

Impact of wealth inequality on child nutrition in Bangladesh

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Abstract

Background The prevalence of malnutrition in Bangladesh is among the highest in the world. Millions of women and children suffer from one or more forms of malnutrition, including low birth weight, wasting, stunting, underweight, vitamin A deficiency, iodine deficiency disorders, and anemia. Today malnutrition not only affects individuals, but its effects are passed from one generation to the next as malnourished mothers give birth to infants who struggle to develop and thrive.

Objective To assess the economic impact on child nutrition in Bangladesh.

Methods The 2011 Bangladesh Demographic Health Survey data was used for this study. In this study, quintiles were calculated based on asset and wealth scores by use of principal component analysis. To understand the nutritional status and health inequality, concentration index was also calculated.

Results The negative concentration index showed a higher rate of malnutrition in the children less than five years of age from the poorest class. Furthermore, the ratio of poorest to richest indicated that stunting and underweight conditions in rural children under five years of age were almost two times higher than that of the richest children. This inequality in the health situation of children may be explained in terms of income inequality. In Bangladesh, about 40% of the wealth is concentrated in 10% of the families. The results are discussed as possible input for public policy.

Conclusion Bangladeshi children under the age of five years and in the poorest economic class are nearly twice as likely to be underweight or stunted compared to children of similar age in the richest economic class. [Paediatr Indones. 2013;53:299-304].

Keywords: *economic inequality, child nutrition, concentration index, tangible wealth, principal component analysis*

In spite of remarkable advances in public health during recent decades, many people throughout the developing world remain vulnerable to food insecurity, under nutrition, and ill health. These problems tend to be particularly severe in developing countries struggling to emerge from the scourge of extreme poverty. In such countries, the health and nutritional benefits spawned from economic growth tend to be concentrated among the economically-advantaged sectors of the population.¹

The Bangladesh economy has improved over the recent past. The country's substantial agricultural sector contributes to 19% of the overall gross domestic product (GDP) and to the significant increase of exported agricultural products.² The industrial sector is also rapidly becoming one of the more important components of the Bangladesh economy, contributing a high percentage to the GDP. However, despite these economic improvements, the country still struggles to emerge from the clutches of poverty. Almost four out of ten people live below the absolute poverty line, with incomes of less than \$1 per day.³

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According to the 2011 Bangladesh Bureau of Statistics, approximately 3.1 million households (or 31 million people) have an energy intake of less than 1,805 kcal per person per day, an indicator of extreme poverty. Recent improvements in economic conditions are believed to have mainly benefited the wealthier sector of the population compared to the less wealthy sector, with the effect of this widely and seemingly growing economic inequality in health and nutrition still very poorly understood. Bangladesh is similar to many other developing countries, in that under nutrition is one of the leading causes of childhood morbidity and mortality. Under nutrition in children is often caused by the combined effects of improper or insufficient food intake, repeated episodes of infection, and inadequate care during sickness. Additionally, under nutrition affects somatic growth, impairs the immune system, and increases the risk of infection. In developing countries around the world, an estimated 54 million children are malnourished, 131 million are underweight, and 167 million children are growth rate stunted.⁴⁻⁶

Previous research has associated childhood nutrition with a number of factors: multiple-birth status, maternal education and nutritional status, maternal breastfeeding and feeding practices, paternal employment, access to safe drinking water and sanitation facilities, access to health care, prevalence of parasitic and infectious diseases, parental health-seeking behavior, race or ethnicity, rural residence, as well as social network and family support. Demographic characteristics such as a child's age and gender, birth interval (both preceding and subsequent), and maternal age at childbirth, have also been associated with child nutritional status.^{7,8} According to Berkman, economic inequality is an independent determinant for childhood under-nutrition. Countries with a greater degree of economic inequality tend to have an overall poorer average population health status than countries with more economic equality.⁹ However, the relationship between economic inequality and under nutrition is complex. For example, greater national wealth does not necessarily translate into better health care for all. If that were the case, then the single best approach to improve health care would be to maximize economic growth.

Additionally, economic growth does not always benefit all sections of the society equally. A country's

social and economic inequality affects food availability, access to health services, as well as disease morbidity and mortality among the many sections of a society differently. In Japan, for example, a rapid improvement in life expectancy in the last few decades was associated not only with its rapid economic growth, but also with a low level of economic inequality.¹⁰

A number of studies have illustrated that children from poorer households tend to be more undernourished than children from wealthier households. Social deprivation has also been linked with a child's nutritional status. However, the relationship between economic inequality and a child's nutritional status has not been conclusively defined.¹¹ A study in Mexico discovered that household poverty is not a necessary condition for children to be undernourished. Another study in Ecuador found inconsistent evidence to indicate any relationship between economic inequality and the nutritional status of children.¹²

The primary objective of this study was to assess for an association between household wealth inequality and childhood under nutrition in Bangladesh. We also examined the effects of other potential risks and confounding factors on childhood under nutrition.

Methods

The analysis in our study was based on 8,395 children aged 0–59 months with valid length or height information in the 2011 Bangladesh Demographic and Health Survey (BDHS). Children whose length/height information was missing or invalid were excluded. The BDHS collected demographic, socioeconomic, and health data from a nationally-representative sample of 17,842 women aged 15–49 years (98% of eligible women) from 17,141 households (98% of eligible households) included in the survey.

The study contained 6,210 households from urban areas and 11,632 household from rural areas. To assess the physical growth and nutritional status of children, the survey measured height or length and weight of all children aged 0–59 months. These measurement details were included in the main survey report. The ratio of height to age of a child serves as a good proxy for chronic under nutrition in children,

and is not significantly affected by a recent episode of illness. Children with a z-score of height-for-age more than 2 standard deviations below the internationally referenced median established by the World Health Organization were classified as stunted. The BDHS also included a household wealth status index which was estimated from several household characteristics and asset variables using a principle component analysis.

The effects of household wealth status and other factors on a stunted growth were estimated using multivariate logistic regression methods with SPSS software. We also analyzed alternative regression models separately for boys and girls, as well as for urban and rural status, to assess the relative significance of different confounding factors among these groups. In our analysis, we assigned assorted weights to restore the representativeness of the sample, adjusting for non-response bias and over-sampling in certain categories of respondents, such as among those respondents living in rural areas. The results are presented as percent of stunting and significance level (P value) in bivariate analysis and odds-ratios (OR) with 95% confidence intervals (CI) logistic regression analysis.

Results

In Model A, the unadjusted odds of suffering from stunted growth were 3.4 times higher in children living in the poorest (lowest wealth index quintile) households than in children in the wealthiest (highest wealth index quintile) households (OR = 3.4; 95%CI 2.9 to 4.1). The odds of suffering from childhood stunted growth declined consistently as the wealth index increased. In Model B, when these childhood characteristics (age, gender) were controlled for, the odds of a child suffering from stunted growth were 2.8 times higher in the poorest 20% of households than in the wealthiest 20% of households. In Model C, when we controlled for maternal characteristics, the effect of household wealth status on childhood stunted growth remained large (OR = 2.1; 95% CI 1.7 to 2.7). In Model D, when we controlled for child and maternal characteristics, urban/rural residence, and geographic division, the effect of household wealth status on childhood stunted growth remained large and highly statistically significant (OR = 2.3; 95%CI 1.6 to 3.2) (Table 2).

Table 1. Sample distribution and prevalence of stunting in children aged 0–59 months by household wealth status and other selected characteristics, Bangladesh 2011

| | Number of children | Prevalence of stunting (%) |
|------------------------------------|--------------------|----------------------------|
| Wealth status | | |
| 5 th quintile (richest) | 1,965 | 25.2 |
| 4 th quintile | 1,700 | 39.4 |
| 3 rd quintile | 1,632 | 42.3 |
| 2 nd quintile | 1,617 | 46.8 |
| 1 st quintile (poorest) | 1,481 | 54.3 |
| Child's age, months | | |
| 0–11 | 1,680 | 17.4 |
| 12–23 | 1,547 | 50.1 |
| 24–35 | 1,545 | 44.7 |
| 36–47 | 1,866 | 49.1 |
| 48–59 | 1,757 | 51.2 |
| Child's sex | | |
| Male | 4,271 | 42.3 |
| Female | 4,124 | 43.7 |
| Maternal education | | |
| No education | 1,689 | 43.4 |
| Primary or less | 5,688 | 47.1 |
| Secondary or higher | 1,018 | 30.2 |
| Urban/rural | | |
| Urban | 1,871 | 36.7 |
| Rural | 6,524 | 44.8 |
| Geographic division | | |
| Barisal | 464 | 6.1 |
| Chittagong | 1,946 | 22.4 |
| Dhaka | 2,601 | 31.2 |
| Khulna | 767 | 11.1 |
| Rajshahi | 1,087 | 22.4 |
| Sylhet | 639 | 8.3 |
| Rangpur | 891 | 4.9 |

Among the controlled variables, a child's age had the strongest effect on the risk of suffering from stunted growth. Additionally, this effect was independent of household wealth status and other maternal and household characteristics. When we controlled for household wealth status and other factors such as maternal age at childbirth and residence, we found that all had statistically significant effects, but these effects were generally small.

Discussion

The effects of poverty on a child's nutritional status are a manifestation of physical developmental patterns of children who live in poorer conditions with insufficient

Table 2. Effects of household wealth status and other selected characteristics on stunting among children age 0–59 months, Bangladesh 2011

| | Odds ratio (95% CI) | | | |
|---|-----------------------|-----------------|-----------------|-----------------|
| | Model A | Model B | Model C | Model D |
| Wealth status | | | | |
| 5 th quintile (richest) [†] | -- | -- | -- | -- |
| 4 th quintile | 2.0 (1.6 - 2.4) | 1.4 (1.2 - 2.1) | 1.6 (1.3 - 2.0) | 1.7 (1.3 - 2.2) |
| 3 rd quintile | 2.1 (1.7 - 2.5) | 1.7 (1.1 - 2.3) | 1.6 (1.3 - 2.0) | 1.8 (1.3 - 2.3) |
| 2 nd quintile | 2.3 (2.0 - 3.3) | 2.1 (1.7 - 2.6) | 1.7 (1.4 - 2.2) | 1.9 (1.4 - 2.5) |
| 1 st quintile (poorest) | 3.4 (2.9 - 4.1) | 2.8 (2.1 - 3.6) | 2.1 (1.7 - 2.7) | 2.3 (1.6 - 3.2) |
| Child's age, month | | | | |
| 0–11 [†] | | -- | -- | -- |
| 12–23 | | 3.9 (2.5 - 6.1) | 4.4 (2.9 - 6.5) | 5.2 (3.4 - 8.1) |
| 24–35 | | 3.2 (2.0 - 4.4) | 3.4 (2.3 - 4.9) | 3.7 (2.5 - 5.6) |
| 36–47 | | 3.4 (2.2 - 5.1) | 3.9 (2.7 - 5.8) | 4.4 (3.0 - 6.1) |
| 48–59 | | 3.7 (2.4 - 5.3) | 4.2 (2.9 - 6.1) | 4.8 (3.2 - 7.1) |
| Child's sex | | | | |
| Male [†] | | -- | -- | -- |
| Female | | 1.1 (1.0 - 1.2) | 1.1 (1.0 - 1.2) | 1.0 (0.9 - 1.2) |
| Maternal education | | | | |
| No education [†] | | | -- | -- |
| Primary or less | | | 1.0 (0.9 - 1.2) | 1.0 (0.9 - 1.2) |
| Secondary or higher | | | 0.8 (0.7 - 1.0) | 0.9 (0.7 - 1.1) |
| Urban/rural | | | | |
| Urban [†] | | | | -- |
| Rural | | | | 0.7 (0.1 - 0.8) |
| Geographic division | | | | |
| Barisal [†] | | | | -- |
| Chittagong | | | | 0.9 (0.7 - 1.2) |
| Dhaka | | | | 0.8 (0.6 - 1.0) |
| Khulna | | | | 0.6 (0.4 - 0.7) |
| Rajshahi | | | | 0.6 (0.5 - 0.8) |
| Sylhet | | | | 0.8 (0.7 - 1.1) |
| Rangpur | | | | 0.6 (0.4 - 0.7) |

† : Reference group

food intake, have a higher risk of infection, and lack access to basic health care.^{13,14} Our results illustrate that chronic childhood under nutrition is a critical problem in Bangladesh, and that children in less wealthy households are at a much greater risk of being undernourished than children in wealthier households. Children in the poorest 20% of households were at more than twice the risk of suffering from adverse childhood growth-stunting than children in the wealthiest 20% of households. This result was independent of the child's birth status, age, maternal educational level and nutritional status, household access to clean water and sanitation, and other important factors. Our results were consistent even when analyzed by gender and urban/rural residence. These findings were consistent with previous research in other developing countries,

and provide further evidence that wealth inequality is an important risk factor for chronic childhood under-nutrition.^{3,5,11}

The lack of a gender differential for stunted growth in our study indicated that there was no intra-household gender bias in feeding and health care for children in Bangladesh. In many developing countries, an increasing pattern of stunted growth by age is consistent with the typical pattern of increasing prevalence of childhood diseases by age, such as diarrhea and acute respiratory infections.¹⁵ This may partly be due to the onset of feeding solid food to a child around 6 months of age, which increases the likelihood of consuming contaminated food and removes the inherent protection provided by breast milk. Additionally, children begin crawling around this

age and are more likely to be carried outdoors, which exposes them to additional infectious agents.^{15,16} Consistent with past research, children of multiple-birth status were more likely to be undernourished than children who were single-birth. The association between stunted growth and multiple births may be due to competition for food within a household that is likely to be greater in households with more children. In addition, there is a higher proportion of stunted growth in children who were breastfed for more than one year, partly due to the tendency of poorer mothers to continue breastfeeding as a substitute for supplemental feeding. Contrary to prior expectations, our analysis found no significant effects of breastfeeding duration or household water and sanitation conditions on childhood stunting.

A limitation of this analysis was that we did not control for diet or other health care indicators. However, household wealth status factors into better access to food and health care in affecting childhood nutritional status. For example, wealthier households can afford better quality food. In the case of adults, the association between nutritional status and household wealth status could be bi-directional or have a reverse-causal relationship. In fact, household wealth status may affect access to food and health care, but undernourished adults whose ability to work is limited, will in turn affect their households' economic status. In this case, our inability to control for food intake and access to health care was not a major limitation.

Another potential limitation was the cross-sectional design of our study. However, due to the fact that the relationship basically comes from household wealth status to childhood stunted growth, the effects estimated in this study were a good measure of the causal relationship between household wealth status and childhood chronic under nutrition. Moreover, the study may be criticized for using an indirect measure of household wealth. However, in developing countries like Bangladesh, it is difficult to obtain reliable income and expenditure data. As such, an asset-based index is generally considered a good proxy for household wealth status.

Notwithstanding these limitations, there was evidence of a relationship between household wealth status and others factors to childhood stunted growth, suggesting that improved health and nutritional status of children in Bangladesh may be realized through

expanding and integrating community health and nutritional programs as well as initiatives targeting the poor. These programs include, but are not limited to, the Bangladesh Integrated Nutritional Program (BINP) and the Program for Bangladesh Poverty Reduction (PBPR).

Our findings indicate the high prevalence of malnutrition among Bangladeshi children. Direct nutritional interventions are needed to assist those affected by malnutrition, including nutritional rehabilitation and direct feeding programs for severely malnourished children. In addition, micronutrient supplementation to prevent and control anemia and vitamin A deficiency among those who are at high risk would help to reduce the effects of malnutrition among the children from poorest households. The interventions should be complemented with poverty alleviation strategies, including the empowerment of women.

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