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Infant and Child Mortality in a Rural Area of Bangladesh: Socio-demographic Differences, Use of Medical Technologies, and Causes of Death

OVER the past two decades, there has been renewed interest in studies focusing upon infant and child mortality in the developing countries (Preston 1980,1978; Casterline et al. 1989; Ruzicka 1983; Flegg 1982; Halsteadet al. 1985; Caldwell 1986; DaVanzo 1988). This renewed interest has been spurred by the controversy whether the ultimate constraints on mortality decline are those of economic living standards or whether the economic shackles could be loosened to a very marked extent by the application of new medical technologies and by social change (Mosley 1983; Caldwell 1986).

Some past studies indicated declining trends in infant and child mortality, which was attributed to the introduction of medical technology and corresponding socio-economic development (Davis 1956; Stolnitz 1965; Arriaga and Davis 1969). A decade ago, a series of studies by Preston (1978,1980) suggested that the influence of medical technology and socio-economic modernisation had equal influence in the overall decline of mortality in the developing countries. On the other hand, Gwatkin (1980) presented data which suggested that the pace of improvement in mortality levels had slowed considerably during the late 1960s through the mid-1970s. But this contention of slowing down of the pace of improvement in mortality has been challenged by Preston and Bhat (1984) who showed new evidence from India, indicating that the mortality decline there did not slow down.

Clearly, the constraints of material resources can be very largely overcome in contemporary developing countries. In recent years, the availability of some simple modern health technologies has opened the possibility of improving health and mortality situations in developing countries (Unicef 1984,1988). Thus, an extensive well-organised and low-cost system of health services and a vigorous malaria eradication programme as well as relatively high levels of female education explained Sri Lanka's low infant mortality (Gray 1974). Similarly, public health programmes implemented during the 1970s are estimated to account for nearly three-fourths of Costa Rica's infant mortality decline (Rosera-Bixby 1986).

Devoting large resources to the health sector also had positive effect on child survival in India (Nag 1985; Jain 1985). On the other hand, the persistence of high infant and child mortality in Bangladesh in excess of desired levels is a puzzle. Is it not possible to improve child survival in Bangladesh without concomitant socio-economic gains? Bangladesh

provides a particularly interesting setting for examining this question since some of the modern medical technologies have been recently introduced there. Such examination will reveal whether these health technologies are equtably reaching the rural population, whether the rural population can effectively use these technologies, whether such use is having any impact on the reduction of infant and child mortality. To answer these and similar questions, the present study analyses the retrospective maternity history, infant and child mortality, and morbidity data collected from a rural area of Bangladesh which has recently been exposed to a decentralised curative and preventive health service both by governmental and non-governmental health agencies.

Data and Procedures

The data for this analysis come from Companiganj upazilla of Feni district, Bangladesh. During the period 1973-80, the governmental rural health service of Companiganj, which was taken over by autonomous demonstration programme, made a major effort to integrate, expand, and decentralise existing health services by operating and invigorating several geographically dispersed health subcentres with linkage with a small hospital-based rural health centre (Amin et al. 1980). This demonstration project continued until late 1980 and thereafter was taken over by the existing government rural health system. Although this take-over has reduced the level of governmental rural health services, the increased availability of modern medicines through informally trained or self-trained providers of modern medicines as well as operation of some non-governmental health agencies might have compensated the reduction in services (Amin et al. 1989). Given such availability of modern health services and modern medicines, what has been the level of use of modern medical technologies such as immunisation and Oral Rehydration Therapy (ORT)? What have been the causes of infant and child mortality? How do socio-demographic factors differentiate infant and child mortality? These are some of the questions which the present study seeks to examine by using data from the Companiganj area of rural Bangladesh. In 1987, a random sample of 2,020 households from the entire geographical area of Com-pan'iganj were selected and interviewed. The present analysis is based on data collected from these 2,020 households. More detailed descriptions of this household survey may be found elsewhere (Amin 1988a). We first examine the level of use of immunisation and ORT in the Companiganj area, which is followed by an analysis of causes of infant and child death as well as analysis of the differences of death by socio-demographic factors.

Use **of Immunisation and ORT**

Table 1 shows the prevalence rate of immunisation and ORT among the children of our respondents. Although the overwhelming majority have used ORT, the immunisation of the children against common childhood diseases is very low. Thus, about 80.5 per cent of the respondents' children have used ORT, but only 4.5 per cent, 4.9 per cent, and 3.0 per cent had used immunisation of children against common childhood diseases reflects the low receptivity and availability of preventive health measures among the people of rural

Bangladesh, the high prevalence of ORT shows its high receptivity and availability. This altered receptivity may have been facilitated by the wide prevalence of ORT through commercial sources as well as non-governmental agencies such as informal or self-trained providers of modern medicines. On the other hand, since governmental health facilities are the only sources of immunisation in rural Bangladesh, the extremely low utilisation of prMic health facilities by the parents of children for preventive health measures may have kept the immunisation against common childhood disease very low. Earlier studies also showed low utilisation of governmental public health facilities (Bhardwaj and Paul 1986; Ashraf et al. 1982) as well as low prevalence of immunisation (Bangladesh 1985).

TABLE 1: USE OF IMMUNISATION AND ORT BY CHILDREN IN RURAL BANGLADESH, 1987

Use of Immunisation/OKI'	*Percentage*
Used immunisation for tetanus	4.5
Used immunisation for diphtheria	4.9
Used immunisation for polio	3.0
Used immunisation for measles	0.8
Used immunisation for whooping-cough	2.5
Used immunisation for smallpox	0.5
Used immunisation for cholera	0.2
Used immunisation for TB	1.6
Used ORT	80.5
NS	2020

SOURCE: The Companiganj Health Care Utilisation Survey, Bangladesh, 1987.

Infant and Child Mortality by Causes of Death

Table 2 shows the infant and child mortality by causes of death. One problem with this list of disease is its lack of diagnostic specificity. For instance, deaths due to fever, adverse congenital conditions and other causes listed in the table represent a mixture of causations not well identified. Moreover, as this classification is based on verbal reporting of cause of death by the respondents, it may not be as accurate as clinical diagnosis of the causes of death. Nevertheless, villagers in Bangladesh have specific local names for common infectious diseases such as tetanus, measles, or diphtheria. Thus, although accuracy may be flawed, the information collected by the interviewers was useful in terms of the prevalence rate and the adequacy of some diagnosis.

The data in the table show that among the identified leading diseases which caused high child and infant mortality rates within one year of birth were adverse congenital or

respiratory conditions, tetanus, fever, diarrhoea, dysentery in that order. Compared to these diseases, death rates from other diseases or causes, such as drowning, measles, or pneumonia, were somewhat lower. On the other hand, although dysentery, diarrhoea, and fever continued to be leading causes of child death when a child reached 13 months to five years of age, the rates of death from tetanus and pneumonia in these age groups were somewhat lower compared to younger age groups. Nevertheless, many of these diseases, which caused high infant and child mortality when a child was five years of age or younger, became minor contributors to death once a child reached above five years of age.

TABLE 2. INFANT AND CHILD MORTALITY PER 100,000 LIVE BIRTHS BY AGE* AT DEATH AND CAUSE OF DEATH, RURAL BANGLADESH, 1987

Cause of Death	Within One Year	Two to Five Years	Above Five Years
All causes	11,628	5,317	1,602
Fever	1,130	696	124
Diarrhoea	919	758	260
Dysentery	646	1,143	174
Measles	311	422	62
Tetanus	1,304	87	25
Pneumonia	323	50	12
Drowning	398	328	12
Adverse congenital or respiratory conditions	1,354	12	0
Other	2,957	1,440	460
Unidentified causes	2,286	335	472

NOTE: Total N = 8,050

SOURCE: The Companiganj Health Care Utilisation Survey, Bangladesh, 1987.

Based on retrospective verbal reportings at the time of the 1987 survey.

In Table 3, we have further analysed infant and child mortality within a multivariate context. The independent variables for this multivariate analysis are the household head's education (1 if above primary level education and zero otherwise), mother's education (1 if above primary level education and zero otherwise), age of mother between 12 and 20 (1 if yes, zero otherwise), age of mother between 21 and 30 (1 if yes, zero otherwise). The categories of the dependent variable are the following: (1) survived children, (2) children died within one year of birth, (3) children died between first and fifth anniversary of birth, and (4) children died after fifth anniversary of birth. Because of the polytomous nature of the variable, polytomous logit

TABLE 3: POLYTOMOUS LOGIT RESULTS *(Bs)* FOR INFANT AND CHILD MORTALITY IN RURAL BANGLADESH, 1987

Variables	*Death before first anniversary of birth versus survived children*	*Death before fifth anniversary of birth versus survived children*	*Deceased children versus survived children*
Household head's	.168*	-.160*	-.142*
Mother's education	-.122*	-.430*	-.344*
Male child	-.133*	.011	-.259*
Mother's age below 22	-.214*	-.164*	-.895*
Mother's age between 21 and 30[a]	.037	.161*	-.022
Constant	-2.032	-1.587	-1.238*
Model Chi-square	13.4	300.1	139.5

SOURCE: Companiganj Health Care Utilization Survey, 1987.
The suppressed category is age group above 30.
*$p < .05$

regression has been adopted in Table 3 (Swafford 1980). The equations in Table 3 include the following comparisons: survived children versus those who died before fifth anniversary of birth, and survived children versus those who did not survive irrespective of their age. Again, a coefficient of 1.0 in the table indicates a 2.7 times higher likelihood of being in the first category versus the second. Similarly, a coefficient of 0.50 corresponds to an observation being 1.6 times more likely to be in category 1 than category 2.

The results in the table show that younger age of mother, mother's education, and male child all contributed to the decline of infant and child mortality. These findings are consistent with other findings from rural Bangladesh (Amin 1988; D'Souza and Bhuiya 1982). Nevertheless, no consistent relationship between household head's education and child mortality is evident in the table. While death before first anniversary of birth or before fifth anniversary of birth was positively associated with household head's education, the association became negative when death above fifth anniversary was included.

Summary and Discussion

Our analysis shows that in spite of the establishment of rural health centres, the coverage of immunisation is low in rural Bangladesh. On the other hand, use of ORT was widespread. The latter may have been the result of widespread availability of ORT through private medical dispensaries as well as door-to-door ORT campaign by a non-governmental health agency in the area. While frequent advertisements by radio, television, and other mass media may have made known the benefits of ORT for diarrhoeal treatment as well as its outlet through commercial sources or private dispensaries, an effective campaign to reach rural

mothers with ORT in the area of our study by a reputable non-governmental agency, Bangladesh Rural Advancement Committee (BRAC), may have brought ORT to the doorsteps of our villagers. This shows that combination of adequate promotional efforts and wise availability can make a simple medical technology widely utilised by the rural residents irrespective of their socio-economic conditions. This wide use of ORT did not, however, have any effect on the reduction of infant mortality. The diarrhoea was persisting as the major killer of infants as was the persistence of high infant mortality.

The important issue that needs to be addressed in this context is the programmatic implication of lack of impact of ORT diffusion on diarrhoeal deaths. Since the efficiency of ORT to rehydrate patients, to maintain hydration, and to shorten the duration of diarrhoeal attacks is well established (Kielmann and McCord 1977), the reasons for the failure to reduce mortality may lie elsewhere. It may be that the theraphy was not administered in proper doses or that the practice of improper nourishment both prior to and during the fatal attack was not rectified, or that nutritional deficiency was too severe to be overcome by therapy alone. Thus, coverage alone without maintaining quality of service may not lead to effective utilisation of community-based health intervention programme with concomitant depressing effect on mortality. Rather, for a programme to be effective, it must provide quality service. Similarly, low coverage of immunisation against common childhood diseases permits tetanus, measles, and other childhood diseases to continue as the major killer of infants and children. As a result, the level of infant and child mortality continues to be high in rural Bangladesh by a developing country standard. In fact, the level of infant and child mortality in our study population in 1987 shows little change from that of the national infant and child mortality level from the late 1950s through the early 1980s (Amin et al. 1986b; National Research Council 1981).

Given the epidemiology and the causes of death as revealed in our foregoing analysis, what might be the major priorities of health programmes in an area like Companiganj? A significant proportion of existing infant and child deaths can be prevented with effective application of simple medical technologies such as diphtheria-tetanus vaccination or tetanus toxoid. Since our study shows that tetanus is the single most powerful killer of infants and children, the tetanus vaccine would clearly have the largest preventable impact. Similarly, measles vaccine would exert a major impact. Our data show that fever or respiratory problems also are important causes of infant and child mortality. Although we do not have precise data, some of the fevers and respiratory disease-related deaths may be attributed to childhood tuberculosis and whooping-cough. Effective vaccines against both these diseases are available and could be applied.

An axiom of public health is that prevention is better than cure; if so, our straightforward analysis of causes of death reinforces that axiom. Our analysis further shows that distribution of simple medical technology like ORT without concomitant provision of quality health services may not have the desirable effectiveness. For a medical technology to be effective, it must provide quality services. Further research is needed to identify.the processes through which both coverage and effectiveness of simple medical technologies can be cost-effectively increased given the environmental and resources constraints of the country.

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