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The Determinants of Infant and Child Mortality[1] in Korea: 1955-1973

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Ⅰ. Introduction

Infant and child mortality varies among individual families, partly because of differences in the demographic characteristics of the mothers. It has been known for a long time that younger or older women, higher parity women, and those with less than optimal birth spacing are more likely to experience infant or child loss (e.g., Wray, 1972; Bouvier and van der Tak, 1976; Federici and Terrenato, 1980; Arriaga, 1980; Edmonston, Greene and Smith, 1981; Winicoff, 1983; Trussell and Hammerslough, 1983; Rutstein, 1983; Hobcraft, McDonald and Rutstein, 1983; Ruzicka, 1984; Gubhaju, 1984; de Sweemer, 1984). Furthermore, previous foetal or infant loss in the family increases the risk that a pregnant woman will again lose a child (Bouvier and van der Tak, 1976). In the developing countries previous child loss is considered one of the most important factors for the survival chances of subsequent children (Swenson, 1978; Chowdhury, 1981; Gubhaju, 1984).

The inverse relationship between socioeconomic status of the parents and infant mortality reflects differences in parental knowledge and skills among individual families, as well as variations in family resources (Frenzen and Hogan, 1982). Father's education, mother's education and father's occupation each has independent effects upon infant survival in the developed(MacMahon, Kovar and Feldman, 1972), as well as developing countries(Caldwell, 1979; Schultz, 1980; Caldwell, Reddy and Caldwell, 1983). Among those factors, mother's education has been found in some countries to have greater impact upon infant survival than that of the father, since mothers normally have more direct responsibilities for child care(Caldwell, 1979; Cochrane, 1980; Caldwell and McDonald, 1981; Frenzen and Hogan, 1982; Flegg, 1982).

Another important determinant of infant and child mortality is the mother's place of residence, which is frequently considered a proxy for living conditions (Arriaga, 1980; Arriaga and Hobbs, 1982; Hobcraft, McDonald and Rutstein, 1983). In many countries urban infant mortality has

1) This is a substantially revised part of *Mortality Transition in Korea: 1960-1980*, submitted for the degree of Ph D. in Demography to the Australian National University, 1986.

declined at a more rapid pace than in rural areas (Johnson, 1964).

This study, therefore, identifies the major factors which were associated with infant and child (age 1-4 years) mortality in Korea,[2] examining the demographic and socioeconomic differentials in infant and child mortality of the five-year birth cohorts during the period 1955-73 based on the 1974 Korean National Fertility Survey (KNFS).

Ⅱ. Methodology

In this analysis we excluded all children who were born less than one year before the survey for infant mortality and less than five years before the survey for child mortality, to eliminate the effect of truncation. We also excluded from the analysis the births that occurred before 1955 (that is, approximately 15 years before the survey) because of the uncertainty about completeness of reports on births and deaths which occurred in the remote past and to reduce the likelihood of source of the biases (see Park and Park, 1981; Ruzicka, 1984; Kim, 1986). Therefore, the present study includes children born between one and approximately 15 years before the survey for infant mortality and between 5 and approximately 15 years for child mortality. The birth cohorts are divided into the following periods: 1955-59, 1960-64, 1965-69, and 1970-73 for infant mortality and 1955-59, 1960-64, and 1965-69 for child mortality.[3]

Since demographic and socioeconomic variables are associated with each other (Hull and Gubhaju, 1984: 1; Frenzen and Hogan, 1982:398), to examine the net effect of each variable on infant and child mortality we have employed a logit-linear model, which is an efficient way to introduce the necessary statistical controls when the depedent variables are dichotomous and the independent variables are categorical (Goodman, 1972; Little, 1978: 23-25). Model-fitting in the subsequent analysis was carried out using a computer package GLIM (Generalized Linear Interactive Modelling), which was developed by the Royal Statistical Society and the Numerical Algorithm Groups (Baker and Nelder, 1978).

Ⅲ. Framework for Analysis

The present analysis is carried out with four models. The first model is used to study the impact of demographic factors on infant and child mortality, separately for urban and rural areas because the social and economic situations are still very different between the two areas in Korea (Korea, 1982). The factors included in this model are sex of the child (male, female), maternal age (less than 25 years, 25 to 29 years and 30 years and over), birth order (first birth, second to third births, fourth and higher order births), and year of birth (1955-59, 1960-64, 1965-69, 1970-73 for infant mortality and 1955-59, 1960-64 and 1965-69 for child mortality) to allow for time trend of infant and child mortality.

The second model includes the socioeconomic factors: mother's education (less than 6 years, 6 years and more), father's education (less than 9 years, 9 years and more), father's occupation (professional and clerical workers, farmers, and

2) Infant and child mortality in Korea were respectively 57.7 per thousand live births and 45.5 per thousand children aged one year in 1955~59 birth cohort, and declined to respectively 42.5 in1970~73 and 19.9 in 1965~69 (see Kim, 1986:43-48).

3) The 1974 KNFS was carried out from September 16 to December 5, 1974 (World Fertility Survey, 1978: 2) and the mid-date of the period was October 27, 1974. Therefore, the exact periods of the last cohorts are January 1970~October 1973 for infant mortality and January 1965~October 1969 for child mortality.

others),[4] number of rooms used (1, 2, 3 and more rooms). Year of birth, using the same classification as that used in the above model, is also added. This model is produced separately for urban and rural areas.

For the third model we select two demographic factors: maternal age and birth order; and two socioeconomic factors: mother's education and number of rooms used which were considered in the earlier two models as the most significant determinants of infant and child mortality. Here again, we add year of birth and analyse the model by urban and rural areas separately.

In the final model, two other important variables, namely previous birth interval (less than 24 months, 24 to 35 months, 36 months and more) and the survival of the previous birth to age one (alive at age one, died before age one) are incorporated. As we have observed in the preceding section, previous birth interval and survival of previous birth clearly affect infant and child mortality. However, there are two limitations to this model. One is that we have to ignore all first births because previous birth interval and survival of previous birth are inapplicable for them. The other is that there are too few cases of deaths of children whose older sibling died before one year old, to add many relevant variables for the model.[5] Therefore, we will examine the impact of previous birth interval and survival of previous birth when the effects of two demographic variables (maternal age and birth order) and two socioeconomic variables (mother's education and number of rooms used) are controlled. This model will not consider rural/urban residence and year of birth.

Ⅳ. Results

1. Effects of Demographic Variables on Infant and Child Mortality

Table 1 presents the result of the logit-linear model of the effects of demographic variables on infant mortality, for urban and rural areas separately.[6]

Only the effect of the sex of the child in urban areas and the effect of birth order in rural areas are statistically significant (with or without controls for the effects of the other demographic factors). Although the gross effect of birth order in urban areas is statistically significant at five per cent level, it disappears when the other demographic variables are controlled for.

In urban areas male children have 26 per cent (1.12/.89) higher risk of infant death than female children which confirms that sex differences in infant mortality reflect innate biological differences in infant liability (Scrimshaw, 1978). However, in rural areas the sex difference is not significant. This indicates that, in the Kor-

4) 'Professional and clerical workers' include professional, technical, administrative, managerial clerical and related workers. 'Farmers' include agricultural, animal husbandry and forestry workers, fisherman and hunters; and 'others' are sales, services, skilled and unskilled workers.

5) Among the total number of second and higher order births, in the period 1955~73, the number of births in which the previous sibling died before age one is 748 and the number of infant deaths among them is only 91. The number of children aged one whose previous sibling died before age one is 516 for the births in the period 1955~69 and the number of child deaths among them is only 23.

6) The results of logit-linear models of the effects of demographic and socioeconomic variables on infant and child mortality show the odds ratio for each specific category and likelihood ratio chi-square test (X_{LR}^2), degrees of freedom and corresponding probability value p, for each variable. The effects of each variable are divided into 'Gross Effect' and 'Net Effect.' The odds ratio indicates the relative risks of dying due to being in a specific category. The likelihood ratio chi-square, the degrees of freedom and p value associated with each variable indicate whether a particular variable is related to mortality in a statistically significant manner. The 'Gross Effect' column indicates the effect of the specific variable when the effects of other variables are not controlled for. The net effect of each of the variables on mortality, controlling for the effects of other variables, is shown in the 'Net Effect' column.

Table 1. Model IA: Logit-Linear Model of the Main Effects of Demographic Variables and Year of Birth on Infant Mortality by Place of Mother's Residence, Korea, 1955~73

Variables	Urban				Rural			
	Gross Effect		Net Effect		Gross Fffect		Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
SEX		4.4*		4.2*		.1		.2
Male	1.11		1.12		1.02		1.02	
Female	.88		.89		.98		.98	
MATERNAL AGE		1.4		1.0		2.6		2.0
~24	.91		.94		1.08		1.15	
25~29	1.03		1.07		.90		.94	
30+	1.08		.97		1.03		.94	
BIRTH ORDER		7.0*		5.6		9.4**		9.4**
1	1.00		1.04		1.16		1.04	
2~3	.86		.86		.82		.80	
4+	1.23		1.23		1.08		1.18	
YEAR OF BIRTH		2.9		2.2		7.6		7.5
1955~59	1.12		1.12		1.14		1.15	
1960~64	1.05		1.03		1.11		1.12	
1965~69	1.02		1.02		1.02		.94	
1970~73	.86		.88		.81		.81	
	Grand mean=.050				Grand Mean=.057			

Notes: 1) *Significant at 5 per cent level
**Significant at 1 per cent level
2) Sex has 1 degree of freedom; maternal age and birth order have 2 degrees of freedom each; year of birth has 3 degrees of freedom.

Source: The 1974 Korean National Fertility Survey

ean rural areas where the traditional value of children[7] is still strong (J.H. Cha, 1978), the better care for sons offsets the biological differences (see Scrimshaw, 1978) while in urban areas the differences are clear because of the change in parents' attitudes to their children, smaller family size, and higher proportion of neonatal deaths under lower infant mortality.

The net effect of birth order in rural areas is statistically significant: as expected, the second and third births have a lower risk of infant death than other births. In the urban areas the same pattern by birth order applies, but the effect is not significant. Maternal age is also generally considered as an important determinant of infant mortality (Gubhaju, 1984; Hull and Gubhaju, 1984). However, in both urban and rural areas in Korea, the effects of maternal age on infant mortality are no longer statistically significant, perhaps because of higher age at first marriage and comparatively early cessation of childbearing.[8]

7) The main values of children in Korea were continuation of the family, security for aging parents, labour for agricultural families (J.H. Cha, 1978: 867).

8) The proportions to total births for the extremely high or low age groups are too small to analyse (6 per cent for less than 20 years and 9 per cent for 35 years and over).

Table 2. Model IB: Logit-Linear Model of the Main Effects of Demographic Variables and Year of Birth on Child Mortality by Place of Mother's resldence. Korea, 1955~69

Variables	Urban				Rural			
	Gross Effect		Net Effect		Gross Effect		Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
SEX		1.5		2.2		1.0		.5
Male	.89		.88		.96		.96	
Female	1.12		1.15		1.05		1.05	
MATERNAL AGE		5.6		17.4**		11.9**		9.5**
~24	1.20		1.77		1.27		1.42	
25~29	1.03		1.03		1.02		1.05	
30+	.66		.41		.72		.67	
BIRTH ORDER		3.3		16.3**		3.2		5.4
1	.95		.68		1.25		.90	
2~3	.85		.77		.94		.81	
4+	1.27		2.15		.95		1.25	
YEAR OF BIRTH		19.5**		14.0**		24.7**		18.4**
1955~59	1.43		1.41		1.31		1.28	
1960~64	1.23		1.34		1.17		1.24	
1965~69	.54		.63		.61		.67	
	Grand Mean=.027				Grand Mean=.041			

Notes: 1) *Significant at 5 per cent level
**Significant at 1 per cent level
2) Sex has 1 degree of freedom; all remaining variables have 2 degrees of freedom each.
Source: The 1974 Korean National Fertility Survey

Table 2 presents the effects of demographic factors on child (1-4 years of age) mortality. This table shows very different results from those for infant mortality. The effects of the year of birth are significant in both urban and rural areas. This result may be greatly influenced by the change in socioeconomic environment,[9] as child deaths are more closely associated with socioeconomic factors than are infant deaths.

Contrary to their effects on infant mortality, the net effects of maternal age and birth order on child mortality are each statistically significant in the urban areas, and those of maternal age in the rural areas. Although the gross effects of maternal age and birth order on child mortality are not statistically significant in urban areas, when the effects of other variables are controlled the risk to the youngest maternal age group (24 years and less) is over four times (1.77/.41) as high as the risk to the oldest maternal age group and the risk to fourth or higher order births is over three times (2.15/.68) as high as to first births. These results may be caused by the strong negative relationships between number of births and age at marriage, and positive relationships between age at marriage and educational level. A similar effect of maternal age occurs in rural areas although the difference in

9) The First 5-Year Economic Development Plan was conmmenced in 1962. Thus, the mortality decline could have accelerated since then.

child mortality level is not as great as in urban areas.

Child mortality is mainly related to exogenous factors, so living conditions, mother's experience and attitude to child care may be more important than maternal age or birth order. Therefore, the risk of child death is lower for the older mothers who may have better living conditions and more experience in the care of children; first births have lower risk of child death because more care may be given to the first child especially by older mothers. Since these environmental effects on child mortality are stronger in more urbanized and lower-fertility societies, the values of X^2_{LR} are greater in urban than in rural areas.

2. Effects of Socioeconomic Variables on Infant and Child Mortality

Table 3 presents the resut of the analysis of the effects of socioeconomic variables on infant mortality in urban and rural areas.

In both areas the gross and net effects of mo-

Table 3. Model IIA: Logit-Linear Model of the Main Effects of Socioeconomic Variables and Year of Birth on Infant Mortality by Place of Mother's Residence, Korea, 1955~73

Variables	Urban				Rural			
	Gross Effect		Net effect		Gross	Effect	Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
MOTHER'S EDUCATION		14.6**		11.6**		12.8**		5.4*
~5 Years	1.41		1.45		1.14		1.11	
6+	.87		.89		.81		.86	
FATHER' EDUCATION		2.5		.3		6.0*		.3
~8 Years	1.12		.69		1.07		1.02	
9+ Years	.93		1.02		.81		.94	
FATHER'S OCCUPATION[1]		.6		.6		3.5		.4
Prof & Cler.	.92		1.06		.73		.87	
Farmers	1.01		.89		1.04		1.01	
Others	1.02		.98		.96		1.00	
NO. OF ROOMS USED		13.8**		15.1**		.2		.3
1	1.25		1.30		.98		1.04	
2	.81		.81		1.03		1.00	
3+	.84		.85		1.07		.96	
YEAR OF BIRTH		2.8		2.7		7.4		4.4
1955~59	1.12		1.12		1.13		1.11	
1960~64	1.05		1.06		1.11		1.10	
1965~69	1.02		1.02		.94		.95	
1970~73	.86		.86		.81		.85	
	Grand Mean=0.50				Grand Mean=.057			

Notes: 1) 'Prof & Cler.' includes professional, technical, administrative, managerial, clerical & related workers.
2) *Significant at 5 per cent level
**Significant at 1 per cent level
3) Mother's and father's education have 1 degree of freedom each; father's occupation and number of rooms used have 2 degrees of freedom each; year of birth has 3 degrees of freedom.

Source: The 1974 Korean National Fertility Survey

ther's education on infant mortality are statistically significant. When the effects of other variables are controlled the risk of infant mortality among the births to mothers educated 5 years or less is 63 per cent (1.45/.89) higher in urban areas and 29 per cent (1.11/.86) higher in rural areas than among births to mothers educated 6 years and over. On the other hand, although the effect of father's education without control for the effects of other variables is statistically significant in rural areas, no significant net effects of father's education are found in either urban or rural areas. This indicates that increasing female education has played a major role in the decline of infant mortality, and the education of mothers has had more impact upon infant survival than that of fathers (see also Caldwell, 1979; Cochrane, 1980).

The effect of number of rooms used, however, is significant for both gross effects and net effects in urban areas while it is insignificant in rural areas. Generally, economic variables may have less effect on infant mortality. However, if the house is too small for the family to live in, the crowded circumstances may seriously affect infant mortality (see Mounroe and Munroe, 1971). Although the patterns of the odds ratios in the 'Net Effect' column in both urban and rural areas are the same, the situation is more serious in urban areas: the risk of death when the infant shares only one room with its family in urban areas is 53 per cent (1.30/.85) to 60 per cent (1.30/.81) higher than if the family shares two rooms or three or more rooms, respectively.

In the case of child mortality in Table 4 the gross effects of the socioeconomic variables on child mortality in both urban and rural areas are statistically significant, except for father's occupation in urban areas. However, after the effects of other socioeconomic variables and the year of birth are controlled for, only the effects of mother's education in rural areas and number of rooms used in both urban and rural areas remain statistically significant.

In rural areas the net effect of mother's education still remains a significant determinant of child mortality. The risk of child death to mothers educated 5 years or less is 47 per cent (1.16/.79) higher than to others, which is a steeper gradient than the 29 per cent for rural infant mortality shown in Table 3. However, mother's education is not any more a significant factor on child mortality in urban areas. This result suggests that in a rural society where traditional customs and values are still strong the roles of mothers are still important for children's surviving during early childhood.

We noted earlier the effect of the family's living conditions (approximated by the number of rooms used to live in by the family) on infant mortality. As far as child mortality is concerned, in the urban areas living conditions exhibit a stronger effect than any of the other socioeconomic variables used in this model. The risk of death between exact ages 1 and 5 for children sharing one room with their parents is over 1.5 to nearly 2.5 times as high as for children living in better conditions.[10] In rural areas this effect on child mortality becomes statistically significant, although it is not significant for infant mortality. Since the number of rooms used is an approximate measure of the living status of the family it is not surprising that in a society where living space is limited and houses are in short supply, the effect of number of rooms is

10) The inverse J-shape of the effects of number of rooms used on child mortality in urban areas was still observed even after controlling for the effects of other variables, which result may be due to some urban characteristics, such as short supply of housing, smaller family size, economic hardship for a big house in urban areas (see Kim, 1986: 173-174).

Table 4. Model IIB: Logit-Linear Model of the Main Effects of Socioeconomic Variables and Year of Birth on Child Mortality by Place of Mother's Residence, Korea, 1955~69

Variables	Urban				Rural			
	Gross Effect		Net Effect		Gross Effect		Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds ratio	X^2_{LR}
MOTHER'S EDUCATION		4.3*		.1		16.7**		6.2*
~5 Years	1.31		1.06		1.20		1.16	
6+ Years	.88		.98		.68		.79	
FATHER'S EDUCATION		7.9**		2.8		8.9**		.4
~8 Years	1.32		1.24		1.10		1.03	
9+ Years	.79		.87		.68		.91	
FATHER'S OCCUPATION[1]		5.0		3.1		8.3*		4.7
Prof & Cler	.88		1.10		.56		.75	
Farmers	1.73		1.52		1.10		1.10	
Others	.95		.92		.78		.77	
NO. OF ROOMS USED		12.8**		15.5**		6.0*		10.8**
1	1.39		1.55		1.40		1.69	
2	.61		.62		1.08		1.09	
3+	.96		.96		.87		.85	
YEAR OF BIRTH		19.6**		18.7**		25.1**		23.3**
1955~59	1.42		1.54		1.32		1.37	
1960~64	1.24		1.36		1.17		1.23	
1965~69	.54		.59		.60		.64	
	Grand Mean=.027				Grand Mean=.042			

Notes: 1) 'Prof. & Cler.' includes professional, technical, administrative, managerial and related workers.
2) *Significant at 5 per cent level
**Significant at 1 per cent level
3) Mother's and father's education have 1 degree of freedom each all remaining variables have 2 degrees of freedom each

Source: The 1974 Korean National Fertility Survey

greater for child than for infant mortality.

3. Effects of Both Demographic and Socioeconomic Variables on Infant and Child Mortality

In the preceding models we examined the effects of demogrophic and socioeconomic variables on infant and child mortality separately. However, these variables are often closely associated with each other: for example, higher-educated women may marry later[11] and have fewer children.[12] Thus, Table 5 presents the effects of selected demographic and socioeconomic variables on infant and child mortality. In Table 5 we displayed only the 'Net Effect' columns by urban and rural areas because the 'Gross Effect' of

11) The mean age at first marriage of women who married before age 25 and were 30 to 34 years of age in 1974 was 20.4 years for the women educated for 1 to 6 years and 22.5 years for those educated over 12 years (Kim, 1981:35).

12) The mean number of children ever born to ll ever-married women in 1974 was 3.6 for the women educated for 1 to 6 years and 2.3 children for those educated over 12 years (Kim, 1981:57).

Table 5. Model III. Log*it*-Linear Model of the net Effects of Demographic and Socioeconomic Variables and Year of Birth on Infant and Child Mortality by Place of Mother's Residence, Korea, 1955~73

Variables	Infant				Child			
	Urban		Rural		Urban		Rural	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
MATERNAL AGE		2.0		2.0		18.3**		10.6**
~24	.90		1.16		1.71		1.42	
25~29	1.10		.95		1.10		1.07	
30+	.98		.92		.39		.66	
BIRTH ORDER		4.9		8.5*		14.3**		4.7
1	1.06		1.08		.69		.95	
2~3	.87		.81		.79		.82	
4+	1.20		1.15		2.05		1.21	
MOTHER'S EDUCATION		5.3*		8.5**		.9		15.3**
~5 Years	1.31		1.14		1.16		1.24	
6+ Years	.92		.84		.95		.74	
NO. OF ROOMS USED		16.9**		.3		15.9**		6.9*
1	1.32		1.04		1.57		1.46	
2	.81		1.03		.63		1.09	
3+	.83		.97		.94		.87	
YEAR OF BIRTH		2.7		4.0		18.2**		15.7**
1955~59	1.14		1.09		1.49		1.25	
1960~64	1.05		1.10		1.42		1.24	
1965~69	1.02		.96		.58		.68	
1970~73	.86		.85		—		—	
GRAND MEANS	.050		.057		.026		.041	

Notes: 1) *Significant at 5 per cent level
**Significant at 1 per cent level
2) Mother's education has 1 degree of freedom; year of birth for infant mortality has 3 degrees of freedom; all remaining variables have 2 degrees of freedom each.

Source: The 1974 Korean National Fertility Survey

each variable is obviously the same as those in the preceding models.

The variables with statistically significant net effects on infant mortality are mother's education and number of rooms used in urban areas, and birth order and mother's education in rural areas. This indicates again that mother's education is the most important determinant of infant mortality in both urban and rural areas. Furthermore, socioeconomic variables were relatively more important for infant mortality in urban areas whereas demographic variables (birth order) retained importance in rural areas.

The net effects on child mortality of each variable, except mother's education in urban areas and birth order in rural areas, are statistically significant. Contrary to the determinants of infant mortality, demographic variables in the urban areas and socioeconomic factors in the rural areas are the more important determinants

of child mortality.

These results are basically the same as those obtained in Tables 1 and 3 for infant mortality and Tables 2 and 4 for child mortality. However, the levels of the effects of birth order, mother's education and number of rooms used change when the effects of the other set of variables are controlled. Among them, the change in the effects of mother's education is clearer than that of others: the effects of mother's education on infant and child mortality in rural areas become more pronounced and the level of statistical significance changes from 5 to 1 per cent. In rural areas where the society is still more traditional, mother's education is the most important determinant of infant and child survival.

4. Effects of Previous Birth Interval and previous Birth survival on Infant and Child Mortality

In Tables 6 and 7, the effects of previous birth interval and previous birth survival on infant and child mortality are tested with controls for the effects of selected demographic or socioeconomic variables, ignoring the year of birth and mother's present residence (urban and rural). This may have introduced some bias because of the change in infant and child mortality over time and because of the differentials by urban and rural areas.

Table 6. Model IVA: Logit-Linear Model of the Main Effects of Maternal Age, Birth Order, Previous Birth Interval and Previous Birth Survival on Infant and Child Mortality, Korea, 1955~73[1),2)]

Variables	Infant				Child			
	Gross Effect		Net Effect		Gross Effect		Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
MATERNAL AGE		1.4		.0		11.6**		24.5**
~24	.96		.99		1.25		1.69	
25~29	.96		.99		1.10		1.20	
30+	1.06		1.01		.75		.61	
BIRTH ORDER		14.6**		11.7**		2.2		20.0**
2~3	.85		.84		.91		.72	
4+	1.16		1.21		1.09		1.43	
PREVIOUS BIRTH INTERVAL		78.4**		55.9**		22.0**		17.0**
~23 Months	1.74		1.73		1.58		1.50	
24~35 Months	.81		.88		.80		.80	
36+ Months	.76		.81		.93		1.07	
PREVIOUS BIRTH SURVIVAL		63.4**		32.0**		2.0		.0
Alive at Age 1	.90		.95		.98		.99	
Dead before Age 1	2.61		2.05		1.35		1.04	
	Grand Mean=.053				Grand Mean=.035			

Notes: 1) The first order births are excluded.
2) Corresponding years are 1955~73 for infant mortality and 1955~69 for child mortality.
3) *Significant at 5 per cent level
**Significant at 1 per cent level
4) Birth order and previous birth survival have 1 degree of freedom each; maternal age and previous birth interval have 2 degrees of freedom each.

Source: The 1974 Korean National Fertility Survey

Table 7. Model IVB: Logit-Linear Model of the Main Effects of Mother's Education, Number of Rooms Used, Previous Birth Interval and Previous Birth Survival on Infant and Child Mortality, Korea, 1955~73 [1),2)]

Variables	Infant				Child			
	Gross Effect		Net Effect		Gross Effect		Net Effect	
	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}	Odds Ratio	X^2_{LR}
MOTHER'S EDUCATION		17.1**		24.7**		18.7**		23.5**
~5 Years	1.18		1.25		1.25		1.33	
6+ Years	.84		.82		.73		.73	
NO. OF ROOMS USED		3.6		4.6		3.8		5.0
1	1.15		1.18		1.25		1.31	
2	.97		.96		.97		.96	
3+	.95		.95		.92		.92	
PREVIOUS BIRTH INTERVAL		78.4**		57.2**		21.9**		23.4**
~23 Months	1.74		1.73		1.58		1.70	
24~25 Months	.81		.88		.80		.83	
36+ Months	.76		.81		.93		.94	
PREVIOUS BIRTH SURVIVAL		63.5**		31.0**		1.9		.0
Alive at Age 1	.90		.96		.98		.99	
Dead before Age 1	2.62		2.02		1.35		1.04	
	Grand Mean=.053				Grand Mean=.035			

Notes: 1) The first order births are excluded.
2) Corresponding years are 1955~73 for infant mortality and 1955~69 for child mortality.
3) *Significant at 5 per cent level
**Significant at 1 per cent level
4) Mother's education and previous birth survival have 1 degree of freedom each; number of rooms used and previous birth interval have 2 degrees of freedom each.

Source: The 1974 Korean National Fertility Survey

Within these limitations we find strong effects of the length of the previous birth interval and of previous birth survival on infant mortality in both the demographic and socioeconomic models. The risk of infant death among children with previous birth interval of 23 months or less is still around twice as high as that of other children; death of the proceeding sibling raises the probability of death during infancy for the younger sibling (index child) more than twice.

There are two interesting results: the effects of birth order on both infant and child mortality are highly significant (Table 6): and the effect of the housing conditions of the family on infant mortality is no longer significant (Table 7). In the earlier analysis the effects of birth order on infant mortality in the urban areas and on child mortality in the rural areas were not statistically significant (see Table 1 and 2). When the first birth is excluded and the year of birth and place of mother's residence are ignored, the difference in survival between earlier and later order births becomes clearer than in earlier analysis because children are born earlier to younger and more educated mothers than to older and less educated ones in a society which is in the process of fertility transition, like Korea. Furthermore, when the effects of birth spacing and survival of previous sibling are controlled for, the early childhood mortality differentials by birth order (except

Table 8. Likelihood Ratio Chi-Square of net Effect of Previous Birth Survival on Child (Age 1 to 5) Mortality, Selected Asian Countries, 1962~71 [1]

Countries	$_1q_4$[2]		Controlled Variables[3]	Likelihood Ratio X^2[4]	
	Urban	Rural		Urban	Rural
INDONESIA	67	83	4 Demographic[5]	.0	7.2**
			2 Socioeconomic[6]	.2	8.3**
SRI LANKA	21	26	2 Demographic[7]	NA	1.6
			2 Socioeconomic[6]	1.2	.1
BANGLADESH	63	89	4 Demographic[5]	NA	33.7**
			2 Socioeconomic[6]	.6	34.6**
NEPAL	--	110	4 Demographic[5]	NA	8.2**
			2 Socioeconomic[6]	NA	6.9**

Notec: 1) Model used is logit-linear model.
2) The probabilities of dying between exact ages one and five years (per 1000 children at age one).
3) All models include previous birth interval as a control variable.
4) Each has 1 degree of freedom.
5) Birth order, maternal age, sex of the child and birth cohort.
6) Mother's education and father's education.
7) Birth order and maternal age.
NA: Not available
** Significant at 1 per cent level
Sources: World Fertliity Survey
Nepal: Gubhaju, 1984
Others: Unpublished data in the Department of Demography, ANU, Canberra

first birth) become much clearer in Korea. On the other hand, the effect of the housing conditions of the family (number of rooms used) on infant mortality was statistically significant in urban areas in earlier analyses (see Tables 3 and 6), but not in Table 7.

Keeping in mind the limitations of the models, the effect of previous birth survival on child mortality is not found to be significant in either of the models. Although previous infant loss increases the risk that a woman will again lose a child (MacMahon, 1974), it appears that if the child has survived infancy the risk does not affect its survival during early childhood (after age 1) in Korea. Comparison with other countries (Table 8) supports the view that the effects of previous birth survival on child mortality may disappear where child mortality has reached lower levels. In all these instance, in the urban areas, and in Sri Lankan rural areas, where the mortality levels are relatively low the effect of previous birth survival are no longer statistically significant.

The effects of the family living conditions (number of rooms used) on child mortality are again statistically insignificant. From the result that even 'Gross effect' is statistically insignificant, we know that the effect of number of rooms used diminished when the effects of urban/rural areas, year of birth and first births on infant and child mortality were combined or excluded.

V. Summary

In both urban and rural areas, mother's education is the most important determinant of infant mortality, maternal age and number of rooms used are the main determinants of child mortality. Previous birth interval and survival of the previous birth also significantly affect infant

mortality and previous birth interval child mortality in both urban and rural areas. For both infant and child mortality previous birth interval and number of rooms used are the most general factors in urban areas; previous birth interval and mother's education in rural areas. Infant mortality is also significantly affected by sex of the child and the number of rooms used in urban areas, and by birth order in rural areas. Significant determinants of child mortality are birth order in urban areas but mother's education in rural areas. Thus, in summary, demographic factors are relatively more important for infant mortality in the rural areas and for child mortality in the urban areas; in contrast, socioeconomic factors play a role for infant mortality in urban areas and for child mortality in rural areas.

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