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**Unpacking the Links Between Women's Empowerment and Child Nutrition: Evidence
Using Nationally Representative Data From Bangladesh**

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*Selected Paper prepared for presentation at the
Agricultural & Applied Economics Association 2010
AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27, 2010*

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Abstract

This paper examines the relationship between gender inequality and nutrition using direct indicators of empowerment such as mobility, decision-making power, and attitudes towards verbal and physical abuse. Our approach draws on the theory of the household as a utility maximizing unit that uses women's status and characteristics as inputs to produce a final good, child health. Indices that capture distinct dimensions of women's empowerment are used as explanatory variables along with controls for age and sex of the child, maternal height and education. Results from Logit models indicate that a greater degree of women's empowerment is associated with better long term nutritional status of children. Attitudes towards domestic violence have a significant effect on chronic malnutrition and mobility; participation in decision making and ability to purchase food are important influences on dietary diversity. Our findings warrant further research and attention to inform the design and implementation of interventions. Specific research questions that emerge from these analyses relate to types of individual and community interventions that can reduce prevalence of violence and empower women in order to achieve better health and wellbeing outcomes; and policy actions, including legal instruments that can empower women and address the links between empowerment and nutrition.

Keywords: Malnutrition, empowerment, gender, domestic violence

Acknowledgements

This research was funded by the World Bank through its Resident Mission in Bangladesh. We thank Lynn Brown for her help in conceptualizing this research and her overall support throughout the project. All errors and omissions are our own.

Introduction

Bangladesh's progress in economic growth has contributed to a modest reduction in the headcount poverty rate of around 1.5 percentage points a year since the early 1990s. This decline however has been of little consequence as childhood malnutrition rates in Bangladesh continue to remain highest in the world. Malnutrition is a close correlate of poverty, serving both as a cause and effect of poverty. Improved nutritional status of the population therefore is a key input in attaining a larger and sustained decline in poverty. This "South Asian Enigma" of poor nutritional status of children despite economic growth has been attributed to the low status of women (see Ramalingaswami, Jonsson, and Rohde 1997; Haddad et al., 1996; Smith et al 2003). This paper examines the role played by women's empowerment in the lack of improvement in childhood malnutrition in Bangladesh. Women are primary care givers and influence child nutrition directly through improved child care practices or indirectly through improvements in their own nutrition (Smith et al 2003).

Compared with their higher-status counterparts¹, women with low status tend to have weaker control over resources in their households, stricter constraints on their time, restricted access to information and health services, and poorer mental health, self-confidence, and self-esteem. These factors can seriously impinge on a woman's ability to care for herself; they may also have long term negative effects on children's birth weights, subsequent growth and the quality of care provided to children (Engle, Menon and Haddad 1997; Kishor 2000). Studies that examine child malnutrition and gender inequality have used proxy measures of women's status such as indicators that depict sources of power such as education or setting of power such as customs regarding marriage (Adato et al. 2000, Yount 1999, Kishor 2000). Our paper extends that literature significantly by using direct evidence on women's empowerment and identifying different aspects of women's empowerment that impinge on the growth and diets of children, an area that deserves attention especially from an intervention perspective.

Using evidence on different aspects of women's empowerment—from mobility, to decision-making power, to freedom from verbal and physical abuse—we can "unpack" the notion of empowerment and ascertain which specific aspects of empowerment matter for child nutrition. This is important since we would expect different aspects of women's empowerment to act upon child health in different ways and to varying degrees. For example, women's decision-making power or control over resources to buy food will affect diet quality. On the other hand, a woman's ability to take the child to the doctor when the child is ill affects overall health and wellbeing. Women who have experienced domestic abuse might be less able to safeguard their own, and their children's, nutrition.

¹Smith et al. (2003) define women's status as women's power relative to men. Three aspects of the definition of women's status are worth noting. First, it is considered to be relative to men rather than absolute or relative to other women. Second, it is founded on the concept of power, defined as the ability to make choices (Riley 1997; Kabeer 1999). Third, the definition has an intrahousehold and an extrahousehold dimension and thus takes into account the influence of customs and norms that may dictate differential roles, acceptable behaviors, rights, privileges, and life options for women and men (Safilios-Rothschild 1982; Agarwal 1997; Kabeer 1999).

To analyze the correlations between women's empowerment and child nutrition, we focus on long term growth of children which is captured by the prevalence of stunting. In addition a minimum diet diversity variable is also used to illustrate differences in diets that is closely related to stunting.

Data and the conceptual framework

This study uses the Bangladesh Demographic and Healthy survey (BDHS, 2007) which is nationally representative and appropriate for examining nationwide trends and patterns in child malnutrition and how it correlates with women's status.

The survey used the sampling frame provided by the list of census enumeration areas (EAs) with population and household information from the 2001 Population Census. EAs from the census were used as the Primary Sampling Units (PSUs) for the survey. The survey is based on a two-stage stratified sample of households. The 361 PSUs selected in the first stage of sampling included 227 rural PSUs and 134 urban PSUs. On average, 30 households were selected from each PSU, using an equal probability systematic sampling technique. In this way, 10,819 households were selected for the sample. The survey was designed to obtain 11,485 completed interviews with ever-married women age 10-49. Our sample includes observations on 5789 children. Analysis of minimum diet diversity uses data on children aged 6-23.9 months whereas the analysis of stunting uses data on children 6-59 months.

The UNICEF's conceptual framework on child malnutrition (UNICEF, 1998) and the subsequent extensions of that framework (Engle, Menon and Haddad, 1997) discuss the role of immediate and underlying determinants that cause child malnutrition. This study focuses on the underlying causes that result in poor child health. Figure 1 depicts a simple conceptual framework showing linkages between women's empowerment and child nutrition.

The extended UNICEF model underscores the importance of the physical and mental well being of women, support from family and community, education all of which directly impact their ability to care for children. The social context of the household such as culture, traditions, occupation and incomes determine the relative status of women. The status of women in turn can determine health and dietary intakes of children in different ways. For instance, female participation in household decisions regarding the health of children or own health, large household purchases and those for daily needs, is essential for improving child nutrition. The degree of autonomy a woman has making decisions in a household can effectively determine if a child is given a proper diet and medical help.

Similarly, the ability to move out of one's home alone or with children could restrict or increase the care available to both the mother and the child. Greater mobility can affect the nutritional status of children in several ways. Access to markets for household purchases of food, medicines and other essentials and access to schools can lead to improved knowledge about nutrition and health. Restricted mobility of women can also prevent them from making visits to the health center thus affecting their own and child health.

The control over financial resources could effectively change the composition of household purchases. Evidence suggests that women's control over assets is particularly important for household food security as well as for child outcomes because women invest substantially in nutrition, education and health care.

Attitudes towards domestic violence are an important indicator of women's empowerment within the household in South Asia. Exposure to intimate partner violence directly influences the physical and mental well being of women and is associated with a variety of health outcomes. At the simplest level, physical abuse hinders a woman's ability to provide adequate care through diminished physical capacity, increased psychological stress and possibly diet deprivation. In addition, witnessing repeated episodes of violence can result in psychological and physical disorders in children.

The Model and Econometric specification

To formalize the relationship between child nutrition and women's status, the theory of household production serves as a useful starting point. Households use human capital and other goods as inputs to produce a final good which is health (Rosenzweig and Schultz, 1983; Behrman and Deolalikar, 1988). This model is modified to include women's characteristics and their relative status to study the impact on child health.

$$U = U(c, l, N) \tag{1}$$

Where U is the utility function, c is the consumption of goods and services, l is the amount of leisure time and N is the nutritional health status of a child. We use prevalence of stunting and minimum diet diversity scores as our measures of child health.

The nutritional status of the child is given by the production function

$$N = N(c, l, k, m, h) \tag{2}$$

c is the consumption, l is inputs into child health such as medical care, k is the child's observable characteristics including age, birth order, size at birth and sex; m is a vector of maternal characteristics such as maternal education, mother's height, age at first marriage, h denotes household characteristics which include household wealth, geographical location. The budget constraint for the household is

$$\sum_i p_i x_i = Y \tag{3}$$

Where p_i is the price of the i th commodity, x_i is the complete set of commodities consumed including c and l , Y is the total money income. Constrained optimization of the utility function subject to the budget constraint and the nutrition production function gives reduced form demand functions for the purchased goods and the nutritional status of children.

$$N = \theta(p, Y, k, m, h) \tag{4}$$

To study the association between women's characteristics and child health, we construct indices based on factors that are found to be significant by other studies. Relative difference between males and females (such as the difference in age or education levels), or more individual/absolute measures (such as the age at marriage, exposure to violence, access to assets) are found to be associated with improvements in child weight and height (Smith and Haddad, 2000; Guha-Khasnobis and Hazarika, 2006; Osmani and Bhargava, 1998, Nyssölä, 2007; Hallman, 2000; Frost, Forste, & Haas, 2005).

We apply similar approaches in our analyses, and present results of logit models adjusting all models for the survey design, clustering of errors by survey cluster, and including dummy variables for regions/villages as appropriate.

Principal components Analysis: We ran two factor analyses using the principal components approach to explore the relationships among the different women's empowerment variables in the BDHS 2007 data set. The first factor analysis included variables on decision making, violence and mobility, while the second included these variables as well as the education and age at first union variables. Results suggested that the decision-making and attitudes towards violence variables were distinct from each other.

Based on the factor analysis results, indices were constructed to capture three distinct dimensions of women's empowerment – decision-making, mobility and attitudes towards violence. Rather than use the scores on individual factors from the factor analysis as index values for the different women's status indices, we used an additive approach to construct indices on the dimensions identified in the factor analysis. This was done to avoid having the noise from other variables included in the indices for a certain set of variables (using the factor scores would include noise from those variables that do not load strongly on a factor).

Decision making is measured by an additive index of participation in decision-making. To develop this, we used 5 decision-making variables, and assigned a score of 1 for each decision the woman was involved in, either alone or with a partner or relative. The scores on these individual variables were then added and then converted these into percentages to capture the proportion of the 5 decisions in which the woman was involved

Mobility: Freedom of movement is measured by an ordinal scale that ranges from 0-2 with 0 implying no mobility, and 2 indicating greater freedom of movement. This index is related to the ability of women to go out alone or with children to the health center or other places

Attitudes towards violence: Attitudes towards domestic violence were quantified by an additive index that takes on values from 0 to 4. This index captures the number of statements to which the respondent agreed that physical violence was justified. These statements relate to the following situations about which the respondent was asked whether she felt the use of physical violence was justified: (i) she neglects children, (ii) argues with the husband, (iii) refuses sex or (iv) goes out without informing the husband. Although physical, sexual and verbal abuse of women constitutes domestic violence, we focus on attitudes towards physical violence in this index, rather than the experience of domestic violence, using the rationale that women who justify

physical violence for the reasons stated are likely to be living in households where the balance of power between spouses is skewed. Moreover, data on attitudes are available for the entire sample of respondents, rather than the sub-set selected for questions on experiences of domestic violence.

In addition we also use traditional measures of women's status and gender inequality such as age at marriage, education and age differentials and women's own health status as measured by their height and body mass index.

Econometric specification: In order to isolate the effect of women's empowerment on child nutrition, we control for a number of other factors such as child age, maternal height, maternal education, household wealth and geographical location.

The equation to be estimated is:

$$Y = \beta_0 + \beta_1 WE + \beta_2 H + \beta_3 M + \beta_4 K + e \quad (5)$$

Y is the dependent variable which is the prevalence of stunting² and minimum diet diversity. WE , as explained above, is an index of women's empowerment, H is a vector of household characteristics such as education and wealth quintile that the household belongs to and geographical region, M is a vector of maternal characteristics such as height and age at first marriage, K denotes child characteristics such as age and sex and e is the error term.

In this set of analyses, we examine the influence of the women's empowerment indices separately rather than introducing all women's empowerment variables together in the same regression models.

Dependent variables: A child is classified as stunted if the HAZ is below -2, wasted if the WHZ is below -2 and underweight if the WAZ is below -2. The z-scores reported here are based on the WHO international reference population (WHO, 2006).

The minimum diet diversity score (MDD) is an additive index that counts the number of food groups consumed. We used 6 food groups: Grains, roots and tubers, Legumes and nuts, Dairy products, Meat products, Vitamin-A rich fruits & vegetables and other fruits & vegetables. The MDD takes on values 0 and 1 based on whether a child consumes 4 or more food groups.

Results

Table 1 presents summary statistics on key characteristics of children and mothers in our sample. The mean HAZ score is -1.72 and 42% of the children are stunted, which indicates a very high prevalence of child undernutrition (table 1). The mean WAZ is -1.7 and approximately 40% of

² Regression results for wasting, underweight prevalence and OLS results for HAZ, WAZ and WHZ are similar though not reported in this paper.

the children in the age group 0-5 years are underweight. The prevalence of wasting, at 17%, is extraordinarily high for an indicator of acute malnutrition.

Fifty-eight percent of respondents are either uneducated or have not studied beyond the primary level. Only 7% of the women have received higher than secondary education. The index for mobility indicates that the 76% of the women are able to go to a health center either alone or with someone else. The decision-making index shows that on average women are generally involved in 64% of the household decisions related to expenditures for daily needs or large purchases, visits to family and own and child health. The age at first marriage is also very low at 15 years. The height of women is an indicator of their own health status over time. The average height for women was 150 cms which is on the lower side. The wealth index available in the DHS survey is computed based on housing characteristics, durable assets etc. Based on this wealth index, approximately 40% of the respondents belonged to the poorest quintile.

Data on women's empowerment enable us to assess the degree of autonomy enjoyed by the women. Around 86% of the respondents report that decisions about cash earnings are made along with their spouses or another person (table 2). 33% of the men are reported to make decisions regarding the woman's health care. Decisions about child health are made mostly in conjunction with a partner or someone else. In traditional societies, with rigid and hierarchical family structures, women often do not make decisions alone. The figures in table 2 suggest that most women are involved to some extent in the decision making process. However, a key area that needs more focus is decisions regarding their own health.

Almost one-third of the women justified physical abuse for at least one reason. Common reasons were arguing with the husband (23%), going out without telling him (19%) table 2. Around 18% of the women justified physical violence on grounds of neglecting children and 11% for refusing sex.

Child anthropometry and maternal characteristics

Stunting is characterized by a low height-for-age z-score and indicates long standing deprivation. Low status of women is a persistent phenomenon and therefore we expect that strongest influence of this on the long-term growth of children. Bivariate and multivariate logistic regressions are used to examine the effect of each empowerment variable one by one (and not simultaneously) on child nutrition controlling for child characteristics (age and sex), maternal characteristics (height, schooling, age at first marriage, age and education differentials with spouse) and household characteristics (wealth, and geographical location using dummy variables for region, education and wealth)³.

The results of the logistic regression, expressed as odds ratios, for stunting are presented in Table 3. Attitudes towards domestic violence, maternal education and child age are found to be significant determinants of child stunting. In models including attitudes to domestic violence (model 7), we find that children of women who accept domestic violence are 1.07 times more likely to be stunted than those who do not justify domestic violence; Even though it might appear

³ We also ran OLS regressions using the HAZ, WAZ and WHZ. Results (not reported here) were similar to those obtained from the logistic model.

small, a 7 percentage point difference in stunting is biologically meaningful. In other regression results, mobility and decision making have no effect on stunting. As expected, increase in age at first marriage, are related with lower odds of stunting.

We also find that, as expected, maternal education and household wealth are associated with lower odds of stunting. Relative to no education, children of women with secondary or higher education had lower odds of stunting. Also children of households that belong to the middle or richer groups had lower odds of stunting as compared to children from the poorest wealth quintile. Maternal height which is an indicator of maternal health lowered the odds of stunting. The regional dummies show that children in Khulna region had significantly lower odds of stunting as compared to children in Barisal.

The minimum diet diversity score is a 0,1 variable that indicates if a child consumes 4 or more food groups. Regressions of minimum diet diversity score on women present an interesting contrast to the results on stunting (table 4). The effects of mobility and participation in decision making are statistically significant while attitudes towards domestic violence are not. Controlling for child and maternal characteristics, we find that the age differential between spouses is a significant correlate of diet diversity. As the age difference between spouses is narrowed, the minimum diet diversity increases. Age at first marriage is also statistically significant indicating that higher age at first marriage is correlated with more diversity in diets. Children in more educated households or wealthier households have greater odds of having diversified diets. Children in Rajshahi region of Bangladesh also have higher odds of a diversified diet as compared to children in Barisal, possibly since Rajshahi is closer to West Bengal, India.

Discussion

This study attempted an analysis of women's empowerment and other maternal characteristics to examine which aspects are most important for child health. Child health is captured by two variables: stunting and minimum diet diversity. Women's empowerment is a complex term that captures a multitude of constructs; control of household resources and assets, decision making capabilities, position in the society and knowledge level among many others (see McGuire and Popkin, 1990, Quisumbing, 2003; Engle, Menon and Haddad, 1997; Kishor, 2000; Osmani and Sen, 2003; Smith et al., 2003; Silverman et al, 2009). We used direct evidence on decision making, mobility, and attitudes towards intimate partner violence as indicators of women's empowerment.

Analyzing the child characteristics, we find that malnutrition rates are very high in our sample with 40% of the children having a height for age z scores that is less than -2. This prevalence of stunting coupled with extraordinarily high rates of underweight and wasting prevalence portray a rather bleak picture of the nutritional status of children in Bangladesh.

Analysis of women's empowerment variables indicates that most women enjoy some freedom of movement and also participate in household decisions. However, most of their involvement is restricted to decisions regarding control of cash rather than decisions regarding their own health. A large percentage of women are also uneducated, which could explain their relative lack of involvement in decisions regarding health. Therefore, even control of financial resources need

not necessarily imply that they will be able to make decisions on the end use of those resources. Attitudes towards domestic violence tend to be rather forgiving, with majority of the women accepting violence on one ground or the other. It could be that the exposure to domestic violence also interferes with their decision making abilities or mobility thus affecting their own and child health as the results on stunting indicate.

The overall picture that emerges from the bivariate analyses of child anthropometry, minimum diet diversity and maternal and women's characteristics is that greater women's empowerment and education are associated with better nutritional status of children reflected in higher HAZ and more diversified diets. Justification of domestic violence is strongly associated with decreases in HAZ. However mobility and involvement in decision making do not appear to be significantly related to stunting. Maternal height and education are inversely related to long-term malnutrition. This is important in illustrating the different mechanisms by which women's empowerment affects child nutrition. As expected, other factors that influence minimum diet diversity are education and wealth of the household and child age.

Minimum diet diversity is closely associated with improvements in growth. While clearly diet diversity is a function of child age, we expect that women with a greater degree of autonomy in making decisions, or ability to go out would be able to exert a significant influence over their children's diets. Maternal education directly affects the mother's knowledge and abilities to care for her children. Either through formal cash earnings, or participation in decision making regarding purchases and health care, women are able to provide healthier environments conducive to children's growth.

Conclusions

Several studies provide evidence that women's empowerment exerts a significant influence on child health (Smith et al 2003, Frost et al, 2005, Guha et al 2006, Ackerson & Subramanian, 2008). Recent work has underscored the association between violence against women and under-five mortality, and the risk of diseases especially in Bangladesh (Asling-Monemi et al, 2008; Silverman, 2009). Different indicators of women's empowerment have been used to study the effect on child malnutrition, and mortality. Some of these include education, and age differentials between spouses, others include measures such as freedom of movement and decision making.

We explore the linkages between women's empowerment and child nutrition while controlling for women's education and household wealth. Our results indicate that malnutrition among children in Bangladesh, especially chronic malnutrition, is significantly affected by attitudes towards domestic violence, maternal education and health, and age at first marriage. Acceptance of domestic violence is associated with lower height-for-age z-scores both for boys and girls but not with weight-for-height. Short-term malnutrition captured by weight-for-height z-score is associated with maternal education and household wealth but not with other empowerment variables (BDHS).

Although our results are inconclusive about mobility and decision making, the relative importance of these two factors should not be underestimated. Given the contextual setting, it is

possible that these factors do not enhance the nutritional status of children but they could have important effects on other child outcomes which we do not explore.

Attitudes that justify or condone domestic violence are strong indicators that the balance of power is unequally distributed within a household. Given that intimate partner violence has far reaching consequences ranging from physical injuries to mental wellbeing for women themselves, the association we see in these analyses between attitudes justifying violence and chronic child malnutrition is alarming.

Last, but not least, our findings warrant further research and attention, particularly from an intervention perspective. Specific research questions that emerge from these analyses relate to (1) the mechanisms through which exposure to domestic violence lead to poorer nutrition outcomes for women and children, (2) types of individual and community interventions that can reduce prevalence of violence and empower women for better health and wellbeing outcomes; and (3) policy actions, including legal instruments, that can lead to greater women's empowerment and address the links between empowerment and nutrition.

References

Ackerson, L. and S. V. Subramanian. 2008. "Domestic Violence and Chronic Malnutrition among Women and Children in India", *American Journal of Epidemiology* 167 (10).

Åsling-Monemi, K., R.T. Naved and L. Å. Persson. 2008. "Violence against women and the risk of under-five mortality: analysis of community-based data from rural Bangladesh", *Acta Paediatrica*, 97 (2), pg 226-232

BBS (Bangladesh Bureau of Statistics). 2006. Preliminary Report on Household Income and Expenditure Survey - 2005. Dhaka: Ministry of Planning, Government of the People's Republic of Bangladesh.

Dávalos, M. E. and I.V. Santos, 2006. "Violence and Child Nutrition in Latin America: A Bargaining Power Approach", Available at <http://ssrn.com/abstract=905936>

Davis, P. 2007. "Discussion among the poor: exploring poverty dynamics with focus groups in Bangladesh", *CPRC Working Paper ??*, Manchester: Chronic Poverty Research Centre.

Davis, P. and B. Baulch. 2009. "Parallel realities: exploring poverty dynamics using mixed methods in rural Bangladesh", *CPRC Working Paper. Manchester, UK: Chronic Poverty Research Center. In press.*

Frost, M. B., Forste, R., & Haas, D. W. 2005. "Maternal education and child nutritional status in Bolivia: finding the links", *Social Science and Medicine*, 395-407.

Girma, W., & Timotiows, G. 2002. *Determinants of Nutritional Status of Women and Children in Ethiopia*. Calverton, Maryland, USA: ORC Macro.

Guha-Khasnobis, B., & Hazarika, G. 2006. "Women's Status and Children's Food Security in Pakistan". *WIDER Discussion Paper No. 2006/03*

Haddad, L., C. Peña, C. Nishida, A. Quisumbing, and A. Slack. 1996. "Food security and nutrition implications of intrahousehold bias: A review of literature", *Food Consumption and Nutrition Division Discussion Paper 19*. Washington, D.C.: International Food Policy Research Institute.

Hallman, K., D. Lewis, and S. Begum. 2007. "Assessing the impact of vegetable and fishpond technologies on poverty in rural Bangladesh", In Adato, M. and Meinzen-Dick, R., eds., *Agricultural Research, Livelihoods, and Poverty: Studies of Economic and Social Impacts in Six Countries*, Baltimore: Johns Hopkins University Press.

Kishor, S. 2000. "Empowerment of women in Egypt and links to the survival and health of their infants", In *Women's empowerment and demographic processes*, ed. H. Presser and G. Sen. Oxford: Oxford University Press.

Linnemayr, S., H. Alderman, & A. Ka. 2008. "Determinants of malnutrition in Senegal: Individual, household, community variables, and their interaction", *Economics and Human Biology*, 252-263.

Nyyssölä, M. 2007. "Women's Status and Children's Food Security in Nepal", *UNU-WIDER Research Paper No. 2007/84*.

Quisumbing, Agnes R., ed. 2003. *Household Decisions, Gender, and Development: A Synthesis of Recent Research*. Washington, DC: International Food Policy Research Institute.

Ramalingaswami V, Jonsson U, Rhode J. 1997. "Malnutrition: A South Asian enigma". In: Gillespie S, editor. *Malnutrition in south Asia: a regional profile*. UNICEF Regional Office for South Asia; 1997. p. 11-22.

Silverman, J. G., M. R. Decker, J. Gupta, N. Kapur, A. Raj, and R. T. Naved. 2009. "Maternal Experiences of Intimate Partner Violence and Child Morbidity in Bangladesh", *Arch Pediatr Adolesc Med*. 163: 700-705.

Smith, L., and L. Haddad. 2000. *Explaining malnutrition in developing countries: A cross country analysis*. Washington D.C: International Food Policy Research Institute.

Smith, L. C., U. Ramakrishnan,, A. Ndiaye, L. Haddad, L., and R. Martorell. 2003. *The Importance of Women's Status for Child Nutrition in Developing Countries*. Washington D.C: International Food Policy Research Institute.

Figure 1: The conceptual framework

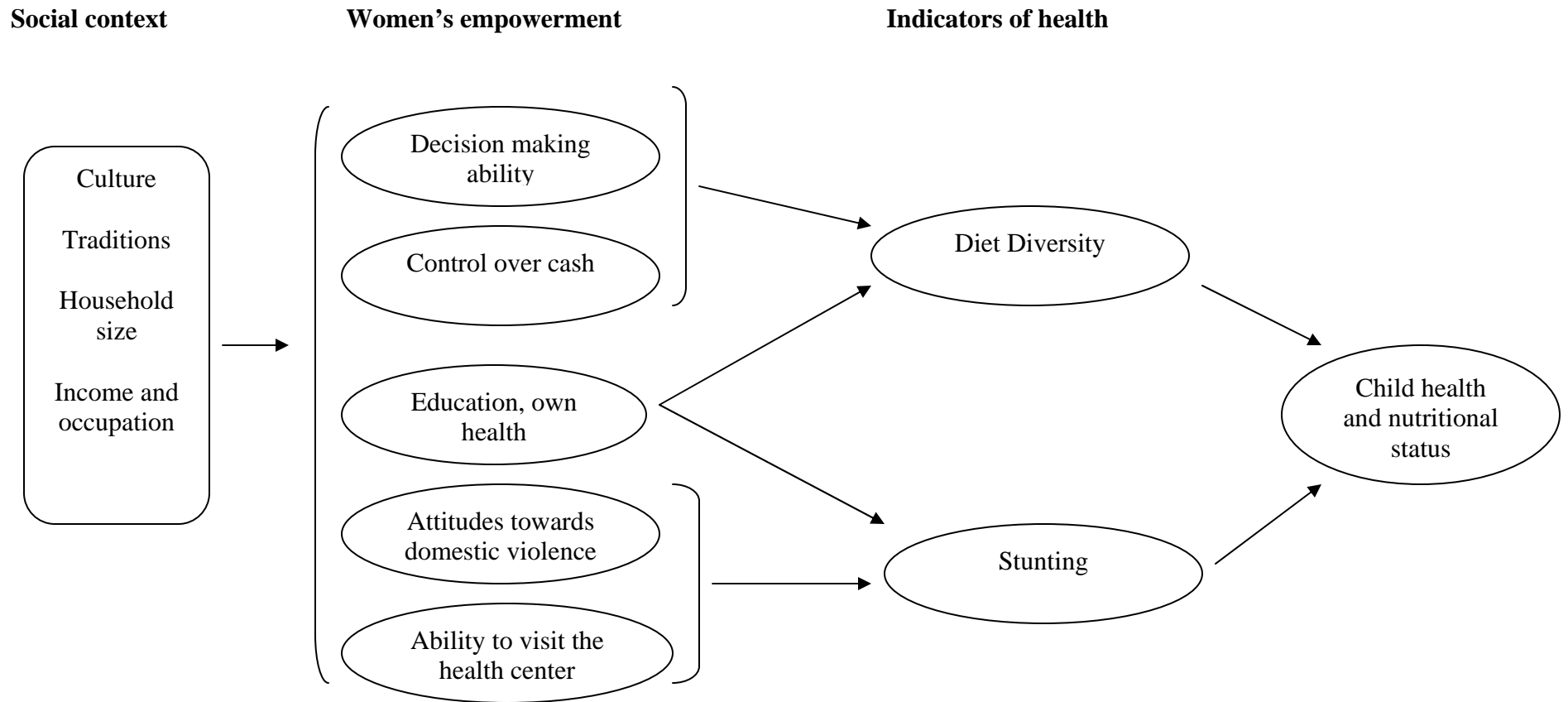


Table 1. Key variables used and their description

Name	Variable Label	N	Mean	Std. Dev.	Min	Max	Description ^a
<i>Child attributes</i>							
b8	Age of child	5789	2.01	1.40	0.0	4.0	Continuous
haz	HAZ	5300	-1.72	1.36	-5.99	5.16	Continuous, -6-+6
waz	WAZ	5300	-1.70	1.12	-5.79	4.70	Continuous, -6-+6
whz	WHZ	5300	-1.03	1.09	-4.98	4.67	Continuous, -6-+6
stuntedwho	Stunted	5300	0.42	0.49	0	1	Binary, 0-1
underwtwho	Underweight	5300	0.40	0.49	0	1	Binary, 0-1
wastedwho	Wasted	5300	0.17	0.38	0	1	Binary, 0-1
<i>mdd</i>	Minimum diet diversity	4179	0.40	0.48	0	1	Binary
<i>Respondent attributes</i>							
v106	Respondent's highest educational level						Categorical, 0-3
<i>No education</i>		1553	26.84*				
<i>Primary</i>		1807	31.23*				
<i>Secondary</i>		1985	34.31*				
<i>Higher</i>		441	7.62*				
v438	Respondent's height	5722	150.61	5.50	130	194.8	Continuous
v511	Age at first marriage	5300	15.68	2.78	9	37	Continuous
mindex	Mobility scale	5788	76 ⁺	0.63	0.0	2.0	Ordinal scale
pindex	Participation in decision making index	5789	64.53	36.64	0.0	100.0	Proportions index
ipv	Index for attitudes towards domestic violence	5789	0.69 [§]	1.19	0.0	4.0	Additive index
<i>Household attributes</i>							
v190	Wealth index						Categorical, 1-5
<i>Poorest</i>		1144	19.76*				
<i>Poorer</i>		1197	20.68*				
<i>Middle</i>		1078	18.62*				
<i>Richer</i>		1081	18.67*				
<i>Richest</i>		1289	22.27*				

* percentage; ²: Not the mean value of mindex. 76% of the women can go to the health center alone or with kids

§: 33% of the women in the sample justified beating by husbands for at least one reason

Table 2. Women's status measured by decision making, mobility and attitudes towards domestic violence, BDHS 2007

Percentage Respondents who have some say in making decisions (alone or with Husband/partner or other person)	
How to spend money	86.3
Own Health Care	61.1
Making large household purchases	62.7
Making household purchases for daily needs	68.1
Visits to family or relatives	64.6
Child's health	75
Percentage Respondents who have some degree of mobility (alone or with children, Husband, relatives or others)	
to health centre alone or with kids	76.7
can respondent go alone or with children	64
Percentage of respondents who justified domestic violence	
Wife beating justified if goes out without telling him	19.12
Neglects children	17.59
Argues with him	22.73
Refuses to have sex	10.59

Table 3: Effects of domestic violence, mobility and decision making on stunting, BDHS 2007 (Odds ratios)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Domestic violence	1.10 ^{**} (0.03)						1.07 [*] (0.03)					
Mobility		0.97 (0.05)						1.00 (0.06)				
Decision making			1.00 (0.00)						1.00 (0.00)			
Education differential				1.02 ^{**} (0.01)						1.02 [*] (0.01)		
Age differential					1.00 (0.01)						1.01 (0.01)	
Age at first Marriage						0.94 ^{***} (0.01)						0.99 (0.01)
Educational level												
Primary							1.07 (0.10)	1.07 (0.09)	1.07 (0.09)			
Secondary							0.80 [*] (0.08)	0.80 [*] (0.08)	0.80 [*] (0.08)			
Higher							0.54 ^{**} (0.11)	0.52 ^{***} (0.10)	0.53 ^{**} (0.10)			
Wealth Index												
Poorer							0.92 (0.09)	0.92 (0.09)	0.92 (0.09)	0.88 (0.09)	0.90 (0.09)	0.89 (0.09)
Middle							0.72 ^{**} (0.08)	0.72 ^{**} (0.08)	0.72 ^{**} (0.08)	0.68 ^{***} (0.08)	0.67 ^{***} (0.07)	0.68 ^{***} (0.08)
Richer							0.64 ^{***} (0.08)	0.64 ^{***} (0.08)	0.64 ^{***} (0.08)	0.57 ^{***} (0.06)	0.54 ^{***} (0.06)	0.56 ^{***} (0.06)
Richest							0.41 ^{***} (0.01)	0.41 ^{***} (0.01)	0.41 ^{***} (0.01)	0.34 ^{***} (0.01)	0.34 ^{***} (0.01)	0.33 ^{***} (0.01)

Table 3: Effects of domestic violence, mobility and decision making on stunting, BDHS 2007 (Odds ratios) continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Maternal Height							0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)	0.91*** (0.01)
Child Age (months)							1.02*** (0.00)	1.02*** (0.00)	1.02*** (0.00)	1.02*** (0.00)	1.02*** (0.00)	1.02*** (0.00)
Child sex							0.95 (0.07)	0.95 (0.07)	0.95 (0.07)	0.95 (0.07)	0.93 (0.07)	0.95 (0.07)
Chittagong							1.16 (0.13)	1.15 (0.13)	1.16 (0.13)	1.14 (0.13)	1.16 (0.14)	1.16 (0.13)
Dhaka							0.98 (0.11)	0.95 (0.11)	0.97 (0.11)	0.99 (0.12)	0.96 (0.12)	0.99 (0.12)
Khulna							0.75* (0.10)	0.74* (0.10)	0.75* (0.10)	0.72* (0.10)	0.70* (0.10)	0.74* (0.10)
Rajshahi							0.84 (0.09)	0.83 (0.09)	0.85 (0.09)	0.81 (0.09)	0.83 (0.09)	0.82 (0.09)
Sylhet							0.98 (0.14)	0.97 (0.14)	0.97 (0.14)	1.02 (0.15)	1.03 (0.16)	1.04 (0.15)
F statistic	9.95	0.28	3.80	7.73	0.49	22.72	24.69	22.73	23.08	24.43	24.29	24.75
Observations	5300	5299	5300	5270	5183	5300	5287	5286	5287	5259	5172	5289

Standard errors in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4. Effects of domestic violence, mobility and decision making on minimum diet diversity, BDHS 2007 (Odds ratio)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Domestic violence	0.96 (0.04)						1.02 (0.06)					
Mobility		1.20* (0.10)						1.11 (0.11)				
Decision making			1.00* (0.00)						1.00 (0.00)			
Education differential				0.99 (0.01)						0.99 (0.02)		
Age differential					1.03** (0.01)						1.04** (0.01)	
Age at first Marriage						1.02 (0.02)						1.07** (0.03)
Educational level												
Primary							1.20 (0.23)	1.20 (0.23)	1.21 (0.24)			
Secondary							1.72* (0.37)	1.72* (0.37)	1.73* (0.37)			
Higher							3.74*** (1.04)	3.65*** (1.00)	3.64*** (1.01)			
Wealth Index												
Poorer							1.14 (0.25)	1.16 (0.25)	1.15 (0.25)	1.30 (0.28)	1.26 (0.28)	1.22 (0.26)
Middle							1.85** (0.43)	1.86** (0.43)	1.85** (0.43)	2.19*** (0.50)	2.10** (0.48)	2.08** (0.47)
Richer							1.63 (0.41)	1.64 (0.42)	1.62 (0.41)	2.25*** (0.50)	2.17*** (0.50)	2.02** (0.45)
Richest							2.19** (0.52)	2.19** (0.52)	2.15** (0.52)	3.49*** (0.74)	3.32*** (0.69)	2.91*** (0.64)

Table 4. Effects of domestic violence, mobility and decision making on minimum diet diversity, BDHS 2007 (Odds ratio) continued

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Maternal Height							1.01 (0.01)	1.01 (0.01)	1.01 (0.01)	1.02 (0.01)	1.02 (0.01)	1.02 (0.01)
Child age							1.23*** (0.01)	1.23*** (0.01)	1.23*** (0.01)	1.22*** (0.01)	1.23*** (0.01)	1.23*** (0.01)
Child sex							0.86 (0.11)	0.86 (0.11)	0.86 (0.11)	0.86 (0.11)	0.87 (0.11)	0.86 (0.11)
Chittagong							0.75 (0.17)	0.74 (0.17)	0.73 (0.16)	0.68 (0.15)	0.72 (0.16)	0.68 (0.15)
Dhaka							1.11 (0.24)	1.10 (0.24)	1.09 (0.23)	0.96 (0.21)	1.00 (0.22)	1.01 (0.22)
Khulna							1.27 (0.28)	1.26 (0.28)	1.23 (0.28)	1.28 (0.29)	1.40 (0.32)	1.31 (0.29)
Rajshahi							1.85** (0.39)	1.87** (0.39)	1.78** (0.38)	1.78** (0.38)	1.75** (0.37)	1.86** (0.40)
Sylhet							0.49* (0.16)	0.51* (0.16)	0.49* (0.16)	0.40** (0.12)	0.44* (0.14)	0.39** (0.12)
F statistic	0.91	4.91	5.60	0.65	7.22	1.80	24.99	24.89	26.92	30.64	30.61	30.56
Observations	2258	2257	2258	2242	2215	2258	2237	2236	2237	2221	2194	2237

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$