

IMPACT OF WEALTH INEQUALITY ON CHILD NUTRITION IN BANGLADESH

Md. Mortuza Ahmmed, MS, BSc Hon's
Department of statistics
International university of business agriculture & technology
Dhaka, Bangladesh
mortuza@iubat.edu

ABSTRACT

The aim of this study was to assess the economic difference in nutrition of under-five children. Bangladesh Demographic Health Survey data 2011 were used for this study. In this study, quintiles were calculated on the basis of asset and wealth score by use of principal component analysis. To understand the nutrition status and health inequality concentration index was also calculated. The ratio of poorest to the richest indicates that stunting and underweight of the rural under-five children was almost two times higher than that of the richest children. The negative concentration index shows that higher rate of malnutrition among the under-five children from the poorest class. This inequality in health situation of the children can be explained in terms of income inequality. In Bangladesh, about 40% wealth is concentrated to 10% of the families. The results are discussed in terms of policy consideration. It is expected that the findings will lead to consider alternative program strategies for the reduction of poor nutritional status of the children and their mothers.

Key words: Economic inequality, Child nutrition, Concentration index, Tangible wealth, Factor score, Principal component analysis.

1. INTRODUCTION

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 spawning from economic growth tend to be concentrated only among the economically-advantaged sectors of the population. 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 all exported agriculture products. The industrial sector is rapidly becoming one of the more important components of the Bangladesh economy, contributing a high percentage to GDP. However, despite these economic improvements, the country still struggles to emerge from the clutches of poverty. Almost four in every ten people live below the absolute poverty line with incomes less than \$1 per day. Most reside in rural areas and those living in urban areas lack many basic amenities. A significant proportion of the population does not have sufficient access to food, sanitation facilities, or health care.

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 benefited mainly the wealthier sector of the population more so than 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: under-nutrition is one of the leading causes of childhood morbidity and mortality. Under-nutrition among children is often caused by the combined effects of improper or insufficient food intake, repeated episodes of infections, 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 adversely growth rate stunted.

2. LITERATURE REVIEW

Previous research has associated childhood nutrition with a child's multiple-birth status, a mother's

education and nutritional status, a father's employment, the mother's breastfeeding and feeding practices, access to safe drinking water and sanitation facilities, access to health care, prevalence of parasitic and infectious diseases, parent's health-seeking behavior, race or ethnicity, rural residence, and social network and family support. Demographic characteristics such as a child's age and gender, birth interval (both preceding and succeeding), and the mother's age at childbirth, have also been associated with child nutrition status. According to Kawachi, 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. Suffice it to say that the relationship between economic inequality and under-nutrition is complex. This is in part due to the fact that greater national wealth does not necessarily translate into better health care for all. If that were the case, then the single best approach to improving 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, and 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.

A number of studies have illustrated that children from poorer households tend to be more undernourished than children in 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 is not conclusive. A recent study in Mexico discovered that household poverty is not a necessary condition for children to be undernourished. Another recent study in Ecuador found inconsistent evidence to indicate any relationship between economic inequality and the nutritional status of children. Additionally, a study in Cambodia found that acute under-nutrition in children was associated with a mother's feeding practices, parent's health-seeking behavior, and personal hygiene; however, there was no association with household food insecurity. The primary objective of this study is to investigate the

association between household wealth inequality and childhood under-nutrition in Bangladesh. We will also examine the effects of other potential risks and confounding factors on childhood under-nutrition.

3. DATA AND METHODOLOGY

The analysis in this study is based on 8395 children aged 0–59 months with valid information on length or height included in the 2011 Bangladesh Demographic and Health Survey (BDHS). Children whose information on length/height was missing or invalid were excluded. The BDHS collected demographic, socioeconomic, and health data from a nationally-representative sample of 17842 women aged 15–49 (98% of eligible women) from 17141 households (98% of eligible households) included in the survey. The study contained 6210 households from urban areas and 11632 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. Details about these measurements are included in the main survey report.

The ratio of the height and age of a child serves as a good proxy for chronic under-nutrition among children, and it is not significantly affected by a child's recent episodes of illness. Children with a z-score of height-for-age more than 2 standard deviations below the international referenced median established by the World Health Organization are defined as stunted. The BDHS also includes a household wealth status index which is estimated from several household characteristics and asset variables using a principle component analysis.

Table 1: Sample distribution and prevalence of stunting among children age 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)	1965	25.2
4 th quintile	1700	39.4
3 rd quintile	1631	42.3
2 nd quintile	1617	46.8
1 st quintile (poorest)	1481	54.3
Child's age (month)		
0–11	1680	17.4
12–23	1547	50.1

24-35	1545	44.7
36-47	1866	49.1
48-59	1757	51.2
Child's sex		
Boy	4271	42.3
Girl	4124	43.7
Mother's education		
No education	1689	43.4
Primary or less	5688	47.1
Secondary or higher	1017	30.2
Urban/rural		
Urban	1871	36.7
Rural	6524	44.8
Geographic division		
Barisal	464	6.1
Chittagong	1946	22.4
Dhaka	2601	31.2
Khulna	767	11.1
Rajshahi	1087	22.4
Sylhet	639	8.3
Rangpur	891	4.9

The effects of household wealth status and other factors on a child's growth-stunting were estimated using multivariate logistic regression methods using the analytical software package SPSS. We also analyzed alternative regression models separately for boys and girls, and for urban and rural 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 the rural areas. The results are presented as percent of stunting and significant level (p-value) in bivariate analysis and odds-ratios (OR) with 95% confidence intervals (CI) logistic regression analysis.

4. RESULTS

In Model A, the unadjusted odds of suffering from growth-stunting are 3.4 times higher among children living in the poorest (lowest wealth index quintile) households than among children in the wealthiest (highest wealth index quintile) households (OR = 3.4; 95% CI: 2.9, 4.1). The odds of suffering from childhood growth-stunting declines consistently as wealth index increases. In Model B, when these childhood characteristics are controlled for, the odds of a child suffering from growth-

stunting are 2.8 times higher among the poorest 20% of households than in the wealthiest 20% of households. In Model D, when we control for child's and mother's characteristics and urban/rural residence, and geographic division, the effect of household wealth status on childhood growth-stunting remains large and highly, statistically significant (OR = 2.3; 95% CI: 1.6, 3.2).

Among the controlled variables, a child's age has the strongest effect on the risk of a child suffering from growth-stunting. Additionally, this effect is independent of the household wealth status and other maternal and household characteristics. When we control for household wealth status and other factors such as mother's age at childbirth, and residence, we find all have statistically significant effects, but these effects are generally small. We also carried out the above multivariate analysis separately for boys and girls, for urban and rural areas, and for children whose mothers had no education, a primary education or less, and a secondary education or higher.

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, 5.2)	3.9 (2.7, 5.8)	4.4 (3.0, 6.2)

		5.1)		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				
Boy [†]		--	--	--
Girl		1.1 (1.0, 1.2)	1.1 (1.0, 1.2)	1.0 (0.9, 1.2)
Mother's 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)

The effects of poverty on a child's nutritional status is a manifestation of physical developmental patterns of children who live in poorer conditions with insufficient food intake, have a higher risk to infection, and who lack access to basic health care. Results of this study 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 are at more than twice the risk of

suffering from adverse childhood growth-stunting than children in the wealthiest 20% of households. This is independent of a child's birth status, age, mother's education and nutritional status, household access to clean water and sanitation, and other important factors. The results hold separately by the gender of a child and by the urban/rural residence of a child. These findings are consistent with the results from previous research in other developing countries, and provide further evidence that wealth inequality is an important risk factor for chronic childhood under-nutrition.

The lack of a gender differential in adverse growth-stunting in our study indicates that there is no intra-household gender bias in feeding and health care for children in Bangladesh. An increasing pattern in many developing countries of growth-stunting by age is consistent with the typical pattern of increasing prevalence of childhood diseases by age such as diarrhea and acute respiratory infections. This may partly be due to the beginning of feeding solid foods to a child around 6 months of age, which increases the likelihood of consuming contaminated foods 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 infections. Consistent with past research, children of multiple- birth status are more likely to be undernourished than children who are single-births. The association between adverse growth-stunting and higher-order 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 adverse growth-stunting among children who were breastfed for more than one year partly due to the fact that poorer mothers are more likely to continue breastfeeding as a substitute for supplemental feeding. Contrary to the expectation, our analysis finds no significant effects of breastfeeding duration and household water and sanitation conditions on childhood adverse growth-stunting.

5. LIMITATION OF THE STUDY

One potential limitation of this analysis is that it does not control for diet and other health care indicators. However, household wealth status functions mainly through better access to food and health care in affecting childhood nutritional status, for example more wealthy households can afford better food in terms of quality. In the case of adults, the association between nutritional status and

household wealth status could be bi-directional and have a reverse-causal relationship. In fact, household wealth status can affect access to food and health care, but undernourished adults whose ability to work is limited will in turn affect the household economic status of the household. In this case, our inability to control for food intake and access to health care is not a major limitation.

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

6. CONCLUSION

Notwithstanding these limitations, there is evidence of a relationship between household wealth status and others factors and childhood growth-stunting which suggests that improving the health and nutritional status of children in Bangladesh can be realized through expanding and integrating community health and nutritional programs and initiatives targeting the poor. These programs include but are not limited to the Bangladesh Integrated Nutritional Program (BINP) and Program for Bangladesh Poverty Reduction (PBPR). The findings indicate the prevalence of high malnutrition among the Bangladeshi children. Direct nutrition interventions are needed to assist those affected by malnutrition, including nutritional rehabilitation and direct feeding program 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 malnutrition among the children from poorest households. The interventions should be complemented with poverty alleviation strategies including the empowerment of women.

REFERENCES

- [1]. Acheson D, Barker D, Chambers J, Graham H, Marmot M, Whitehead M: Independent inquiry into inequalities in health. London:

Stationary Office, Report to the Secretary of State for Health; 1998.

- [2]. Asian Development Bank, Japan International Cooperation Agency: Economic Growth and Poverty Reduction in Bangladesh 2004. Dhaka: ADB, JICA; 2004.
- [3]. Bangladesh Bureau of Statistic: Household Expenditure Survey 1995–1996. Dhaka: BBS; 1998.
- [4]. Berkman LK, Kawachi I: Social Epidemiology. New York: Oxford University Press; 2000.
- [5]. Dibley MJ, Goldsby JB, Staehling NW, and Trowbridge FL: Development of normalized curves for the international growth reference: Historical and technical considerations.
- [6]. Frongillo EA, Onis M, Hanson KMP: Socioeconomic and demographic factors are associated with worldwide pattern of stunting and wasting of children.
- [7]. Hertzman C, Frank J, Evans RG: Heterogeneities in health status and the determinants of population health. In Why are some people healthy and others not? The determinants of health of the populations. Edited by Evans RG, Barer ML, Marmor TR. New York: Aldine de Gruyter; 1994:67-92.
- [8]. Int J Epidemiol 2003, 32:847-853. PubMed Abstract | Publisher Full Text Peña R, Wall S, Persson L: The effect of poverty, social inequality, and maternal education on infant mortality in Nicaragua, 1988–1993.
- [9]. Mishra V: Indoor air pollution from biomass combustion and acute respiratory illness in preschool age children in Zimbabwe.
- [10]. Rev Panam Salud Publica 2002, 11:356-64. PubMed Abstract | Publisher Full Text Wang Y, Monteiro C, Popkin BM: Trend of obesity and underweight in older children



and adolescence in the United States, Brazil, China, and Russia.

- [11]. Reyes H, Perez-Cuevas R, Sandoval A, Castillo R, Santos JI, Doubova S, Gutierrez G: The family as a determinant of stunting in children living in conditions of extreme poverty: a case-control study.
- [12]. Rice AL, Sacco L, Hyder A, Black RE: Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries.
- [13]. Ross NA, Wolfson MC, Dunn JR, Berthelot J, Kaplan GA, Lynch JW: Relation between income inequality and mortality in Canada and in the United States: cross sectional assessment using census data and vital statistics.
- [14]. United Nations Development Program: Human development report 2005. New York: UNDP; 2005.
- [15]. United Nations System, Standing Committee on Nutrition: 5 ft report on the world nutrition situation: Nutrition for improved development outcomes. New York: United Nations; 2004.
- [16]. United Nations System, Standing Committee on Nutrition: 5 ft report on the world nutrition situation: Nutrition for improved development outcomes. New York: United Nations; 2004.
- [17]. Wilkinson RG: Putting the picture together: prosperity, redistribution, health, and welfare. In Social determinants of health, Edited by Marmot MG, Wilkinson RG, New York: Oxford University Press; 1999:256-74.
- [18]. World Health Organization: World Health Report 2002. Geneva: World Health Organization; 2002.
- [19]. World Bank: World Development Report 2000. Washington DC: World Bank; 2000.