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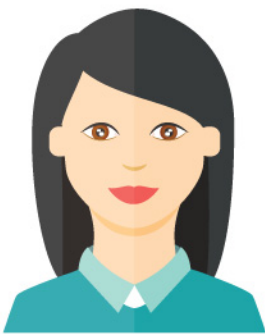# NUTRITION FOR
BANGLADESH

GIRLS' SECONDARY SCHOOLING:
COSTS AND BENEFITS OF EDUCATION AS A SOLUTION TO CHILD MALNUTRITION

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Girls' Secondary Schooling: Costs and Benefits of Education as a Solution to Child Malnutrition

Bangladesh Nutrition

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Introduction

Malnutrition is regarded as one of the crucial factors causing children's illnesses and deaths. Generally, a combination of inadequate or inappropriate food intake, gastrointestinal parasites and other childhood diseases, as well as improper care during childhood illness cause child malnutrition (Mishra and Retherford, 2000). In addition to this, maternal characteristics can contribute to the child's nutritional status. The literature provides evidence that a mother's education improves nutritional gains for a child (Semba et al., 2008). Furthermore, adolescent-aged motherhood – which is a major concern in developing countries including Bangladesh – is regarded as one of the determinants of a child's nutritional status.

Education contributes through knowledge and awareness gained due to a higher level of education, while the lack of physical readiness of adolescent girls/mothers affects the child's nutrition. The concern is raised in this regard as the average age of girls at the time of their first born is about 18 in Bangladesh, making the newborn vulnerable to a lack of nutrition. Thus, malnutrition during childhood potentially affects the growth potential and the risk of morbidity and mortality in later years of life.

The impact of programs that promote secondary education goes beyond child nutritional gains, and includes income gains that are attributed to an extra year of education. The empirical findings suggest a 13 percent return to education for girls in Bangladesh (Asadullah, 2008). This paper provides the benefit-cost ratio of the impact of promotion of girls' secondary education on child nutrition in Bangladesh as well as income gains. It is important to note that the impact of promoting girl's education is not limited to child nutrition but also applicable to adolescent girls as well. Therefore, the benefit-cost ratio calculated in this paper does not necessarily indicate the full effect of the promotion of girls' education in Bangladesh.

Child Malnutrition in Bangladesh

Though relatively better than many developing countries, many Bangladeshi children are still malnourished (Horton and Hoddinot, 2014). A significant proportion of children in developing countries are stunted, underweight or wasted, indicating chronic as well as acute malnutrition. Many suffer severe malnutrition as per the WHO definition. Even though the child nutritional status in Bangladesh has improved over time, it is still far from the aimed-for level. The percentage of children under five years of age who are stunted and underweight is very high: according to the Bangladesh Demographic Health Survey (DBHS) of 2011, over 40% are stunted and more than 36% are underweight (Figure 2).

Figure 1: Child nutritional status in Bangladesh
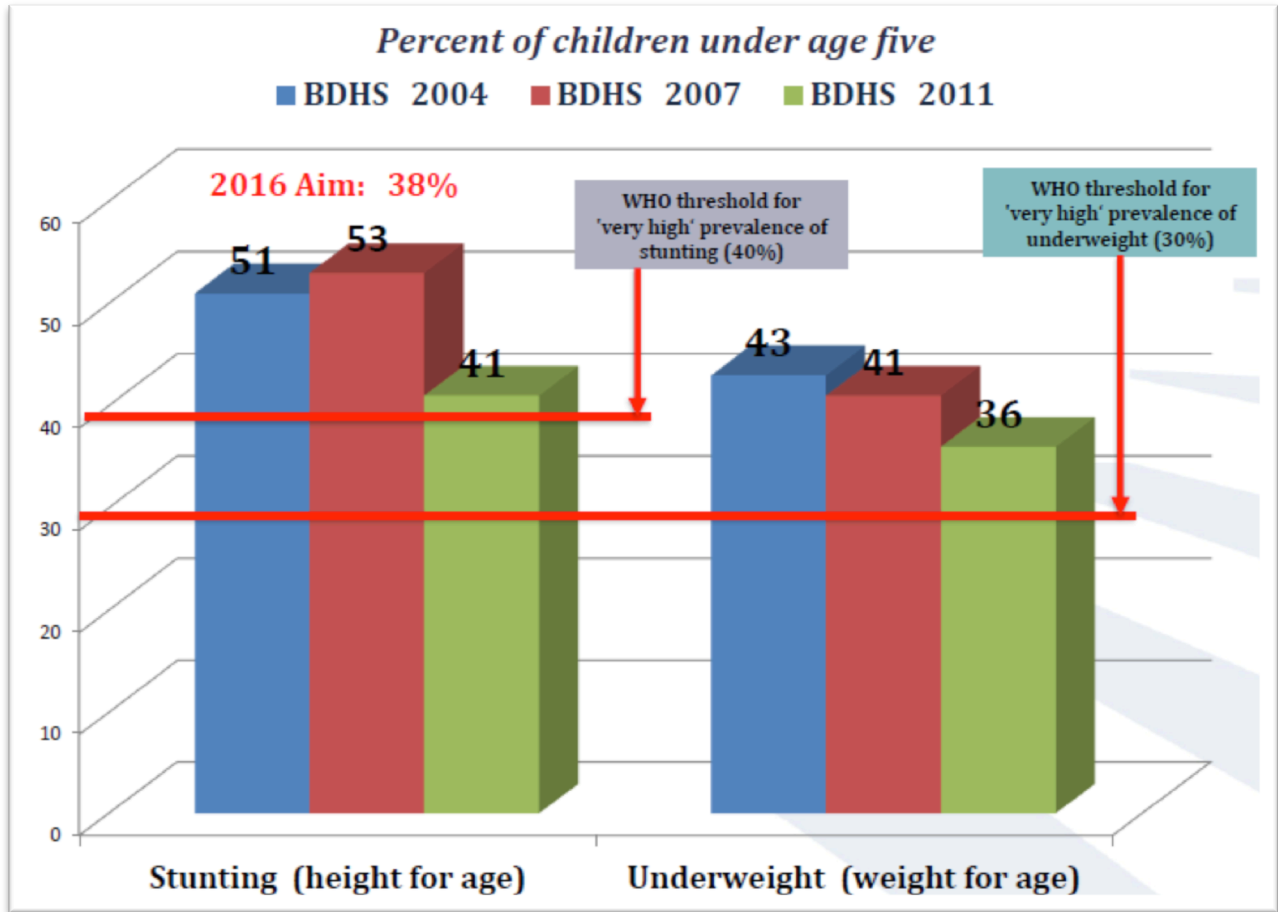
Source: BDHS 2004-2011

Factors affecting child malnutrition

The literature provides evidence of a positive relationship between mothers' education and children's nutritional status such as Mishra and Retherford (2000) in India, Anwar et al., (2013) in Bangladesh, and Abuya et al., (2012) in Kenya, among others. This is also expected to be consistent among other countries as well. To be more precise, children whose mothers have completed secondary school are less likely to be stunted and underweight than those children whose mothers are illiterate. The higher the level of education of the mother, the more this relation becomes enhanced. The literature reveals that socioeconomic status is one of the most important pathways to explaining the link between maternal education and child nutrition (Frost et al., 2005; Desai and Alva, 1998; Caldwell, 1994). The channels through which a mother's education and child nutrition are related is shown in Figure 2. The figure explains that the child nutritional status is enhanced by a

mother's education through increased household income. In addition, the child's nutritional status is improved through a mother's empowerment, improved educational environment, greater access to media and hence improved knowledge on nutrition and health. Adolescent marriage is regarded as one of the confounding factors for children's malnutrition. More than one-in-three girls in Bangladesh is married before her 15th birthday

Figure 2: Relationship between maternal education and child-nutritional status.
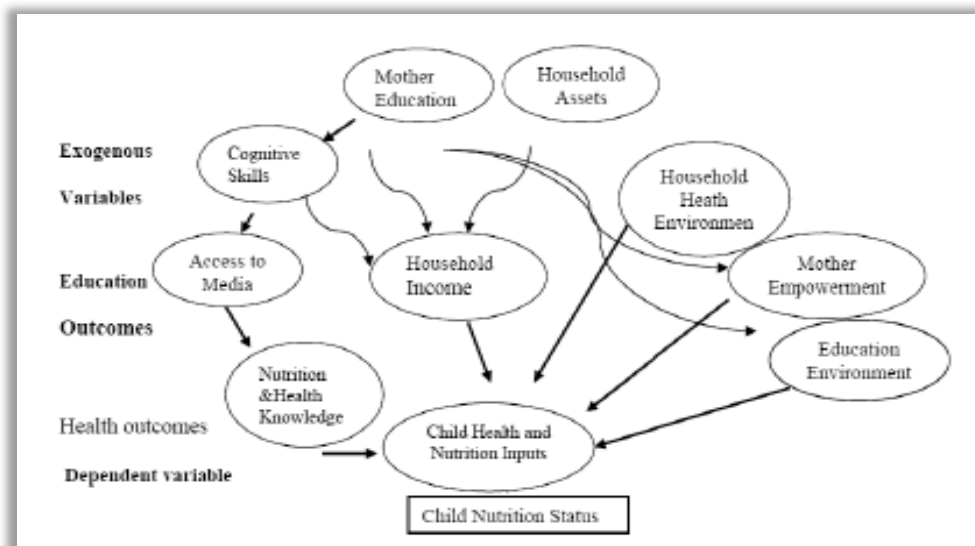
NB: The figure has been adapted from Anwar et al., (2013)

Economic analysis

The literature on the economic consequences of girls' education focuses on several issues including income gain, girls' increased age at the time of their first-born as a direct effect and other indirect effects such as the improved nutritional status of the child. One of the strong indicators of a child's nutritional status is stunting – low height for age. There are no programs in Bangladesh aimed at raising a girl's age at time of motherhood as a means to improve children's nutritional status. This paper uses empirical findings in different papers that estimate the returns to education as well as the impact of maternal education on child nutrition status. The costs and benefits in the paper have been calculated using findings from studies such as Horton and Hoddinot (2014) and Semba et al., (2008), Schurmann (2009), Anwar et al., (2013), and Khandker et al., (2003). Horton and Hoddinot (2014) state that, as a means to determine nutritional gain, stunting acts a better indicator than being underweight. More importantly, a goal of halving the proportion who are hungry is a weaker goal (easier to achieve) than one of halving the current number who are hungry in a world with regions with growing populations such as South Asia. Semba et al., (2008) provides evidence that a one-year increase in girl's education causes a 5% decrease in child stunting. Horton and Hoddinot (2014) also state that less stunted children yield 59.4% more in income benefits. Using 1996 data,

Khandker et al., (2003) estimate that one-year of stipend provision increases girl's secondary education by 8%. The study also provides the class-wise amount of stipend as well as school tuition fees in order to calculate cost of average secondary schooling.

Estimation Technique - costs

The costs are calculated for a cohort of girls who receive government funding for their education at the secondary school level. Schurmann (2009) reports that the education costs per girl, per year, after an inflationary adjustment, is 6112 Taka (BDT). The total cost of schooling has been calculated as the sum of the cost of schooling provided by students as well as the stipend from the government. The output per worker is then multiplied by the labor force participation rate for 15-19 year old girls to proxy the opportunity costs of one-year extra education in the equation.

Estimation Technique - Benefits

The benefits of promoting girls' secondary education are two-fold: increased wages for the girl who receives the schooling and increased wages for the children of the girl who are no longer stunted. These are calculated based on the findings in Khandker et al., (2003), Semba et al., (2008), and Asadullah (2008) and other publically available data sources. Khandker et al., (2003), using 1996 data of a government stipend provided to secondary students, found that one year of stipend provision increases girls' enrollment in the secondary level by 8 percent. According to Semba et al., (2008) an extra year of secondary education by a mother decreases the incidence of child stunting by 1.1 percentage points (i.e. from 37% to 35.9%). Horton and Hoddinot (2014) find that improving child stunting raises income by 59 percent compared to the status quo. Furthermore, while calculating income benefits due to extra years of education, Asadullah (2008) estimates that the return to girl's education in Bangladesh is about 13 percent. We also weight the relevant benefits by the participation rate of women in the Bangladesh labor force (58% according to ILO), the average number of children each woman in Bangladesh has (2.2 according to the World Bank) and the general participation rate in the labor force for men and women (to adjust stunting benefit, since not all people work. This is 71% according to ILO).

Costs and benefits are discounted at 5% (and for sensitivity analysis also 3% and 10%). Furthermore, in order to check the robustness, different growth rates (3, 4, and 5 percent) have also been considered.

Underlying assumptions:

- One year of education reduces child stunting by 4.3%
- Not being stunted yields 59.4% increased income
- 3, 4, and 5 percent economic growth in the time period considered
- Per capita GDP in the first year: 95,864 Taka
- 4.3 percent reduced incidence of child stunting due to an extra year of secondary education by a mother
- 13 percent increase in income due to an extra year of education
- Average age at birth: 18 years

Results

Table 1 provides the benefit-cost ratio of investment on girls' education in Bangladesh: child nutritional gains and income gains. The corresponding results for 4 and 5 percent growth rates are provided in tables 2 and 3, respectively. The benefit-cost ratio (BCR), with a 3 percent growth rate and 3 percent discount rate, is 8.0, considering both nutritional gains as well as income gains arising from an extra year of education (Table 1). The benefit-cost ratio considering only income gains from an extra year of education is 6:1, indicating that the contribution to the BCR for child-nutritional gains from maternal education is about 2. This implies that a one Taka expenditure on girls' secondary education generates a 0.5 Taka benefit through improved child nutrition, and 6 takas in income gain for an extra year of education. Considering discount rates of 5% and 10%, the BCR remains favorable to expenditure on girls' education (as BCR>1), in terms of both child-nutrition gain (0.2 and 0.1, respectively) as well as own income gain attributed to the extra year of education (5 and 2, respectively). When considering investment in any project, regardless of whether it is a public or private project, the return on investment is a primary concern. If a 3 percent economic growth rate is assumed in the analysis period, the calculated BCRs provide an indication that favors the investment.

Table 1: Benefits and costs per educated girl of spending on educational promotion of girls in Bangladesh: child's nutritional gains (3 percent growth rate)

	Discount Rates		
	3%	5%	10%
Benefits - stunting	34,583	15,614	2,709
Benefits - education	423,005	277,467	120,216
Total Benefits	457,588	293,081	122,924
Costs	70,052	70,052	70,052
BCR	**6.5**	**4.2**	**1.8**
BCR - just education	6.0	4.0	1.7

Note: costs and benefits are in Bangladeshi Taka (BDT).

The BCR in Table 1 is calculated under the assumption that the economy will grow at 3 percent in the analysis time period. The historical growth rate of Bangladesh for the last two decades, however, averaged around 5 percent. Thus, analysis considering a 3 percent growth rate in the next couple of decades raises a concern about the practicality of the outcome from the analysis. Consequently, a similar exercise has been conducted considering 4% and 5% growth rates. Tables 2 and 3 provide the corresponding BCRs, assuming 4% and 5% growth rates, respectively.

The benefit-cost ratios considering 4 and 5 percent growth rates suggest outcome in favor of investment on girl's education. Considering 4 and 5 percent growth rates and depending on the growth and discount rates, the BCR ranges from 2 to 11. A 4 percent economic growth rate generates BCRs of 8, 5, and 2, at the discount rates of 3, 5, and 10 percent, respectively (Table 2). The corresponding figures for a 5 percent growth rate are 11, 6, and 2, at the discount rates of 3, 5, and 10 percent, respectively (Table 3).

Table 2: Benefit-Cost ratio of spending on educational promotion of girls in Bangladesh: child's nutritional gains (4 percent growth rate)

	Discount Rates		
	3%	5%	10%
Benefits - stunting	51,931	22,931	3,790
Benefits - education	527,027	337,664	138,882
Total Benefits	578,959	360,595	142,672
Costs	70,052	70,052	70,052
BCR	**8.3**	**5.1**	**2.0**
BCR - just education	7.5	4.8	2.0

Note: costs and benefits are in Bangladeshi Taka (BDT).

Tables 2 and 3 indicate that a one taka investment on girl's education yields benefits of both child nutrition and income gains of 2-11 Taka, at different discount rates and growth rates. Disaggregating the benefits, the corresponding benefits due to income gain range from 2.0-9.5 Taka. The marginal contribution to BCR in terms of non-stunting gain ranges from 0.0-1.1 Taka. The relatively small contribution from stunting is attributable to two main factors. Firstly, the reduction in stunting incidence from a year of extra education is relatively small – 1.1 percentage points per year of education. Secondly, the benefits are not realized until many years into the future, after the woman receiving the education reaches child-bearing age, has a child and her children grow up to be active participants in the labor force – and discounting at any reasonable rate diminishes the present value of this benefit. So despite the large benefit of an almost 60% boost in wages from not being stunted, these factors reduce the marginal contribution to the BCR from the non-stunting benefit to a maximum of 1.1 taka per 1 taka spent. While achieving female education is a worthy aim in its own right – and indeed the analysis here suggests commendable BCRs around 5 (in the median scenario), just in terms of increased wages for the woman receiving the extra education – using this as a tool to diminish stunting seems relatively ineffective.

Table 3: Benefit-Cost ratio of spending on educational promotion of girls in Bangladesh: child's nutritional gains (5 percent growth rate)

	Discount Rates		
	3%	5%	10%
Benefits - stunting	78,539	33,924	5,333
Benefits - education	662,848	414,948	161,781
Total Benefits	741,386	448,872	167,114
Costs	70,052	70,052	70,052
BCR	**10.6**	**6.4**	**2.4**
BCR - just education	9.5	5.9	2.3

Conclusion

Malnutrition is regarded as one of the crucial factors causing child illness and death. In addition to the characteristics involved directly with the child, maternal characteristics such as a mother's education contribute to the child's nutritional status. The literature provides evidence that a mother's education improves a child's nutritional gain. Maternal education contributes through knowledge and awareness due to a higher level of education, while the lack of physical readiness of adolescent girls/mothers affects the child's nutrition. The impact of programs that promote secondary education goes beyond child nutritional gains, such as the income gains that are attributed to an extra year of education. This paper attempts to analyze the effect of potential investment in girls' education through improved child's nutrition and increased income in Bangladesh, and to calculate the cost benefit ratios. It finds that the cost benefit ratio ranges from 2 to 11. Stated differently, a 1 BDT of expenditure on girls' education provides benefits ranging from 2 BDT to 11 BDT, considering the economic growth rates from 3-5% and discount rates of 3, 5, and 10 percent.

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