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Health Care Determinants of Child Survival in Pakistan*

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INTRODUCTION

The health and survival status of children which are important indicators of social well-being, have become a subject of great concern in Pakistan in recent years. The available literature suggests that infant and child death rates in Pakistan are high even in the context of the Asian region and progress in health and survival of children has been much less than the desired level [World Bank (1993)]. Although estimates of infant and child mortality rates as derived from various data sources in Pakistan show great variation,[1] the available evidence indicates that nearly 58 percent of all deaths occur among children under five years of age, 36 percent die during infancy and more than half of all infant deaths occur within the first four weeks of their birth [Irfan (1986); Afzal *et al.* (1988); Rukanuddin and Farooqui (1988); Sathar (1994)]. Recognising the fact that most of these deaths could be prevented, it is important to study the processes that are likely to influence the survival chances of children, the health care factors in particular, which are important components of mortality change.

Health care facilities in Pakistan are concentrated mostly in urban areas contributing to lower risks of deaths among children from infectious and diarrheal diseases. In contrast, poor sanitary and health facilities alongwith massive poverty

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[1]The Pakistan Demographic Surveys (PDS) average estimate of infant mortality rate for 1984–88 five years period is 110 per 1000 live births. A more recent estimate from the 1990-91 Pakistan Demographic and Health Survey (PDHS) is 91 per 1000 for the period 1987–91, while the Pakistan Integrated Household Survey (PIHS) also conducted in 1991 reports a much higher infant mortality rate of between 114 and 120 per 1000 live births for the same period, posing a question about the placement of the infant mortality rate (IMR). However, an overview of the estimates from various data sources indicate that IMR has declined very little in the 1980s, and this trend seems to be continuing until recently [Sathar (1994)].

and illiteracy in rural areas contribute to relatively higher incidence of child deaths. With a view to improve the childhood mortality situation in the country, the support of the government for mass immunisation and other maternal and health related programmes has expanded in recent years [Government of Pakistan (1986)] yet the availability and provision of public health facilities are much below the needs of the growing population, particularly in rural areas[2] [Rukanuddin and Farooqui (1988)]. However, knowledge about the factors affecting child mortality in both urban and rural areas has been extremely limited. Given that a substantial difference in the urban and rural levels of development and life-styles already exists, this paper examines the relative contribution of health related factors which affect the survival chances of children under five years of age in urban and rural areas. This analysis may give us an important basis to judge the variation in child survival and its determining factors across the two settings and help to identify more specific and effective policies for lessening the urban-rural and regional gap in child mortality.

FACTORS AFFECTING CHILD MORTALITY

The most relevant conceptual framework of the determinants of child survival as developed by Mosley and Chen (1984) identifies the availability and use of health care and nutritional status of both the mothers and the children as proximate variables, through which social, economic and demographic factors affect child survival. Better maternal diet, antenatal care during pregnancy and lactation and proper child care practices after the birth are expected to positively influence the survival of infants. Other health related variables categorised as environmental factors are mother's exposure to various infections during pregnancy through unhygienic housing conditions, unsafe drinking water and bad sanitation in the household, which adversely affect the survival of children.

Among the socio-economic and demographic factors, mother's age and parity, the interval between births, rising level of education and disease treament stand out as significant factors affecting child survival. [Alam and Cleland (1984); Sullivan (1991)]. It has also been found that children born to very young and older mothers, especially after age 35, who have repeated births with short intervals are at greater risks of dying [Hobb-craft *et al.* (1984); Galway *et al.* (1987)]. Maternal education is noted to have a strong positive net effect on child survival because it

[2]Previous studies on infant and child mortality in Pakistan have documented wide urban-rural and regional differences [Alam and Cleland (1984); Afzal *et al.* (1988); Sathar (1987); Rukanuddin and Farooqui (1988)].

inculcates modern health knowledge, improves the effectiveness of health behaviour (through better child care and feeding practices); and changes the mother's role within the family including greater use of modern health services [Cleland and Ginneken (1988); Bicego and Boerma (1991)].

The present analysis focuses on the survival probability of children under five years of age in relation to selected health care and environmental factors after controlling for mother's socio-demographic characteristics. The availability of the national level Demographic and Health Survey (DHS) of 1990-91 provides us with the opportunity to document empirically the relationships between a set of selected health related variables and survival status of children in both urban and rural areas, which has great policy significance in the context of Pakistan's social development.

DATA, METHOD AND VARIABLES USED

Using the Pakistan Demographic and Health Survey (PDHS) of 1990-91, which provides detailed information on maternal socio-economic and other characteristics with complete birth histories for all children, the sample selected for the present study is the number of all children born during five years preceding the survey date (all births occurring since January 1986), for which information on each child's health care and survival status is available.

To examine the survival probability children under five years of age in relation to selected exposure variables, multivariate analysis is used. A child's survival outcome is defined as a dichotomous variable with the value of 1 for survival and zero otherwise. For purposes of analysis, logistic regression is used, an appropriate functional form for the analysis of dichotomous dependent variables [Aldrich and Nelson (1984)]. The dependent variable which quantifies survival outcome, is taken directly from a question in the survey that asks whether the child was still alive or not? Thus, the unit of analysis is the individual child rather than the child mortality rate. The logit analysis provides the natural logarithm of the odds of surviving children as a function of a set of predictor variables. The regression coefficients therefore represent the magnitude of the increment in the log-odds of surviving children with a unit increase in explanatory variable.

The control variables used in the analysis of childhood survival are mother's age at birth, place of residence, mother's and father's level of education and the gender of the child, whether a boy or a girl. The expectation is that the births occurring to very young and relatively older mothers have lower chances of survival than those occurring in the middle age group of women (20–34 years). Urban living

and education of parents are expected to positively influence the survival of children. Education is measured as a three-category variable, representing 'none', 'primary', and 'secondary or higher level', to see if reaching a particular level of education is critical in influencing child survival.

Among the health care factors are included mother's prenatal visit to the doctor or clinic and tetanus toxoid injection during pregnancy with the expectation that both factors will affect the health and survival of children positively. Regarding the child health care measures, whether the child was 'breastfed', 'ever immunised' or born as a 'below average size baby', are included to see which factors are more likely to increase the survival probability of children. In addition, source of water supply and availability of toilet facilities in the households reflecting the sanitation and living conditions of families, are also added to the analysis. Region of residence is included to see if more urbanised and developed regions in the aggregate context reflect better survival status of children than the less developed regions. The analysis is undertaken for urban and rural areas separately to see if the effect of each explanatory variable diverge across the two settings.

RESULTS

The frequency distribution of births which occurred in five years preceding the survey are shown in Table 1 by selected exposure variables used in the analysis. The distributions in the table are in the expected direction where urban mothers appear to be more educated, have better antenatal and child health care, and have greater access to piped water supply and modern toilet facilities than those living in rural areas.

To assess the net independent effect of the selected factors on child survival, the logistic regression results are presented in Tables 2, 3 and 4 for total, urban and rural areas, respectively. We have estimated three basic models. Model 1 gives the effect of socio-demographic factors; Model 2 includes the health related factors after controlling for selected socio-economic factors; and Model 3 takes into account all predictor variables including the two household variables and region of residence. The interpretation of the logit results is that a positive coefficient increases the likelihood of child survival and a negative coefficient reduces the probability of survival with each unit increment in the explanatory variables.

The results for the total sample are presented in Table 2 to indicate whether urban residence makes a significant contribution to increasing the survival chances of children when other predictor variables are taken into account. We can see from the table that the effect of urban residence is significant when certain

Table 1

Percent Distribution of Births(Five Years Prior to Survey) by Socio-economic, Demographic and Health Care Variables Used in the Analysis: PDHS, 1990-91

Variables	Total	Urban	Rural
Mother's Age at Birth			
< 20	10.7	9.2	12.3
20–34	78.0	81.1	74.7
35+	11.3	9.7	12.9
Mother's Education			
None	74.6	61.6	88.6
Primary	10.3	13.1	7.2
Secondary and Higher	15.1	25.3	4.2
Father's Education			
None	42.6	33.2	52.7
Primary	16.1	15.1	17.3
Secondary and Higher	41.3	51.7	30.1
Gender of Child			
Girl	50.6	50.0	48.8
Boy	49.4	50.0	51.2
Region of Residence			
Punjab	35.6	30.5	41.1
Sindh	26.8	33.5	20.1
NWFP	26.4	22.5	30.6
Balochistan	11.2	14.0	8.2
Antenatal Visit			
None	62.9	44.4	82.6
Atleast One	37.1	55.6	17.4
Tetanus Injection			
None	66.5	52.9	81.2
One or More	33.5	47.1	18.8
Size of Child at Birth			
Average and Above	77.5	79.7	75.1
Below Average	22.5	20.3	24.9
Child Breastfed			
No	5.3	6.2	4.4
Yes	94.7	93.8	95.6
Child Immunised			
No	56.5	51.0	62.5
Yes	43.5	49.0	37.5
Water Source in the H. H.			
Mostly Piped	52.4	79.4	23.5
Wells	39.1	17.7	62.0
River, Ponds, Rain, etc.	8.5	2.9	14.5
Toilet Facility in the H. H.			
None	34.6	7.9	63.1
Some(Flush, Bucket, Pit)	65.4	92.1	36.9
Child Survival			
Dead	7.3	6.3	8.3
Alive	92.7	93.7	91.7
Total Number of Cases	(5868)	(3034)	(2834)
%	51.6	48.4	100.0

Table 2

Logistic Regression Coefficients of the Effect of Selected Predictor Variables on Child Survival: Total Areas. Pakistan DHS 1990-91

Variables	Model 1	Model 2	Model 3
Constant	2.449	–.1012	–.332
Mother's Age at Birth(20–34)[a]			
< 20	–.193	–.170	–.202
35 +	.441*	.617*	.647*
Residence(Rural)[a]			
Urban	.205*	.123*	.074
Mother's Education (None)[a]			
Primary	.091	–.066	.021
Secondary and Higher	.371*	.503*	.589*
Father's Education(None)[a]			
Primary	–.184	–.284*	–.263*
Secondary and Higher	.065	–.077	–.116
Gender of Child (Girl)[a]			
Boy	–.137	–.181	–.174
Antenatal Visit (None)[a]			
Atleast One		.073	.022
Tetanus Injection (None)[a]			
One or More		.254*	.308*
Size of Child at Birth(Av and Above)[a]			
Below Average		–.283*	–.262*
Child Breastfed (No)[a]			
Yes		2.599*	2.605*
Child Immunised (No)[a]			
Yes		1.206*	1.259*
Toilet Facility in the H. H. (No)[a]			
Yes			.161
Water Source in the H. H. (Other)[a]			
Direct Piped			.061
Wells			–.077
Region(Punjab)[a]			
Sindh			.156
NWFP			.387*
Balochistan			.559*
Model Chi Sq. (N = 5868)	28.14 (8df)*	455.68(14df)*	474.3(11df)*

*Significant at .05 level of confidence or less.

[a]Reference category.

Table 3

Logistic Regression Coefficients of the Effect of Selected Predictor Variables on Child Survival: Urban Areas PDHS, 1990-91

Variables	Model 1	Model 2	Model 3
Constant	2.652	.160	–.113
Mother's Age at Birth(20–34)[a]			
< 20	–.237	–.152	–.141
35 +	.427*	.643*	.661*
Mother's Education (None)[a]			
Primary	.028	–.229	–.288
Secondary and Higher	.513*	.484*	.486*
Father's Education (None)[a]			
Primary	–.027	–.037	–.056
Secondary	–.059	–.121	–.126
Gender of Child (Girl)[a]			
Boy	–.095	–.134	–.136
Antenatal Visit (None)[a]			
Atleast One		–.045	–.112
Tetanus Injection (None)[a]			
One or More		.398*	.379*
Size of Child at Birth (Av and Above)[a]			
Below Average		–.377*	–.405*
Child Breastfed (No)[a]			
Yes		2.433*	2.456*
Child Immunised (No)[a]			
Yes		1.187*	1.172*
Toilet Facility in the H.H. (No)[a]			
Yes			.271
Water Source in the H. H. (Other)[a]			
Direct Piped			.078
Wells			.139
Region (Punjab)[a]			
Sindh			.124
NWFP			–.229
Balochistan			.043
Model Chi Sq.			
(N = 3034)	10.79(7df)	207.9(12df)*	211.61(18df)*

*Significant at 0.5 level of confidence or less.

[a]Reference category.

Table 4

Logistic Regression Coefficients of the Effect of Selected Predictor Variables on Child Survival: Rural Areas PDHS, 1990-91

Variables	Model 1	Model 2	Model 3
Constant	2.459	.261	–.774
Mother's Age at Birth(20–34)[a]			
< 20	–.165	–.177	–.236
35 +	.457*	.613*	.697*
Mother's Education (None)[a]			
Primary	.201	.177	.375
Secondary and Higher	.021	.601	.804
Father's Education (None)[a]			
Primary	–.291*	–.476*	–.378*
Secondary and Higher	–.202	–.027	–.092
Gender of Child (Girl)[a]			
Boy	–.183	–.229	–.214
Antenatal Visit (None)[a]			
Atleast one		.238	.142
Tetanus Injection (None)[a]			
One or More		.069	.208
Size of Child at Birth (Av & Above)[a]			
Below Average		–.202	–.132
Child Breastfed (No)[a]			
Yes		2.799*	2.921*
Child Immunised (No)[a]			
Yes		1.233*	1.342*
Toilet Facility in the H. H. (No)[a]			
Yes			–.097
Water Source in the H. H. (Other)[a]			
Direct Piped			.181
Wells			–.075
Region (Punjab)[a]			
Sindh			.188
NWFP			.932*
Balochistan			1.498*
Model Chi Sq.			
(N = 2834)	13.51(7df)*	247.51(12df)*	286.28(18df)*

*Significant at 0.5 level of confidence or less.

[a]Reference category.

socio-demographic factors are controlled for (Model 1), but the effect disappears when health related factors are added to the model (Model 2). This implies that the substantial difference in urban-rural mortality in Pakistan is explained by the differences in the health related behaviour of individuals among urban and rural populations. In Model 3, which incorporates all the variables, the results indicate that mothers of relatively older ages (35+), with secondary and higher education, and with adoption of better antenatal and child health care behaviour (such as tetanus injection, breastfeeding, immunisation, etc.) indicate a greater likelihood of the survival of their children.

To further examine whether the predictor variables retain their significance in both urban and rural areas, we present the regression results in Tables 3 and 4 for urban and rural areas separately. We find from the results that the effect of mother's higher age (35+) is positive and significant in both urban and rural areas across all models. This implies that older mothers with larger number of children may have become more aware and experienced in handling child health matters, thereby affecting their chances of survival positively. Moreover, older mothers may have children who are old enough to assist in the care of younger siblings, thus enabling such mothers to spend time and resources more efficiently. In contrast, the negative effect of very young age of mothers on child survival is in the expected direction, but the coefficients are not significant in any model when compared with women in 20–34 age group.

Our findings in case of maternal education in affecting child survival are that only in urban areas, the secondary and higher levels are important in increasing the survival chances of children, while primary schooling is not. As Table 3 shows, the coefficients for urban mother's secondary and higher education are positive and highly significant across all models, a finding in accord with the results of many other studies in developing countries including Pakistan [Cleland and Ginnen (1987); Sathar (1987); Bicego and Boerma (1991)]. In rural areas, on the other hand, mother's education is weakly related to child survival. Our results indicate that the coefficients for rural mothers' secondary and higher education become statistically significant (at .09 level) only in Model 3, where the magnitude of the coefficient increases, probably because those few rural educated women have relatively better awareness of health care practices.[3] Fathers' education is not a

[3]The weak and poor performance of mother's education as an explanatory variable in childhood mortality has been demonstrated in some other studies [Paul (1990); Ahmed (1992); Sathar (1994)]. The explanations given are that mother's health seeking behaviour are probably subject to other more crucial influences of better sanitation and environmental factors, small progress achieved in child mortality transition and negligible proportion of women with formal education in rural Pakistan.

powerful net predictor of child survival in our analysis. The results are that educated fathers indicate lower survival of children but the coefficients are significant for primary education in rural areas only, a finding contrary to our general expectation.[4] This may be interpreted to mean that rural families in which fathers have little education may be exposed to some health practices or environmental risks that affect child survival negatively. These results, however, need further probing.

Among the five health care variables included in our analysis, breastfeeding and immunisation show the largest beneficial effect on child survival in both urban and rural areas. As we can see, children who have been breastfed have a log-odds of surviving of 2.46 in urban and 2.92 in rural areas; and those immunised have 1.17 and 1.34 respectively (Model 3 in Tables 3 and 4). Tetanus injection during pregnancy has significant positive effect and low weight/size of child at birth lowers the survival chances of urban children only. Our findings, thus conform well with the hypothesis that child health care practices are critical components of mortality decline. The significant effect of mother's health related factors on survival outcome of children only in urban areas is probably reflective of the greater access to and use of health facilities by urban women.

Interestingly, however, the two household variables, e.g., toilet facility and source of water supply, representing the sanitary and living conditions of households, do not emerge as significant net predictors of child survival in both urban and rural areas,[5] a finding not in agreement with the results of another study on infant mortality [Sathar (1994)]. This is perhaps because sanitary and environmental conditions of households are more critical in explaining mortality differentials of infants (an age more vulnerable to poor hygiene and bad sanitation) than of children who have survived up to age five in the sample selected for this analysis. However, this question needs further investigation of the data.

CONCLUSIONS AND DISCUSSION

This study examined the relationships between selected individual and household level factors and survival of children under five years of age based on

[4]Ahmed (1992) also found a weak and positive relationship of father's lower level of education (6–10 years) with child morality in urban areas based on the analysis Pakistan Contraceptive Prevalence Survey of 1984-85.

[5]Water and toilet facilities of households did not emerge as significant variables in a reduced model without any controls for health factors in both urban and rural area. Only toilet facility was weakly related to survival in rural areas. The results are thus not presented here.

the data in the Pakistan Demographic and Health Survey of 1990-91. The main conclusions of our analysis are:

Older maternal age (35+) unexpectedly enhances the survival of children, probably because of a cumulative increase in maternal experience (both as a mother and as a wife) with increase in age; whereas very young mothers (<20) do not significantly differ in their experience of child mortality from those in the intermediate age group of 20–34 years. Mother's education, secondary and higher, has a net positive and significant influence on child survival in urban areas only, while it has a weak effect in rural areas. Father's education is not a powerful net predictor of child mortality.

The effects of health care factors are prominent in increasing the likelihood of child survival. In particular, breastfeeding and child ever immunised stand out as the most beneficial factors for both urban and rural children. The sanitary and living conditions in the household such as piped water supply and toilet facilities do not appear to be significantly influencing the survival probability of children under five years of age in both urban and rural areas.

Although the results of this analysis in most cases are in the expected direction, there are situations where we have contrary findings which may have raised questions rather than provided answers in explaining differentials in childhood mortality. At the outset, we found that there are substantial differences in mortality of children by urban-rural residence in all population strata, but the effects of health care factors have mitigated the statistical significance of urban residence for child survival.

The analysis, however, seems to clearly suggest that child health care measures including the nutritional intake through breastfeeding and preventive care through immunisation are crucial in promoting child survival–a finding of considerable policy significance for future emphasis. The results also suggest that an urban survival advantage exists if the mother had some prenatal care by taking tetanus injection during pregnancy or gave birth to a healthy child, as low weight/size of the child at birth reduced the probability of survival.

As expected, higher maternal education has a positive influence on child survival in urban areas, implying that specific beneficial health care practices are more likely to be found in families with educated mothers, a well-established finding suggesting for the promotion of educational opportunities of women as a policy measure. The fact that mother's education does not show a strong relationship in rural Pakistan perhaps because the impact of education among those few primary and secondary educated rural women is not substantial enough to alter their

attitudes and behaviour concerning hygiene, preventive care and use of medical treatment.

As there is little doubt that breastfeeding provides a sterile, affordable and effective means of nutrition to reduce the probability of diarrheal and infectious diseases among infants, our results indicate a clear positive effect of breastfeeding on child survival, and the implications for enhancing educational campaigns for the promotion of breasfeeding appear profound in the overall context of policy development. Another clear indication for a reappraisal of policy alternatives aimed at lowering infant and child mortality is to increase the immunisation coverage in both urban and rural areas. Even though immunisation coverage for children has increased substantially in recent years, the PDHS (1990-91) data report only 35 percent of children age 12–23 months as fully vaccinated [NIPS (1992)], whereas our analysis of children born during five years prior to survey indicate 43 percent of all children who had ever been immunised, 49 percent in urban and 37 percent in rural areas (Table 1).

Our findings for urban areas seem to conform well with Caldwell's recent findings (1986) that education, health care factors and nutrition all contribute to mortality reduction, whereas in rural areas only nutritional and curative child health care factors appear to be more influential.

Nevertheless, our finding do suggest for an expansion of educational opportunities beyond primary levels, for the development of accessible and affordable maternal and child health care facilities and antenatal care services for all mothers. The effects of such changes are likely to reinforce each other in improving the health and survival chances of children in both urban and rural areas.

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