparation of this proposal would not have been possible without his advice and recommendations.

Special thanks to Gayl Howard for the English editing of this paper.

I also wish to acknowledge the Public Health faculty for comments and suggestions I have received.

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1. Abstract

The aim of this study is to investigate the effect of socioeconomic status on children's health in Armenia using case-cohort design. The evaluation of socioeconomic status will be done on the basis of the PAROS system of household vulnerability assessment. Cases and controls will be selected from the same initial cohort of households registered in 1995 in the PAROS database. As an indicator of morbidity, the hospitalization for children 5-8 years of age will be taken. The proportion of exposed cases and controls will be estimated using the PAROS 1997 database that contains 63% of 1995 database. Analysis of the potential association between socioeconomic status and child morbidity will be done by calculation of odds ratios controlling for possible confounders. Intensity or "dose" of exposure will be considered and relative odds of diseases associated with each level of exposure will be estimated.

In Armenia, 33% of children under 7 years of age are considered to be poor and this could have serious negative consequences for the future. No research studies have been done in the Republic regarding this issue. The finding of this study will help to raise concern about the health status of poor children and will improve direct medical care for this part of the population.

2. Specific Aims

The primary objective of this study is to determine the effect of socioeconomic status on the health of children in Armenia. As an indicator of health status, hospitalization will be used. Socioeconomic status will be measured using the PAROS system of social vulnerability assessment that was introduced in the Republic of Armenia during 1994 - 1995. This system uses a number of proxy measures for estimating household vulnerability taking into consideration the social status of each member of the family, income, family size, size of residential unit and residential conditions. The level of vulnerability of the household is expressed by 1/100 precision of a unit [1]. All information for each family is recorded in the general Republican computer network.

The case-cohort design proposed for this study provides that cases and controls will be selected from the initial cohort irrespective of outcome. The PAROS 1995 database for Yerevan, the capital of Armenia will be taken as an initial cohort. This includes 93% of all households registered in the city. Children 5-8 years of age will be involved in this study. These are children born from 1991 to 1994, growing up during the period of deepest economic crisis. Medical care for children under 8 years of age is included in the government-funded Basic Benefits Package (BBP). Therefore it could be assumed that all children of this selected age range have equal access to hospitals, i.e. an equal chance to be selected for the study. Cases will be identified by reviewing existing medical records for the period 1 January – 31 December, 1999. Controls will be randomly selected using the PAROS database. Mothers of these children will be interviewed at home, aiming to obtain information about health status. The preliminary estimated number of cases is 2,500, and for each case, one control will be identified. The proportion of exposed cases and controls will be estimated using the PAROS 1997 database, in this second registration strict requirements for documents about household conditions were implemented. As a result of this exercise, the PAROS 2 database for Yerevan contains 63% of the PAROS 1 database or 59% of the total number of households [1].

In this research, the following hypothesis will be tested: there is an inverse relationship between child morbidity and socioeconomic status. In Armenia, where 33% of children under 7 years old are considered to be poor the findings of such a study could help to improve medical care for the at-risk population.

3. Background and Significance

3.1 Poverty in Armenia

The devastating earthquake in 1998, the collapse of USSR and its trade system and subsidies, and the economic blockade and war in Nagorno Karabach led to the serious deterioration of the Armenian economy. The astronomical inflation rates during 1993-1995 of up to 5,000%, declined to just 5.7% in 1996, but it rose again to just over 20% in 1997 [2]. This deep economic crisis and manifested inflation resulted in a rapid decline in living standards of the population. A Household Survey undertaken by the State Department of Statistics in 1993-1994 reflected the following level of poverty (Table 1).

Table 1.

	Urban	**Rural**
Extremely poor	20%	12%
Poor	11%	13%
Total	31%	25%

(Source: Ministry of Statistics, State Register and Analysis, Social Snapshot and Poverty, National Report)

It has been assumed that "extremely poor" are households whose average per capita expenditures are lower than the expenditure median by 15% and "poor" are the households with average per capita expenditures between 15% and 40% of the median [3].

The present definition of poverty is given by the State Department of Statistics as the inability to ensure a certain living minimum. In order to calculate the relative line of poverty, the approach accepted in countries with a stable economy was applied (relative line of poverty is 40% of the average current expenditures median on a per capita basis). On the basis of poverty criteria, three groups were defined:

1) very (extremely) poor are those whose average current expenditures per capita are lower than the poverty food line - approximately $13.20 per month
2) poor are those whose average current expenditures per capita are lower than the poverty general line - approximately $21.50 per month;
3) non-poor are those whose average current expenditures per capita were higher than the poverty general line.

Based on these definitions, 27.06 % of population (25.83% of total households) is poor and 27.67 % of population (24.15% of households) is very poor. The urban population is economically in worse condition than the rural population. In Yerevan, the capital of Armenia, the level of poverty is 58.2%.

Large families and families with many children have the most risk to be among the poor. Regression analysis showed that the existence of a child in a family increases the poverty depth in comparison with families having no children by 6.9% (all other conditions equal). Very poor households have the largest number of children. Household having children under 7 are much more often found within the category of very poor than families that do not have children at all. 33% of the children under 7 are very poor [4].

3.2. Access to health care

The poor population is unable to meet its basic needs, including health care, because access to health services is limited by the cost of care. This cost includes the official cost of medicines, consultations, diagnostic tests and other services, as well as informal payments used to guarantee quality care and secure costly medical interventions [5]. Treatment is not affordable for the poor even though the Government has financed a package of free health services for some vulnerable categories, the so-called State Order.

Public expenditures on health care fell from 2.7% of GDP in 1990 to 1.1% in 1995. This rose slightly in 1997 to 1.3% of GDP. However, actual public expenditures on health are very low at $5.40 per capita. The majority of health care expenses is paid by patients, through either formal or informal payments [6].

According to the Survey of Health Problems (978 households, 3498 members) conducted by the Department of Statistics, approximately only half of the sick people visit the doctor. When ill, the poor applied to medical institutions less frequently than those with higher socioeconomic status.
The main reason is expensive health services. In 1995, patients' health expenditures in Armenia were estimated to be in the magnitude of $50-60 million U.S. dollars [6].

Table 2.

Population who fell ill, visited medical institutions and incurred costs by poverty groups

	Number of Sick People in 1996				Number of Those Applied for Medical Care	Medical Expenses as Declared
	Total	Including				
		Women	Children under 5	Children 6-14		
Non-poor	38.9%	53.8%	8.8%	13.7%	44.9%	39.4%
Poor	32.0%	52.7%	8.7%	21.4%	37.0%	27.7%
Very poor	32.3%	52.1%	12.7%	16.0%	29.0%	22.5%
Total	35.6%	53.2%	9.7%	15.9%	39.6%	33.0%

(Source: Ministry of Statistics, State Register and Analysis, Social Snapshot and Poverty, National Report)

Table 3.

Distribution of expenses of population for medical services according to poverty groups (percentage)

Population group	Share of population who announced their expenses for medical services				
	Diagnosis	In hospital	Dentist	Pregnancy, delivery	Other services
Non-poor	5.6	11.0	9.4	1.9	2.9
Poor	2.3	5.0	5.3	1.3	2.6
Very poor	1.1	2.7	4.8	0.6	0.7
Total	3.4	7.1	7.0	1.4	2.2

(Source: Ministry of Statistics, State Register and Analysis, Social Snapshot and Poverty, National Report)

For all poverty groups, more expenses are related to hospital care than to diagnostic procedures. According to the noted qualitative study, this can be explained by the fact that the poor opted for cheaper treatments; i.e., avoided laboratory or other diagnostic tests, took medicines or took incomplete course of treatment [5]. Serious health conditions and emergencies lead to hospitalization because medical assistance could not be postponed without serious consequences. Participants of the survey mentioned that children bear the greatest impact. Mothers complained that children suffered

from pneumonia and other respiratory diseases. The very poor are more likely to report health problems than poor and non-poor [5].

Since 1997, the health care system budget has been based on a government-funded Basic Benefits Package (BBP) for the population [7]. However, the package is grossly under-funded and restricts access to medical care for many socially vulnerable groups. Utilization of health services has been declining over the past decade. Hospital bed occupancy rate decreased by 40%. High costs of care and a perceived decline in quality are the primary reasons for decreased utilization of medical services [6].

Many research studies provide evidence that poverty is one of predictors of morbidity and mortality and risk factor for many diseases [8-10]. Taking into consideration that approximately 55% of the population in Armenia is considered to be poor, the investigation of the association between socioeconomic status and health becomes very important. Findings of this study could be helpful for the development of a special system of medical vouchers or insurance for the poorest population.
There has been no scientific research done in Armenia related to this problem despite the existence of a system of vulnerability assessment that gives an opportunity to evaluate socioeconomic status.

3.3. PAROS system

The PAROS system was established in 1995 by the Ministry of Social Security, funded by the United States Agency for International Development and the support of the Armenian Assistance Fund of the Eastern Diocese of the USA Armenian Apostolic Church. Within the framework of the PAROS system the degree of vulnerability of the population is evaluated on the basis of the social status of each member of a family, the family size and the size of residential units and income. Under the current system, 17 social groups of population were defined for each member of a family, as well as 5 ratios for residential conditions and 3 ratios for location of residence (Annex 1). The level of vulnerability of a household is expressed by 1/100 precision of a unit. All information about each household has been recorded in the Republican computer network [1].

4. Literature review

4.1 Socioeconomic status and health

Many research studies confirm the existence of the relationship between socioeconomic status and health: the higher an individual's income, the better his or her health [8-10]. Moreover recent findings suggest that health may also be affected by the distribution of income within society [8]. Cross-sectional multilevel study on income distribution throughout the United States and a self-rated health status proved that inequality in the distribution of income are associated with an adverse impact on health, independent of the effect of household income. Furthermore, the effect of income distribution did not change significantly when household income was included in the model. When stratified by income, the effects of inequalities in income were strongest among those with lower income [11].
The prevalence of poor health increases with decreasing social position [12]. Social class differences in health are seen at all ages, with lower socioeconomic groups having greater incidence of premature and low birth-weight babies, heart diseases, stroke and some cancers in adults [13-14].

4.1.1 Mortality

A number of studies have been conducted to determine the association between socioeconomic status and mortality.
A Study of Income Dynamics and Adult Mortality in the United States showed that income level was a strong predictor of mortality, especially for persons under the age of 65 years. Data were taken from the longitudinal study of a representative sample of individuals living in the United States. All-cause mortality was the dependent variable in this study and income measures were based on annual total household income reported by household heads. The non-linear effect of income was observed [15].
These findings are also supported by the survival analysis conducted in a national sample from the first National Health and Nutrition Examination Survey (NHANES-1) and NHANES-1 Epidemiological Follow-up Study. The proportion of mortality associated with poverty during 1971-1984 and in 1991 was estimated by calculation of attributable risk in blacks and whites 25 to 74 years of age with assessment of confounding by major known risk factors. In 1973 6% of mortality was attributable to poverty; in 1991 the proportion was 5.9% [16].

Some researchers found that individual mortality is associated with unequal income distribution within societies. The data of the 1986-94 National Health Interview Surveys showed that concentrated

poverty is associated with a significantly elevated risk of mortality even after controlling for individual household income [17].

Other authors argued that the relation between inequalities in income and mortality might be overstated because of unmeasured confounding variables at the individual level. In a multilevel longitudinal cohort study of 14,407 people in the United States, community income inequality was significantly associated with subsequent community mortality and with individual mortality after adjustment for age, sex, and mean income. After adjustment for individual household income, however, the association with mortality was lost [18].

Most studies use indicators of socioeconomic status associated with individuals such as income, education or occupation.

In the U.S. National Longitudinal Mortality Study, socioeconomic status was characterized by income, education, occupation and employment status. Selected subjects were followed for the years 1979 through 1989. A significant relationship, both in magnitude and by statistical tests, was found between increasing income and lower mortality in each age and sex group. Relationships for women and men were similar. Study results demonstrated that income and education are related to mortality separately. Taken alone, the differences in income appeared to describe greater differences in mortality relative to education. Multivariate adjustment reduced the income effects more than education effects because income was more strongly associated with other variables than education [19]. However, it is necessary to mention that income represents the family income while education reflects individuals and this difference could influence the final results.

4.1.2 Cardiovascular diseases

The negative effect of low socioeconomic status on cardiovascular morbidity and mortality is thoroughly investigated [20-21]. In most mortality studies, lower socioeconomic groups exhibited higher rates of all-cause mortality than did higher socioeconomic groups, irrespective of what dimension was used as the measure of socioeconomic status. A study on the relative impact of separate indicators of socioeconomic status on the risk factor for cardiovascular disease found that the strongest relationship exists for education: lower levels of education were associated with higher risk [22].

In the Charleston Heart Study cohort, low socioeconomic status was found to be a significant predictor of the incidence of hypertension, while skin color was not [23]. Random sampling of this cohort was done later in order to support the hypothesis that socioeconomic status is a key predictor of

mortality when ethnicity is controlled. Among Whites, for all causes of death, men of low socioeconomic status had rates 1.8 times those of men of high socioeconomic status. The rate ratio was 2.1 for coronary heart disease mortality. Among Blacks, the low-high socioeconomic status ratio was 2.1 for all-cause mortality and 1.6 for coronary heart disease mortality. Findings of this study showed that socioeconomic status has a powerful influence on coronary mortality and death from all causes. Educational level and occupation were selected as measures of socioeconomic status [24].

4.1.3 Cancer

Some epidemiological studies proved that low socioeconomic status is directly associated with different types of cancer incidence [25]. It was a significant predictor on breast cancer survival after controlling for age, stage, histology and type of treatment in a study of women with breast cancer in 1987-1991 [26]. Association between incidence of disease and the level of material deprivation was also found in the study of colorectal cancer in Northern Ireland [27].

4.1.4 Chronic diseases and functional status

Several studies were conducted to investigate the relationship between low socioeconomic status and common chronic conditions. Analysis of data from a cross-sectional study on 9,744 men and women aged 51 through 61 showed that individuals reporting a chronic condition have lower incomes and, especially wealth compared with those who do not report so. In this study, prevalence rates for chronic conditions were estimated from self-reports; for the measurement of socioeconomic status, two variants of income and wealth variables were created. Wealth and income disparities associated with the presence of chronic conditions are much larger among women than among men. The study also found that both income and wealth are significant and independent predictors of the probability of having a chronic condition. Lower income and wealth were also associated with worse functional status.

The effects of socioeconomic status on health were generally much stronger for those at the bottom of economic strata than for those at the top. One of the major findings of this study is that relationship between income and wealth and both health outcomes (chronic conditions and functional status) are highly nonlinear. The influences of income and wealth are quite strong within the poverty and near-poverty population. Although the socioeconomic status-health gradient continues outside the poverty population, it is a maximum strength among the poor [28]. This observation is consistent with findings of mentioned above mortality studies reporting non-linear effect of income on mortality [15]. Certainly, this study has some limitations. People aged 51-61 could have a history of health problems

that were not recalled. In addition, their poor health might somehow be the reason for the current low socioeconomic status that creates a kind of closed cycle: poor health - poor socioeconomic status. And finally cross-sectional design limits the possibility of making conclusions about causation. Nevertheless, from a public health perspective, the findings of the study are very important, particularly taking into account that low socioeconomic status restricts the access to and the utilization of medical care.

The Whitehall II study of British civil servants showed that low socioeconomic status is associated with poor health functioning and for physical functioning this association may act both via and independently of disease. Health functioning was assessed by the SF-36 questionnaire (eight scale scores of the Medical Outcomes Short Form 36) and socioeconomic status was evaluated by means of civil service employment grade and access to the use of a car [29]. Although the study demonstrated the inverse relationship between socioeconomic status and physical functioning, the effect of socioeconomic status could be underestimated because the white-collar population under study did not reflect the lowest level of socioeconomic status.

4.1.5 Access to and use of health services

A number of studies examine the relationship between socioeconomic status and the use of health service. Residents of middle - and lower-income areas in the United States were shown more likely to be hospitalized with conditions for which hospitalization is potentially avoidable [30]. Poorer, less healthy groups receive more acute hospital care and have more contacts with general practitioners [10].

The Spanish National Health System conducted a study on accessibility and utilization of health care service, using as a variable for socioeconomic status, one's educational level. Results showed that doctor consultation and the use of inpatient hospital services were more frequent in individuals with the lowest level of education [31].

To examine the relationship of a population's socioeconomic characteristics to its health status and use of health care services a summary risk index was developed for the Population Health Information System in Canada. Worst health status was associated with the highest consuming of health services and socioeconomic risk index explained 87% to 92% of the differences in health status and acute hospitalization [32]. While the low-income population is more likely in need for health care the utilization of it could be limited. The study of access to medical care and the availability of physicians

in a rural California community showed that medical services are underused in low-income areas although need is high [33].

4.2 Children health

4.2.1. Mortality

The strong association between childhood mortality and socioeconomic status points to the existence of social class differences in housing, nutrition, education, exposure to environmental risks and access to and use of health care and related services and facilities. A study of U.S. children from families eligible to received Aid to Families with Dependent Children (AFDC) found that these children have a substantially higher mortality rate than children from families which were not eligible for the AFDC program. Mortality from pneumonia or influenza was 4.8 times high; mortality from heart disease was 3.8 time high for AFDC children. These children were 1.8 times more likely to die from cancer and 5.4 time more likely from perinatal conditions. Mortality from pneumonia or influenza in age group 10-14 was 24.2 times higher in AFDC children. The authors concluded that poor children die from cancer, heart diseases and pneumonia/influenza, at a rate two to five times more than non-poor children because parents of poor children either postpone seeking medical care until it is too late to benefit or do not have access to medical care [34].

In an ecological study conducted in Hong Kong, socioeconomic deprivation was found to be significantly associated with a high infant mortality rate and a high neonatal mortality rate [35]. Similar findings were obtained in a study that examined long-term trends and differences in infant mortality in the United States from 1950 through 1991. This study provided evidence that family income in general was inversely related to infant mortality rates [36].

4.2.2. Morbidity

Epidemiological studies proved a strong association between low socioeconomic status and child morbidity.

The effects of family structure, race and poverty on the health of U.S. children and youth under 20 years of age were investigated using data from the National Health Interview Surveys. In this study, children in single-mother families were compared with those in two-parent families. Poverty was

defined as 1.5 times the poverty index and health was measured as perceived health status reported by mothers. A child's age was taken as the control variable. Results showed that poor children were twice as likely to have fair or poor health as children in more affluent families. The highest rates of poor or fair health were found in children from low-income, single-mother families. After adjustment for both poverty and race, the family structure's effect on health was reduced however there was still a 50% greater likelihood of having poor/fair health status for children who live in households with only a single mother, as compared with children in two-parent families. A comparison of children above and below 1.5 times the poverty level demonstrated that even after controlling for both family structure and race, poor children were almost 3 times more likely to be in fair or poor health [37]. Poverty was measured as a dichotomous variable thus it was not possible to investigate the effect of middle-income; it is one of the study limitations. Nevertheless, findings of this study are significant and alarming from a public health prospectus.

Various studies showed the association between socioeconomic status and asthma [38-39]. Low-income children have higher annual morbidity (days in hospital, days off school, etc.) than higher income children and are more dependent on hospital emergency departments for primary care [40].

4.2.3. Development

Low socioeconomic status also has been shown to negatively influence child development.
A study of 8,596 Dutch children from neighborhoods of different socioeconomic levels found that children living in poor neighborhoods appeared to be shorter than those living in rich neighborhoods. At the same time, the prevalence of overweight was higher among children from rich families [41].

Another study done on Chilean school children, in order to compare the head circumference values by socioeconomic status, showed that in medium and low socioeconomic status children the head circumference was lower than in children from families with high socioeconomic status [42].

4.2.5. Access to and use of health services

The problem of accessibility of medical care has particular importance for children from families with low socioeconomic status. Poor children have been shown to be less likely than their non-poor counterparts to receive routine preventive care on a timely basis. The National Medical Expenditures Survey aiming to assess the access of primary care services for children in the United States showed

that only 9% of children from white, non-poor, insured families reported being inadequately immunized against measles in comparison with 23% of children from poor families (P<.01) [43].

Despite the extensive available literature that addresses the relationship between low socioeconomic status and child health, as yet there is no consensus on how it could be measured; different variables are used in several studies. Many U.S. studies typically include only one question about "annual family income" at one point in time, often without regard to the number of persons supported by this income [44].

In Armenia, the system of social vulnerability assessment that already exists gives an opportunity to measure the socioeconomic status of a household. In the study of child health, the socioeconomic status of a household is particularly meaningful because children are not expected to be in the active labor force. Thus, individual measures are not applicable [44]. Besides, for a majority of studies, the population is not homogeneous in terms of race and ethnicity. On the contrary, the population of Armenia is primarily ethnic Armenian, with approximately 3% of people from other ethnic backgrounds.

No research has been done in Armenia regarding the relationship between poverty and child health. In a country where 33% of children under 7 years old are considered to be poor, the negative effect of low socioeconomic status will have important consequences for the population's health in the future. Investigation of this effect could help to improve medical care for children in the at-risk population, as well as targeting them for humanitarian assistance.

5. Research Design and Methods

5.1. Data source

This study will be based on the data from the PAROS system – the national program of social vulnerability assessment. PAROS was developed in 1995 with funding from the United States Agency for International Development (USAID). Registration in PAROS was voluntary between 1995 and 1996 for any household that considered itself to be needy. It led to the situation when 735,992 out of 884,658 households in Armenia were registered. In 1997-1998 a second registration was organized with a strong requirement for documents regarding household conditions. Well-off households were identified using a register of recently bought cars, a register of private enterprises and coupons for

electricity consumption. As a result, only 519,993 households were registered, which is 71% of the PAROS 1 database or 59% of all households in Armenia. In Yerevan, the capital of the Republic, 234,594 households (93% of total households in Yerevan) were registered in PAROS 1 and 148,685 (59% of the total households and 63% of PAROS 1) were registered in PAROS 2.

The household vulnerability assessment takes into account two major components: 1) the social group for which the individual members of the household belong; and 2) the household as a total unit. The vulnerability degree of an individual member of the household is expressed by certain units. If a person belongs to several social groups, the vulnerability degree is calculated via the proportional addition of different social group scores using special coefficients. The final formula for the household vulnerability assessment includes average per capita scores for the household, the size of household, the place of residence and housing conditions and income. The size of household is calculated taking into account the number of household members who cannot be employed. Family income is estimated with a special coefficient that is based on the minimum salary in the Republic of Armenia, the income of household members at the moment of completing the social passport and the value of humanitarian aid received, expressed in drams (Armenian currency).
The household vulnerability formula ensures the degree of vulnerability by 1/100 precision of a unit. The higher the score, the higher the vulnerability [1].

5.2. Study design and population

A case-cohort design is proposed for this study, aiming to examine the possible association between socioeconomic status and general morbidity in children.
Cases and controls will be drawn from the cohort of households with children from the ages of 1-4 years registered in Yerevan in 1995 in the PAROS 1 database. Yerevan, the capital of Armenia, is selected because it covers 1/3 of the total population of the Republic and the average republican indicator of the population density is exceeded here by more than 50 times [4].

5.3. Cases

Hospital records for the period 1 January – 31 December, 1999 from five non-specialized children's hospitals in Yerevan will be used as a data source for the selection of cases. There are five non-specialized hospitals for children under 18 years of age in Yerevan. According to the governmental policy, hospital treatment of children under 8 years of age is included in the so-called state order and all kinds of diagnostic and treatment procedures for any diseases have to be provided free of charge.

For older children, free medical care is provided only following the special list of health problems. There is also the list of categories of children (handicapped, orphans, etc.) who have to be treated free in any case [45]. Fee for medical service becomes a substantial barrier to the access to and use of hospital care for the socially vulnerable population. Thus, medical records of children ages 5-8 will be identified supposing that, for this age group, all categories of children have an equal access to hospitals.

The preliminary estimated number of cases for the study is 2,500. At the end of the year hospitals in Armenia report only the total number of admissions and the number of admissions for children aged 0-14 years. Thus, only an approximate number of subjects can be predicted. The diagnosis of diseases will be defined using medical records and taking into account the standardized classification accepted in Armenia.

5.4. Controls

Controls will be selected from the initial cohort, that is, households with children ages one to four years (i.e. born in 1991-1994), registered in the PAROS 1 database in 1995. Only households registered in Yerevan will be selected. Having the list of households, it is possible to use a simple random sampling method in order to give all households an equal chance to be included. Random selection will be done using a table of random numbers or the EPI-info software package. If the selected respondent (household) cannot be contacted, the household registered next on the list will be approached.

Information about health status of the controls will be obtained through face to face interviews with the parents. This approach is more appropriate than telephone interview for this particular study for two main reasons: 1) many families are not able to pay the monthly telephone bills, therefore telephones are often cut-off, 2) the issue under study is sensitive for the population.

5.5. Inclusion and exclusion criteria

All children from 5 to 8 years old registered in Yerevan will be eligible for the study. Children from other cities and regions of the Republic will be excluded. Also excluded will be children from households that were not registered in the PAROS 1 database.

5.6. Exposure

The proportion of exposed and unexposed cases and controls will be estimated using the PAROS databases. Exposure is defined as being registered in PAROS 1 and re-registered in PAROS 2 database; it means that the socioeconomic status of the household did not improve and the child grew in poverty conditions. Based on the number of vulnerability scores obtained in PAROS, exposed cases and controls will be stratified into the following subgroups:

1) a score less than 30,
2) a score between 30.01 to 60,
3) a score more than 60.01

The higher the score, the higher the vulnerability or "dose of exposure" [1]. Number of scores obtained will be identified using PAROS databases.

Determining how far below the poverty line people are living may be particularly important in studies of the poor population [44]. Stratification will provide an opportunity to investigate the association between health and socioeconomic status depending on "degree of vulnerability".

5.7. Confidentiality

Informed consent will be offered to all respondents as well as participating hospitals, explaining the purpose of this study. Confidentiality of information will be guaranteed by removing the name of the respondent and replacing it with code. Interviewers will be specifically instructed to not discuss any personal information obtained. Personnel of PAROS, particularly those who directly work with the databases will also sign a written statement regarding the confidentiality of information provided for the study.

5.8. Data collection

Approval for conducting the study will be given by the Ministry of Health. The study protocol, informed consent and the questionnaire will be approved by the National Institute of Health. Both questionnaire and informed consent will be preliminarily tested. Afterwards, these documents will be presented to all participating hospitals with a cover letter elaborating the purpose and objectives of the study.

Data from hospital records will be collected using special questionnaire forms. (Annex 2). These forms will include personal characteristics of the subjects (age, gender, etc.), date of admission, diagnosis and treatment outcome. Information about registration in PAROS and vulnerability scores will be obtained from the PAROS database.

Controls will be visited at their homes. Mothers will be interviewed because children will not be able to provide the detailed information needed for the study. Only in cases when it is not possible to ask the mother will proxies be interviewed: i.e. father, or as a second option, grandmother. The questionnaire for controls will include the same personal characteristics as for the cases and information about being hospitalized during the period of interest (Annex 3) Again, information regarding PAROS will be checked using the databases.

Prior to the interviewing, the informed consent will be presented. Interviewers will be identified and trained in interviewing technique and collection of data from hospital records.

Interviewers will be recruited from alumni and students of the Public Health Department of the American University of Armenia.

5.9. Limitations

Limitation in recall could lead to recall bias. The problem of medical service and fees is very sensitive for the majority of the population. Thus, mothers could report wrong information about the health status of their children trying sometimes to overestimate the severity of disease and the necessity for hospitalization. This could particularly happen in households that were excluded from the PAROS database in accordance with the established criteria. In this case, households do not receive governmental subsidies and humanitarian assistance, including medicines. When the family members do not accept the fairness of their exclusion, the seriousness of medical problems in children could be also overreported because people might expect further assistance from interviewers. Thus, the informed consent should be detailed and clearly explains the purpose of the study, eliminating unreal expectations from the respondents. Knowing that no assistance will be forthcoming from the interviewers could lead to negligible increase in the non-response rate. In general, the expected non-response rate is not more than 10%, because for the most part mothers do not work and will have the time and willingness to discuss such an important issue as their children's health.

Interviewer bias could also occur due to differences in interviewers' technique, such as deep probing [46]. In order to avoid this, both training for interviewers and monitoring of their work should be conducted to identify such problems as soon as possible.

Some problems could also occur with the hospital records. They may be incomplete or missing. Also the diagnostic quality of the records in different hospitals and by different physicians may differ. This could result in difficulties with comparability. In order to minimize this problem, the broader "definitions" of diseases that will include possible variations in wording of written diagnosis will be established and provided to interviewers who will work with the medical records.

Finally, the PAROS system itself is not perfect and has its own limitations. The registration process is time consuming and requires much documentation. This reduces access to some categories of people in the system who are needy but not able to obtain all necessary papers. Also, errors in inclusion and exclusion occur [1]. However this is the only official register of the vulnerable population in Armenia. It has a computerized database which makes selection and follow-up of cases and controls possible.

5.10. Analysis

Phase I:

The first step in the analysis will be an investigation of the potential association between the independent variable (socioeconomic status) and the dependent variable (child morbidity). Exposure of interest, socioeconomic status, is measured as the vulnerability score registered in the PAROS 2 database. It will be dichotomized as present and absent in cases and controls [47]. Presence of exposure is defined as being registered in the PAROS 1 in 1995 and re-registered in PAROS 2 in 1997. Then, a point odds ratio will be estimated using a single 2x2 table.

	Cases	**Controls**	
Exposed	a	b	a+b
Unexposed	c	d	c+d
	a+c	b+d	Total

$$OR = \frac{k\,a\,(c+d)}{k\,b\,(a+b)} = \frac{a/k\,(a+b)}{c/k\,(c+d)}$$

The practical significance of results will be evaluated by calculating 95% confidence intervals using Woolf's method. A Chi-square test of statistical significance for association will be done, $P<0.05$.

Phase II:

The presence of possible association will be examined afterwards controlling for gender as a potentially confounding variable.

Another possible confounding variable is "head of household". The number of households headed by women for the period 1995-1997 is 89,783; that is, 38.27% of total households for this time interval. For the period 1995-1998, these figures become respectively 70,640; that is 47.51%. Although the absolute number of households headed by women decreases, the percentage of these households increases. This situation could be explained taking into consideration that 2/3 of the unemployed population are women. It might be assumed that for the households headed by women, overcoming poverty is more difficult; belonging to these households is an additional risk factor for health problems. Thus, stratification will be done into two groups:

1) households headed by men
2) households headed by women.

The Mantel-Haenzel estimate of the odds ratio adjusted for "head of household" will be calculated.

Phase III:

In this phase, analysis of intensity or "dose" of exposure will be considered. Exposure of interest is continuously distributed. The common analytic approach that will be used in this situation is to divide the exposure variable into a relatively small number of categories and calculate a series of odds ratios [48]. As it was already mentioned before, cases and controls will be stratified on the basis of a vulnerability score and divided into three subgroups:1) a score of less than 30; 2) a score from 30.01 to 60; 3) a score of more than 60.01. Establishment of such categories assumes that each category of exposure contains a reasonable number of cases and controls. The Mantel-Haenzel method will be used next for subgroups to calculate the relative odds of diseases associated with each level of exposure, that is the vulnerability scores. This will provide the estimation of "dose-response" relationship; i.e. whether an increase in the level of vulnerability results in increased or decreased odds ratios. The Chi-square test of significance for trend will be applied.

5.11. Time-table

Project implementation will be comprised of the following phases:

1. Organizational phase: negotiation with local authorities, approval of study protocol and informed consent, testing of questionnaire.
2. Data collection phase: identification of cases in hospitals, identification of controls through the PAROS database, interviewing of controls.
3. Data analysis phase, including check-up of cases in the PAROS database.
4. Preparation of final report.

Organizational Phase	Data Collection Phase	Data Analysis Phase	Preparation of Final Report
January-February, 2000	March-July, 2000	August-October, 2000	November-December, 2000

6. Participation of Children

Children 5-8 years age will be involved in this study. These are children born during 1991-1994 who have grown up during a period of economic crisis, and supposes that they were exposed to poverty. This age range is selected because all children under 8 years of age have to be provided with medical services free of charge. In reality some people might avoid necessary medical care because of illegal payments required. Anyway it could be assumed that for the age category under 8 years, all children have an equal rights to apply for hospital care. For the selection of cases, existing hospital records will be used. For identification of controls, interviews will be conducted at children's homes with their mothers. Approximately 2,500 cases and the same number of controls will be selected. Informed consent will be presented to all participants of the study prior to interviewing. There is no potential risk for study participants. Confidentiality of the information obtained will be guaranteed by replacement of names by special codes.

7. Budget

Item	Unit (USD)	Months	Total
Salaries and Wages*			
Project Director (full-time position)	1x600	12	7,200
Research Assistant (full-time position)	1x500	12	6,000
Interviewer (full-time position)	10x200	5	10,000
Computer Analyst (full-time position)	1x400	3	1,200
Staff Benefits (24% of Salaries and Wages)			5,856
Consultant**	200	3 days	600
Subtotal			*30,856*
Materials and Supplies			
Office Supplies	40	12	480
Communications	25	12	300
Questionnaire forms	5000pages x0.03		150
Subtotal			*930*
Travel			
Administrative***	20	12	240
Subtotal			*240*
Services			
Computer maintenance	100	5	500
Duplication services (report, etc.)	5x30		150
Service contracts (PAROS)	200	3	600
Subtotal			*1,250*
Other			
Space Rental	50	12	600
Subcontracts (participating hospitals)			300
Subtotal			*900*
Total Direct Costs			34,176
Indirect Costs (25% of Direct Costs)			8,544
Grand Total			**42,720**

*These are gross salaries

**Consultations in Epidemiology and Biostatistic s will be needed

*** Includes local travel (negotiation with partners, monitoring of interviewers work, etc.)

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Annex 1

Social groups in PAROS system

#	**Social group**	**Social group scores (Pi)**
1.	Handicapped I category	48
2.	Handicapped II category	39
3.	Handicapped III category	28
4.	Handicapped child less than 16 years old	45
5.	Child less than 2 years old	35
6.	Child in the age range 2-18	33
7.	Pensioner	34
8.	Unemployed	27
9.	Student (less than 23 years old, state order)	22
10.	Pregnant woman (20 weeks and more)	30
11.	One sided orphan	43
12.	Child of a single mother	26
13.	Child of divorced family	26
14.	Two sided orphan	50
15.	Single pensioner	36
16.	Elderly pensioner (75 years and more)	39
17.	A person not belonging to any social group	20

Source: Ministry of Social Welfare of the Republic of Armenia, A system for vulnerability assessment, Experience and analysis, Yerevan, 1999

Annex 2

Questionnaire form for the identification of cases

Date of completion ___ _____

Interviewer name _____

Hospital _____

Case

1. Name_____

2. Date of birth ___ _____19

3. Sex

M ⊙ F ⊙

4. Home address _____

5. Date of admission ___ _____19

6. Diagnosis

a) Main_____

b) Accompanying _____

7. Treatment outcome:

a) Discharge

Yes ⊙ No ⊙

b) Death

Yes ⊙ (go to #9) No ⊙

8. Date of discharge ___ _____19 (go to #11)

9. Date of death ___ _____19

10. Cause of death

a) Immediate cause of death _____

b) Conditions (if any) lead to the immediate death _____

11. Registration in PAROS 1 database

Yes ⊙ No (go to #17) ⊙

12. Date of registration ___ _____19

13. Individual vulnerability score _____

14. Household vulnerability score _____

15. Head of household _____

16. Number of children under 18 in the family ___

17. Registration in PAROS 2 database

Yes ⊙ No ⊙

18. Date of exclusion from PAROS ___ _____19 (end of questionnaire)

19. Date of registration ___ _____19

20. Individual vulnerability score _____

21. Household vulnerability score _____

22. Head of household _____

23. Number of children under 18 in the family____

Thank you

Annex 3

Questionnaire form for the identification of controls

Date of completion ___ _____

Interviewer name _____

Respondent:

Mother ⊙ Proxy ⊙

Control

1. Name_____

2. Date of birth ___ _____19

3. Sex

M ⊙ F ⊙

4. Home address _____

5. Has your child been seek during the period 1 January – 31 December 1999?

Yes ⊙ No ⊙

6. Has your child been advised by doctor to be hospitalized during the period 1 January – 31 December 1999?

Yes ⊙ No ⊙ (go to #15)

7. Has your child been hospitalized during the period 1 January – 31 December 1999?

Yes ⊙ (go to #9) No ⊙

8. Could you please, mention the reason why your child has not been hospitalized?

_____

9. Could you please, mention the hospital where your child has been hospitalized?

_____

10. Could you please recall when your child has been hospitalized?

_____

11. What was the diagnosis? (if possible check in hospital record)

c) Main_____

d) Accompanying _____

12. What was the treatme nt outcome:

c) Discharge

Yes ⊙ No ⊙

d) Death

Yes ⊙ No ⊙

13. Date of death ___ _____19

14. Cause of death (if possible check in hospital record)

c) Immediate cause of death _____

d) Conditions (if any) lead to the immediate death _____

15. Registration in PAROS 1 database

Yes ⊙ No ⊙ (go to #21)

16. Date of registration ___ _____19

17. Individual vulnerability score _____

18. Household vulnerability score _____

19. Head of household _____

20. Number of children under 18 in the family ___

21. Registration in PAROS 2 database

Yes ⊙ No ⊙

18. Date of exclusion from PAROS ___ _____19 (end of questionnaire)

19. Date of registration ___ _____19

20. Individual vulnerability score _____

21. Household vulnerability score _____

22. Head of household _____

23. Number of children under 18 in the family____

Thank you