Determinants of Some Health Indicators in the Squatter Areas of Amman*

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Abstract

A principal benefit of upgrading projects is the improvement of people's health. As for the question of measuring the health status, two indicators are considered: proportion of children dying before attaining age 3 years and weight-for-age confined to the same age group of children. Socioeconomic and demographic determinants of these indicators are analyzed using multiple regression analysis and multiple classification analysis. Data used in this research are derived from the 1985 Amman Follow-Up Health and Population Survey***.

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1. Introduction

Urbanization, in the sense of proportionate increase of the urban population, and its consequences has been one of the most serious problems during the last few decades (Teller, 1981[1]). This issue has largely affected economic, social and physical structure of the urban communities (Harpham, 1986[2]). Recent figures, in the developing countries, show that the rate of urban growth has reached a very high level and 50 percent of the urban population will be living in very poor settlements (Donohue, 1982[3]). Such phenomenon has resulted in poverty, high child mortality, poor health conditions, environmental pollution, low housing quality, shortage in water supply and other social and economic problems.

The process of urbanization has been accompanied, in the recent years, by a tremendous change in policy makers' consideration towards health, nutrition and disease (Edmonston, 1982[4]). This shift has been implied in defining these aspects within environmental framework rather than just in terms of medical technology. This line of thinking has been translated, in real life, by including economic, social, medical, health and environmental aspects in any development plan.

2. Urban Setting in Jordan and the Amman Urban Development Projects

The East Bank of Jordan has a population of approximately 2.599 million with 70 percent of this population living in the urban areas (ESCWA, 1984[5]). About 75 percent of the urban

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1 C. Teller, "The Population Dynamics of Urbanization and Some Implications for the Health Sector," Pape prepared for the PAHO/AMRO Regional Technical Consultation on the Development of Health Services an Primary Health Care in Urban Areas and Big Cities (1981), Washington.

2 T. Harpham, "Review Article: Health and the Urban Poor," Health Policy and Planning 1 (1986), No. 1, 5-18.

3 J. Donohue, "Facts and Figures on Urbanization in the Developing World," Assignment Children 57-58 (1982 21-41.

4 B. Edmonston, "Community Variations in Infant and Child Mortality in Rural Jordan," Working paper (1982 Cornell University.

5 ESCWA, "Demographic and Related Socioeconomic Data Sheets for Countries of the Economic and Soci Commission for Western Asia," (1984), No. 4, 69-72.

population live within the borders of the capital city of Amman (Bisharat and Tewfik, 1985[6]). This rapid growth in the size of Amman and other cities has been caused by high level of fertility compounded by severe influxes of refugees and displaced persons from the occupied Arab territories (Bisharat and Zagha, 1987[7]).

Despite the continuous efforts of the Government of Jordan to improve health and environmental conditions, it is still felt that the problems of the poorest of the urban population should be tackled through urban projects, rather than just recognizing them within national urban strategies (Urban Development Department, 1982[8], Tekce and Shorter, 1984[9]).

Following the new approach of development, Urban Development Department (UDD) was established in 1980. The task of the UDD is to develop and implement upgrading projects in the poorest urban sites in Jordan. While the mandate of the UDD emphasized physical implementation, it also involves raising the standard of water and electricity supply, sanitation and social amenities, providing access to low cost housing, establishing training centers and organizing programs in health education (Urban Development Department, 1982[10]).

The first wave of the UDD activities took place in five squatter areas in East Wahdat, Jebel Jofeh, Wadi Rimam, Wadi Haddadeh and Nuzha between November 1980 and April 1981. Subsequent project was confined to the first three sites until late 1984 when Nazha was again given upgrading priority. Wadi Haddadeh was dropped out of the project as a result of a dispute over a

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6 L. Bisharat and M. Tewfik, "Housing the Urban Poor in Amman: Can Upgrading Improve Health?", Third World Planning Review 7 (1985), No. 1, 54-23.

7 L. Bisharat and H. Zagha, "Health and Population in Squatter Areas of Amman: A Reassessment After Four Years of Upgrading," (1987), Urban Development Department, Amman, Jordan.

8 Urban Development Department, "A Baseline Health and Population Assessment for the Upgrading Areas of Amman," (1982, reissued by the Population Council, 1984).

9 B. Tekce and F. Shorter, "Determinants of Child Mortality: A Study of Squatter Settlements in Jordan," (1984) in Mosely and Chen (eds.), Child Survival Strategies, 257-280.

10 Urban Development Department, op. cit.

highway planned to pass through this site (Bisharat and Zagha, 1987[11]).

3. Upgrading and Health

Improved health is assumed to be one of the most significant outcomes of the upgrading projects. Signs of health benefits would be the concern of health policy planners for evaluation purposes and future planning.

As for the question of measuring the health status of the population, two indicators are considered of particular importance in health assessment: proportion of children dying between birth and age 3 years and weight-for-age confined to children in the same age group (Bisharat, 1985[12]; Tekce and Shorter, 1984[13]; Mosely, 1984[14]; Wolfe and Behrman, 1982[15]). These variables are selected because they are important indexes of the prevailing socioeconomic welfare and measure, to a large extent, the impact of access to project-supplied inputs.

4. Data and Estimation Techniques

4.1 Data

Data used in this paper are derived from the inventory of the Amman Follow-up Health and Population Survey which was conducted by the UDD in 1985. This survey is more of a census than a sample and it contains information about household characteristics, person records, birth histories, environmental conditions and health status. The data appear to be of excellent quality and

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11 L. Bisharat and H. Zagha, op. cit.

12 L. Bisharat, "Methodological Summary: Amman Follow-up Health and Population Assessment," Unpublished Report Prepared for UDD (1985).

13 B. Tekce and F. Shorter, op. cit.

14 W. Mosely, "Child Survival: Research and Policy" (1984), in Mosely and Chen (eds.), Child Survival Strategies, 3-24.

15 B. Wolfe and J. Behram, "Determinants of Child Mortality, Health and Nutrition in a Developing Country," Journal of Development Economics 11 (1982), 163-193.

epresent a complete coverage of births. Mosely (1985[16]) has pointed to the Amman Study as one of those enriched with information about the proximate determinants of health. A full description of all modules and coding of all variables is well documented in the User's Manual (1985[17]).

The main objective of this survey is to study the demographic, socioeconomic and health characteristics of a number of the squatter areas in Amman; and evaluate the upgrading process being implemented by the UDD in some of these sites (Bisharat and Zagha, 1987[18]).

4.2 Estimation Techniques

Two multivariate techniques are used in analyzing child mortality and weight-for-age: ordinary least squares (OLS) multiple regression analysis and multiple classification analysis (MCA).

However, the application of an OLS method requires solving the problem of dealing with categories instead of continuous normally distributed and linearly related variables (Sonquist, 1970[19]). These problems can be solved by assigning arbitrary scales or dummy variables to different categories (Suits, 1957[20]; Hill, 1959[21]) and then employing more appropriate procedures, such as Logit or Tobit regression, to estimate the coefficients of the model (Tobin, 1958[22];

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16 W. Mosely, "Biological and Socio-economic Determinants of Child Survival. A Proximate Determinants Framework Integrating Fertility and Mortality Variables," Papers and Proceedings of the International Population Conference, Florence 5-12 June (1985), Brussels: IUSSP, 189-202.

17 Urban Development Department, User's Manual for the Amman Follow-up Health Assessment (1985), Amman, Jordan.

18 L. Bisharat and H. Zagha, op. cit.

19 J. Sonquist, Multivariate Model Building: The Variation of a Search Strategy, ISR, The University of Michigan (1970), Ann Arbor, Michigan.

20 D. Suits, "The Use of Dummy Variables in Regression Equations," Journal of the American Statistical Association 52 (1957), 548-551.

21 J. Hill, "An Analysis of the Distribution of Wages and Salaries in Great Britain," Econometrica 27 (1959), 355-381.

22 J. Tobin, "Estimates of Relationships for Limited Dependent Variables," Econometrica 26 (1958), 24-36.

Goldberger, 1964[23]). However, it has been shown (Trussell and Preston, 1982[24]) that the OLS usually gives similar results to the more elaborate and expensive procedures.

Multiple classification analysis (MCA), which was proposed by Yates (1934[25]) and refined by others, is widely used for the multivariate analysis of the socioeconomic and environmental variations in childhood mortality (Little, 1982[26]; Edmonston, 1982[27]; Tekce and Shorter, 1984[28]). Although, MCA is viewed as a simple form of regression, it is preferred in mortality studies for several reasons. First, it separates the impact of independent variables on child mortality in the case of highly intercorrelated factors. Second, MCA is more suitable than OLS for the analysis of non-continuous categorical independent variables, such as those in the present analysis of health determinants. Third, unlike the OLS and other standard regressions, the application of MCA does not require linear relationships between the dependent variable and independent variables. Fourth, by using the MCA technique, the researcher can see the change in the effect of a certain variable when other correlated variables are included in the analysis.

Nevertheless, if one is just interested in determining the magnitude and direction of relation with the dependent variable, regression techniques provide good estimates of the coefficients of independent variables and significance of each coefficient based on the t-test. However, it should be noted that one can not estimate the total effect of all factors on the dependent variable by adding up the estimated coefficients, because the individual effects are not additive.

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23 A. Goldberger, Econometric Theory, John Wiley (1964), New York.

24 J. Trussell and S. Preston, "Estimating the Covariates of Childhood Mortality from Retrospective Reports of Mothers," Health Policy and Education 3 (1982), 1-36.

25 F. Yates, "The Analysis of Variance with Unequal Numbers of the Different Classes," Journal of the American Statistical Association 29 (1934), 51-66.

26 R. Little, "Direct Standardization: A Tool for Teaching Linear Models for Unbalanced Data," The American Statistician 36 (1982), No. 1, 38-43.

27 B. Edmonston, op. cit.

28 B. Tekce and F. Shorter, op. cit.

Although it is possible to consider interactions in a MCA model, it is assumed that the effects of different independent variables are additive and each categorical net effect represents deviation from the grand mean if other independent variables are kept constant. This approach was followed in dealing with the 1980-1981 baseline data (Tekce and Shorter, 1982[29]) and it is adopted here so that the results can be compared.

5. Differentials in Child Mortality and Weight-for-Age

5.1 Child Mortality

5.1.1 Socioeconomic Determinants of Child Mortality

In the present research, determinants of child mortality are analyzed regardless of the site of residence.

Mother's education has been shown to be the most significant variable in child mortality analysis (Tekce and Shorter, 1984[30]; El-Atoum, 1983[31]; Caldwell, 1979[32]). It influences mortality rates, through several intermediate variables, from conception to early years of childhood. This factor is also of particular concern because it reflects, to a certain extent, the family standard of living. Educational attainment is defined here as a dichotomous socioeconomic variable between illiterate and literate mothers.

Housing forms the main family capital asset and it has been considered, along with mother's education, an important indicator of the family standard of living. Following the same approach of Tekce and Shorter (1984[33]), housing quality is defined in a way which reflects the condition of the unit and types of facilities available in it. The households are divided into the following three

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29 B. Tekce and F. shorter, op. cit.

30 B. Tekce and F. Shorter, op. cit.

31 S. El-Atoum, "Infant and Child Mortality Differentials in Amman- Balqa: Estimates from 1976, Jordan National Fertility Survey," Dirasat 10 (1983), No. 2, 15-63.

32 J. Caldwell, "Education as a Factor in Mortality Decline: An Examination of Nigerian Data," Population Studies 33 (1979), No. 3, 395-413.

33 B. Tekce and F. Shorter, op. cit.

classes according to the material used in roof and wall construction: 1 - first class housing if both roof and wall material are permanent; 2 - second class housing if any one of them is permanent and the other is temporary and finally 3 - third class housing if both roof and wall material are temporary.

Total monthly household income represents the level of family welfare and it measures the power of the household to purchase food, clothes, medical and health services and different types of household amenities. The households are categorized in two groups: households with income below the median and households with income above the median.

To examine socioeconomic determinants of child mortality, a method first suggested by Brass (1968[34]) and later refined by others (Sullivan, 1972[35]; Trussell, 1975[36], Feeney, 1980[37]) is used to estimate the probability of dying before attaining age a(=2, 3, and 5), q(a). It should be mentioned that the West Model Life Table is used throughout the analysis because it was used in the 1980-1981 baseline study (Tekce and Shorter, 1984[38]) and it is reasonable to be used here for comparison purposes. Moreover, there is no evidence from the demographic structure of the country and change of parameters over time to assign it to any one of the patterns.

To maintain a sufficient number of cases which yield reasonably robust estimates, the results for the three age groups, 20-24, 25-29, and 30-34 were expressed in terms of levels using the Model Life Tables (Coale and Demeny, 1966[39]). The average of these levels is calculated and

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34 W. Brass et al, The Demography of Tropical Africa, Princeton University Press (1968), Princeton, N.J.

35 J. Sullivan, "Models for the Estimation of the Probabilities of Dying Between Birth and Exact Ages of Early Childhood," Population Studies 26 (1972), No. 1, 79-97.

36 J. Trussell, "A Re-Estimation of the Multiplying Factors for the Brass Technique for Determining Childhood Survivorship Rates," Population Studies 29 (1975), No. 1, 97-108.

37 G. Feeney, "Estimating Infant Mortality Trends from Child Survivorship Data," Population Studies 34 (1980), No. 1, 109-128.

38 B. Tekce and F. Shorter, op. cit.

39 A Coale and P. Demeny, Regional Model Life Tables and Stable Populations, Princeton University Press (1966), Princeton, N.J.

expressed in terms of the standard probability of dying between birth and age 3 years by interpolating from the Coale and Demeny Model Life Tables. This procedure is repeated for different categories and the results are presented in Table 5.1.

Table 5.1. Proportion of Children Dying (Per 1000 Births) by Socioeconomic Determinants (Confined to Women Aged 20-34). Amman Follow-Up, 1985.

Socioeconomic Variable	Number of Children Ever Born	Number of Dead Children	Proportion Dead	Standard Proportion Dying up to Age 3
Mother's Education				
Illiterate	618	42	68.0	80.8
Literate	1562	86	55.1	71.5
Housing Quality				
First Class	1758	94	53.5	59.8
Second Class	148	13	87.8	86.4
Third Class	272	21	77.2	98.5
Household Income				
Below the Median	902	66	73.2	79.8
Above the Median	1278	62	48.5	47.8
TOTAL	2180	128	58.7	65.0

5.1.2 OLS Estimates of the Effects of Socioeconomic Determinants on Child Mortality

To examine mortality differentials by a multivariate method, the dependent variable should be defined in a way which takes into account differing periods of exposure. As suggested by Trussell and Preston (1982[40]), the ratio of the actual number of deaths among a woman's children ever born to the expected number of deaths, calculated for all women in the same age group, is used as a dependent variable. Estimates of the coefficients are obtained by OLS regression weighting by each woman's number of children ever born.

Since this study is concerned with evaluating the effect of the UDD interventions, between 1980-1981 and 1985, on child mortality, the calculation of the ratio is confined to women in the age

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[40] J. Trussell and S. Preston, op. cit.

groups 20-24, 25-29 and 30-34. This approach produces estimates of child mortality in the study period and excludes the deaths which occurred prior to 1980-1981.

The independent variables are mother's literacy, housing quality and household income. These factors are included in the regression with the following values:

Mother's Education: 0 = illiterate, 1 = literate

Housing Quality: 1 = first class, 2 = second class, 3 = third class

Household Monthly Income: 0 = below the median, 1 = above the median.

The results of this regression are summarized in Table 5.2.

Table 5.2. OLS Estimates of the Effects of Socioeconomic Determinants of Child Mortality (for Women Aged 20-34). Amman Follow-up, 1985

Variable	Coefficient ($\hat{B}$)	Significance of Coefficient (α)	Explained Variability in the Dependent Variable (R^2)
Mother's Literacy	-0.2180	≤0.01	
Housing Quality	+0.0830	≤0.10	
Household Income	-0.3190	≤0.001	
Constant (c)	+1.4230	≤0.001	
			0.020

The directions of the effects are plausible and all of them are highly significant. However, the monthly household income has the highest proportionate effect on proportion dead among children ever born for women aged 20-34, while housing quality has the lowest.

5.1.3 MCA Gross and Net Effects of Socioeconomic Variables on Child Mortality

The dependent variable and socioeconomic independent variables are defined exactly as in subsection 5.1.2. The results of the MCA technique are presented in Table 5.2.

Table 5.3. Gross and Net Effects of Socioeconomic Variables on Child Mortality (for Women Aged 20-34). Amman Follow-up, 1985.

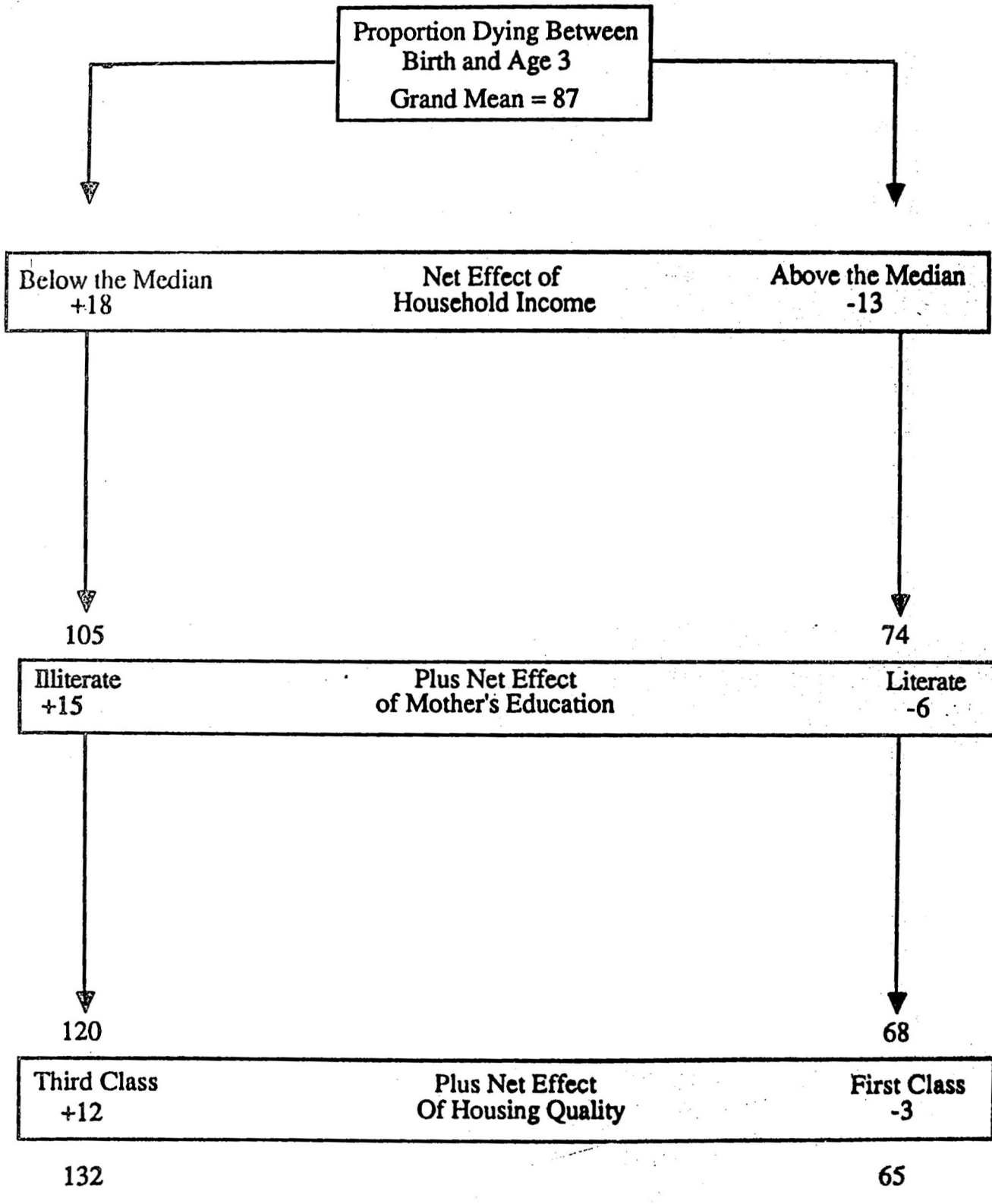
Socioeconomic Variables	Number of Children Ever Born	Gross Effect on the Proportion Dying up to Age 3	Net Effect Dying
Household Income			
Above the Median	1278	-15	-13
Below the Median	921	+20	+18
Mother's Education			
Literate	1572	-7	-6
Illiterate	627	+18	+15
Housing Quality			
First Class	1766	-5	-3
Second Class	155	+24	+14
Third Class	278	+17	+12

Grand Mean = 87 deaths per 1000 births
R^2 = 0.0140

The results in Table 5.3 show that all the variables have plausible effect on the proportion dead among children ever born. In rank order, the size of the effects puts household monthly income first, followed by mother's education and housing quality.

The effects of these major factors can be summarized as shown in Figure 5.1. At one extreme, the children born into households with income below the median, with illiterate mothers and with the poorest quality of housing, 132 per thousand die before they reach the age of 3 years. At the other extreme where all conditions are most favorable, the mortality rate is 65 per thousand births.

Figure 5.1: Net Effects of Mothers's Literacy, Housing Quality and Monthly Household Income on Child Mortality (For Women Aged 20-34): Amman Follow-Up, 1985



Source: Urban Development Department, "A Baseline Health and Population Assessment for the Upgrading Areas of Amman," (1982, reissued by the Population Council, 1984).

As the gross effect is an unadjusted deviation, of a certain category, from the grand mean, the net effect is the deviation adjusted for independents and covariates, the gross effect of a variable can be decomposed into its own net effect plus the additional effects of the variable which is associated with it. Mother's education and household income seem to be highly independent. This is indicated by the small difference between the gross and net effects. Housing quality seems to be more dependent on household income and mother's education and therefore, a decomposition of its gross effect is given in Table 5.4.

Table 5.4. Decomposition of Gross Effect of Housing Quality on Proportion Dying Before Age 3 Per 1000 Births. Amman Follow-up, 1985.

Children Ever Born by Socioeconomic factors

	Household Income				
	Below Median		Above Median		
Housing	Mother's Education		Mother's Education		
Quality	Illiterate	Literate	Illiterate	Literate	All
1st	143	474	255	835	1707
2nd	56	35	14	42	147
3rd	39	94	49	80	262
All	238	603	318	957	2116

Decomposition Steps

Effect of Housing:

Grand Mean = 87

Gross Effect of Housing

Third Class	+17
First Class	- 5
	(+17) - (-5) = 22

Net Effect of Housing

Third Class	+12
First Class	- 3
	(+12) - (-3) = 15

Difference Between Gross Effect and Net Effect = 22 - 15 = 7

Effect of Associated Factors:

Factor	Net Effect	Number of Children Ever Born 3rd Class Housing		1st Class Housing	
Household Income					
Below Median	+18	133		617	
Above Median	-13	129		1090	
Weighted Average Effect		+(2)	-	(-2)	= 4
Mother's Education					
Illiterate	+15	88		398	
Literate	-6	174		2181	
Weighted Average Effect		+(1)	-	(-2)	= 3
TOTAL					7

5.2 Weight-for-Age

5.2.1 Data and Standardization

Weight is assumed to be a significant indicator of health especially for children under age 3 years. Low weight is associated with different problems throughout childhood and it is a sign of malnutrition.

Because of the importance of this indicator, standard growth charts have been developed to measure the divergence of weight-for-age from an expected value. Harvard and WHO standards are widely used for this purpose. The Harvard standards were used in measuring the nutritional impact from the 1980-1981 baseline health data (Urban Development Department, 1982[41]) and they are utilized here for comparison.

The 1985 Amman Follow-up health data consist of two sets. First, 246 children, under age 3 years, in households which were included in the 1980-1981 baseline health sample were identified and weighed. This set of data is recognized, in the analysis, as the 1985 Health Sample. Second, all children, under age 3 years, in the upgrading sites, were identified and weighed, using the same scale. This survey took place during the first few weeks of 1986 and covered 886

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41 Urban Development Department, op. cit.

ldren. The data of this survey will be recognized in the analysis as the 1985 Child Weight.

Child's weight, which is assessed by sex and age in completed months, is divided by the dian weight for that age and sex group. The result is multiplied by 100 in order to give the child andardized weight expressed as a percentage of the reference value.

The standardized weights fluctuate about an average of 100. The World Bank (1981[42]) ups the children according to this measure as follows:

Normal	Over 90
First Degree Malnutrition	76-90
Second Degree Malnutrition	60-75
Third Degree Malnutrition	Below 60

owever, in a healthy population about 85 percent of the children are expected to have standardized ight above 90.

2. Dependent and Independent Variables

The dependent variable, which is the same in OLS regression and MCA, is a dichotomy with ero value if the standardized weight is less than or equal to 90 and one if it is more than 90.

The independent variables, besides the three socioeconomic factors introduced in section 5.1, sex of the child with values 1 for male and 2 for female, age of the mother with values range tween 15 and 49 and number of children ever born for the mother.

23 OLS Results

The independent variables are entered in one regression and the results are presented in Table

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The World Bank, "Guidelines for Nutrition Sector Work," Population, Health and Nutrition Department (1981), Washington, D.C.

Table 5.5 Socioeconomic and Demographic Effects on the Standardized Weight for Children Under Age 3 Years. 1985 Health Sample and 1986 Child Weight

I. 1985 Health Sample

Variable	Coefficient ($\hat{B}$)	Significance of $\hat{B}$ (α)	Explained Variability (R^2)
1. Number of Children Ever Born	0.0163	≤0.30	
2. Sex of Child	-0.1822	≤0.01	
3. Household Income	0.0726	≤0.30	
4. Housing Quality	-0.0318	≤0.55	
5. Mother's Literacy	-0.1262	≤0.15	
6. Mother's Age	-0.0087	≤0.25	
Constant (c)	1.0583	≤0.01	0.049

II. 1985 Child Weight

Variable	Coefficient ($\hat{B}$)	Significance of $\hat{B}$ (α)	Explained Variability (R^2)
1. Number of Children Ever Born	-0.0042	≤0.60	
2. Sex of Child	-0.1216	≤0.01	
3. Household Income	0.0876	≤0.01	
4. Housing Quality	-0.0589	≤0.05	
5. Mother's Literacy	-0.0130	≤0.75	
6. Mother's Age	0.0033	≤0.40	
Constant (c)	0.6338	≤0.01	0.033

5.2.4 MCA Results

Number of children ever born and age of mother are excluded from the analysis. The results of the MCA technique are summarized in Table 5.6.

Table 5.6. Gross and Net Effects of Socioeconomics Variables and Sex of the Child on the Standardized Weight for Children Under Age 3 Years. 1985 Health Sample and 1986 Child Weight

I. 1985 Health Sample

Variable	Number of Children Ever Born	Gross Effect On Standardized Weights	Net Effect On Standardized Weights
Mother's Education			
Literate	77	0.05	0.06
Illiterate	145	-0.03	-0.03

Housing Quality			
First Class	189	0.01	0.01
Second Class	11	-0.17	-0.16
Third Class	22	0.01	-0.01
Household Income			
Above the Median	142	0.02	0.02
Below the Median	80	-0.03	-0.04
Sex of the Child			
Male	119	0.08	0.08
Female	103	-0.09	-0.09

Grand Mean = 0.62
R^2 = 0.047

II. 1985 Child Weight

Variable	Number of Children Ever Born	Gross Effect On Standardized Weights	Net Effect On Standardized Weights
Mother's Education			
Literate	552	-0.01	-0.01
Illiterate	282	0.02	0.02
Housing Quality			
First Class	694	0.02	0.02
Second Class	49	-0.14	-0.13
Third Class	91	-0.07	-0.07
Household Income			
Above the Median	487	0.04	0.04
Below the Median	347	-0.06	-0.05
Sex of the Child			
Male	437	0.06	0.06
Female	397	-0.07	-0.07

Grand Mean = 0.59
R^2 = 0.036

5.2.5 Some Comments on the Weight-for-Age OLS and MCA Results

An examination of the results presented in Table 5.5 (II) shows that the effects of sex, housing quality and household monthly income are highly significant. As expected, standardized weight decreases as age of mother and parity increase but the coefficients are not significant.

The results of the MCA technique, as presented in Table 5.6 (II), show the same pattern of relationship.

However, it should be noted that mother's education has no independent effect because it is highly correlated with housing quality and monthly household income. Thus, to some extent, the variability in the standardized weight which could be ascribed to educational attainment of the mother has been absorbed by the associated independent variables.

6. Summary and Conclusions

The objective of this paper has been to analyze the determinants of trends and differentials in child mortality and weight-for-age, both confined to children under age 3 years, in the squatter areas of Amman. Knowledge of these determinants is important to understand the mechanisms through which they affect these health indicators and to alter them by implementing upgrading projects.

The statistical techniques have identified several factors contributing to the decline in child mortality and to the increase in the standardized weight. The main findings can be summarized as follows:

1. Mother's education has a highly significant effect on child mortality and further advances in this direction are expected to achieve more improvements.

   As mentioned earlier, this factor has not shown a significant effect on the standardized weight. This result does not reflect the exact influence of mother's education because it is strongly associated with housing quality and household income and most of the variability in the dependent variable could have been absorbed by these characteristics. However, mother's education is expected to have more effect in the third class and low income households.

2. The access to good quality housing has a substantial impact on both child mortality and weight-for-age. This variable is of particular importance because it represents physical characteristics which are directly influenced by the UDD interventions.

3. The household monthly income or the purchasing power has a large proportionate effect on child mortality and weight for age. This result is in sharp contrast to

some findings in the developing countries (Wolfe and Behram, 1982[43]). Nevertheless, in the setting of the squatter areas, any raise in the monthly income is expected to improve the family welfare and its ability to purchase food, clothes and medical and health services.

43 B. Wolfe and J. Behram, op. cit.