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IFPRI Discussion Paper01192

June 2012

What Dimensions of Women's Empowerment Matter Most for Child Nutrition?

Evidence Using Nationally Representative Data from Bangladesh

Priya Bhagowalia

Purnima Menon

Agnes R. Quisumbing

Vidhya Soundararajan

Poverty, Health, and Nutrition Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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PARTNERS AND CONTRIBUTORS

IFPRI gratefully acknowledges the generous unrestricted funding from Australia, Canada, China, Denmark, Finland, France, Germany, India, Ireland, Italy, Japan, the Netherlands, Norway, the Philippines, South Africa, Sweden, Switzerland, the United Kingdom, the United States, and the World Bank.

AUTHORS

Priya Bhagowalia, Ambedkar University, Delhi, India
Associate Professor

Purnima Menon,International Food Policy Research Institute
Senior Research Fellow, Poverty, Health, and Nutrition Division

Agnes R. Quisumbing,International Food Policy Research Institute
Senior Research Fellow, Poverty, Health, and Nutrition Division

Vidhya Soundararajan, Cornell University, Ithaca
Graduate student

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ABSTRACT

Child malnutrition rates in Bangladesh continue to remain among the highest in the world. This *Asian enigma* of persistent malnutrition despite growth in the overall economy is often attributed to the low status of women. It is against this backdrop of higher economic growth and stagnating malnutrition rates that this paper examines the role played by women's empowerment and endowments in relation to childhood malnutrition in Bangladesh.

We use data from the 2007 Bangladesh Demographic and Health Survey to examine the relationship between women's status and nutrition in Bangladesh using indicators of empowerment such as mobility, decisionmaking power, and attitudes toward verbal and physical abuse. We also examine the role of variables reflecting maternal education and height, in relation to child nutrition. All models control for age and sex of the child, household wealth, and region. Results from logit models indicate that both a greater degree of women's empowerment and greater maternal endowments are associated with better long-term nutritional status of children. Attitudes toward domestic violence have an effect on child stunting and mobility; participation in decisionmaking is an important influence on dietary diversity. Consistent with previous studies, maternal height and maternal schooling decrease the probability of stunting, and maternal schooling is positively associated with dietary diversity. While these are not immediate measures of empowerment, they are positively associated with child nutritional outcomes and reflect prior investments in women and girls. Our findings merit further research and attention to inform the design and implementation of interventions. Specific research needs that emerge from these analyses relate to types of individual and community interventions that can reduce prevalence of violence and empower women to achieve better health and well-being outcomes, and to policy actions, including legal reform and efforts to build community support for women's empowerment. Additional research needs relate to exploring ways in which investments to improve the nutritional and educational status of girls before they become mothers can be strengthened and sustained.

Keywords: child nutrition, stunting, empowerment, gender, domestic violence, Bangladesh

ACKNOWLEDGMENTS

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, and Marie Ruel for comments and suggestions. All errors and omissions are our own.

1. INTRODUCTION

Economic growth in Bangladesh has contributed to a modest reduction in the headcount poverty rate of around 1.5 percent a year since the early 1990s. Although rates of child malnutrition remain among the highest in the world, long-term nutritional trends in Bangladesh are encouraging. The proportion of underweight children has dropped from 43 percent in 2004 to 36 percent in 2011. More important, the proportion of children with severe stunting has registered a dramatic decline from 28 to 15 percent in a little over one decade between 1996/97 and 2011 Demographic and Health Surveys rounds. Bangladesh is considered to be on track to achieve the Millennium Development Goal target for child nutritional deprivation by 2015. Similarly, the indicator of maternal malnourishment has decreased. The proportion of women (age 15–49) with a body mass index less than 18.5 has dropped noticeably over 1997–2007—from 52 to 30 percent (Sen et al. 2010).

Accelerating the decline in maternal and child undernutrition to keep pace with the rate of poverty reduction remains an important item on the policy agenda for Bangladesh. This *Asian enigma* of persistently poor nutritional status of children despite growth in the overall economy has been attributed to the low status of women (see Ramalingaswami, Jonsson, and Rhode 1997, Haddad et al. 1996, and Smith et al. 2003). Improved nutritional status of the population therefore is a key input in attaining a larger and sustained decline in poverty. This paper examines the role played by women's empowerment and endowments, such as maternal schooling and maternal height, in relation to childhood malnutrition in Bangladesh.

Women's empowerment is a complex term that captures a multitude of constructs: control of household resources and assets, decisionmaking capabilities, position in society, and knowledge level, among many others (see McGuire and Popkin 1990; Engle, Menon, and Haddad 1999; Kishor 2000; Osmani and Sen 2003; Smith et al. 2003; Silverman et al. 2009). Because women's empowerment is a multidimensional concept, it is not surprising that various definitions of the concept exist. For example, the recently developed Women's Empowerment in Agriculture Index (WEAI) is a composite indicator that comprises five dimensions of empowerment in agriculture as well as the empowerment of the primary female relative to the primary male in her household (IFPRI/ OPHI/USAID 2012).[1] Most definitions of empowerment have focused on agency and process (Malhotra, Schuler, and Boender 2002). One definition pertinent to our study defines empowerment as "the process of enhancing an individual's or group's capacity to make effective choices, that is, to make choices and then to transform those choices into desired actions and outcomes" (Alsop, Bertelsen, and Holland, 2006, 10.). Along similar lines, Kabeer (2001, 19) defines empowerment as "the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them." The ability to make choices can be a function of several factors, such as women's economic decisionmaking, child-related decisionmaking, freedom of movement, power relations with their spouse, and access to and control over resources (Jejeebhoy 2000).

Smith 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 relative to men rather than absolute or relative to other women. Second, it is founded on the concept of *power*, also defined as the ability to make choices (Riley 1997; Kishor 2000). Third, the definition has both intrahousehold and extra-household dimensions and 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).

Women are primary caregivers and influence child nutrition directly through improved childcare practices and indirectly through improvements in their own nutrition (Smith et al. 2003). Generally, relative to men, women with low status tend to have weaker control over resources in their households,

[1] For more on the WEAI, see http://www.ifpri.org/publication/womens-empowerment-agriculture-index. The dimensions over which women's empowerment is defined in the WEAI is slightly different—though related—from those analyzed in this paper. The WEAI focuses on empowerment in the agricultural domain, while the dimensions of empowerment that can be analyzed using the Demographic and Health Survey pertain to decisionmaking about expenditures and domestic violence.

stricter constraints on their time, limited information about health services, and poorer mental health 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 and subsequent growth and on the quality of care provided to children (Engle, Menon, and Haddad 1999; Kishor 2000). Several studies provide evidence that women's empowerment exerts a significant influence on child nutrition (Smith et al. 2003; Frost, Forste, and Haas 2005; Guha-Khasnobis and Hazarika 2006; Ackerson and Subramanian 2008). Recent work has underscored an association among violence against women, mortality of children under age five, and the risk of diseases especially in Bangladesh (Åsling-Monemi, Naved, and Persson 2008; Silverman et al. 2009).

Studies that examine child malnutrition and women's status have used proxy measures of women's status, for example, indicators that depict sources of power such as education or setting of power such as customs regarding marriage (Adato and Mindek 2000; Yount 1999; Kishor 2000). These variables could include direct measures such as control over assets, mobility, attitudes about gender roles, spousal communications, involvement in household decisionmaking; sources of power such as education, media exposure, and employment for cash; and settings of power such as living arrangements, local power relations, patriarchal social hierarchies, age at first marriage, and educational differences between spouses (Kishor 2000; Malhotra, Schuler, and Boender 2002; Ibrahim and Alkire 2007). Most studies, however, do not separate dimensions of empowerment (such as decisionmaking) from determinants or correlates of empowerment (income, education). A woman who lives in a high-income household may be able to afford more food or medicines for sick children, but she does not necessarily make the decisions about household expenditures or whether to take the child to the doctor. Our paper contributes to this literature by using direct evidence on women's empowerment along with indicators that describe the source or setting of power and by identifying different aspects of women's empowerment that impinge on the growth and diets of children.

Using evidence on different aspects of women's empowerment and endowments—from mobility to decisionmaking power and attitudes toward verbal and physical abuse—we can examine the notion of empowerment and ascertain which specific aspects of empowerment matter most for child nutrition. This is important because different aspects of women's empowerment may act upon child nutrition in different ways and to varying degrees. For example, women's decisionmaking power or control over resources to buy food will affect diet quality. Similarly, women's ability to take their child to the doctor when the child is ill affects overall health and well-being. Women who have experienced domestic abuse might be less able to safeguard both their and their children's nutrition. Because gender is context-specific, indicators of empowerment vary according to geographical area. For instance, in Bangladesh, dowry or other demands in marriage and a history of abuse of the husband's mother by his father have been shown to increase the risk of violence, while better spousal communication and husband's education beyond grade 10 decreased it (Naved and Persson 2005).

To analyze the correlations between women's empowerment, maternal endowments, and child nutrition, we focus on a marker of chronic growth retardation among children: prevalence of stunting (low height-for-age). We also examine associations between women's empowerment and diet diversity of infants and children, given the strong links in the literature between diet diversity and nutritional outcomes (Ruel and Menon 2002; Arimond and Ruel 2004) including in Bangladesh (Rah et al. 2010).

2. DATA AND THE CONCEPTUAL FRAMEWORK

This study uses the nationally representative Bangladesh Demographic and Health Survey–2007 (NIPORT/Mitra and Associates/Macro International 2009), which is appropriate for examining nationwide trends and patterns in child malnutrition and how they correlate with women's status. The sampling frame is based on 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. Our sample includes observations on 5,274 living children, which excludes all households that did not have a child and children who had died prior to the date of interview. Analysis of minimum diet diversity uses data on children aged 6.0–23.9 months, whereas the analysis of stunting uses data on children 6–59 months.

We base our analyses on an expanded framework for childcare developed by Engle, Menon, and Haddad (1999), based on the original United Nations Children's Fund (UNICEF) conceptual framework for nutrition (UNICEF 1990), but with greater focus on components related to *resources* that women have to care for their children. The expanded framework postulates that to ensure adequate care for their children, women need access to a variety of resources themselves. This includes resources such as social support, social status and empowerment, mental and physical health, and knowledge and education. We focus specifically on the social status and empowerment domain of resources, and expand on work that shows that children of more autonomous women have better health and nutrition outcomes (Doan and Bisharat 1990; Ross-Suits 2010). Our analyses also include other resources available to women, such as their own nutritional status and education, because of the influence of these factors on child nutrition outcomes (Leslie 1991; Mishra and Retherford 2000). We view these resources as *maternal endowments*, markers of investments made in girls by their families and by society.

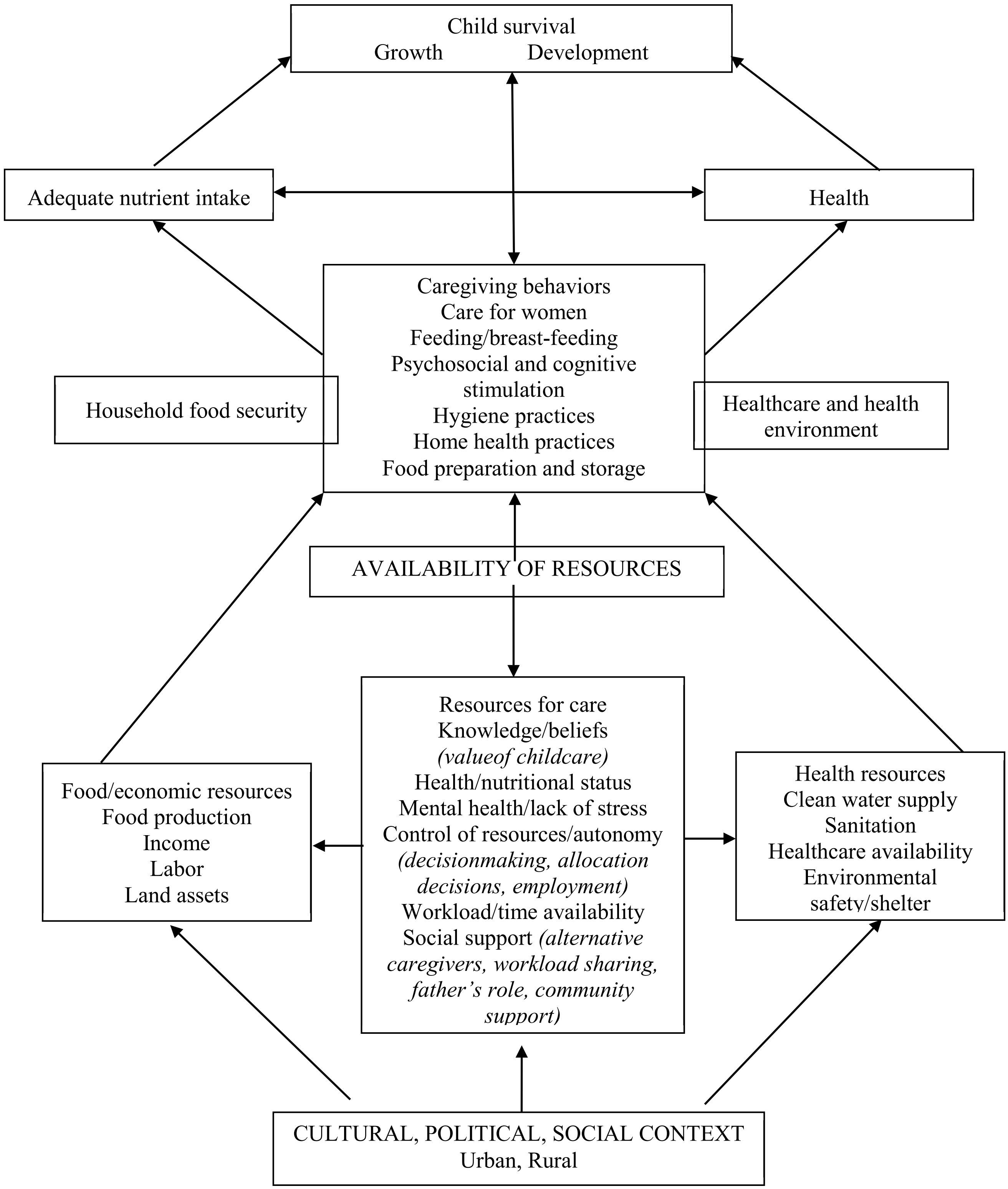
Figure 2.1 depicts the UNICEF framework showing linkages between various resources for care, including different types of maternal empowerment, and child nutrition.

The extended model underscores the importance of the physical and mental well-being of women, support for women from family and community, and maternal education, which directly affect their ability to care for children. The social context of the household, such as culture, traditions, occupation, and incomes, determines the relative status of women. The status of women, in turn, can determine nutritional status and dietary intake of children in different ways.

For instance, female participation in household decisions regarding their own health and the health of their children is essential for improving child nutrition (Allendorf 2007; Doan and Bisharat 1990; Ross-Suits 2010). Women's involvement in decisionmaking, alone or with someone else, can help solidify their value within the family. A woman's degree of autonomy in making decisions in a household can effectively determine if a child is given a proper diet and medical care. Desai and Johnson (2005) maintain that a woman's participation in decisionmaking affects child nutrition through daily and emergency care and a child-oriented allocation of resources. The ability to respond to a child's needs without consulting the husband or family could result in greater confidence, which then translates into improved care of self and ability to respond to the child's needs.

A woman's 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 and for child outcomes because women invest substantially in nutrition, education, and healthcare (Roushdy 2004; Shroff et al. 2009).

Figure 2.1—The extended model of care



Source: Engle, Menon, and Haddad (1999).

Freedom of mobility outside the home could affect the care available to both the mother and the child (Shroff et al. 2009). Greater mobility indicates not only the degree to which a woman can move about but also her capability to be mobile independently or without permission. This can affect the nutritional status of children in several ways. Access to markets to purchase food, medicines, and other essentials and access to schools can improve knowledge about nutrition and health. Limited mobility can also prevent women from making visits to a health center, affecting their own and their children's nutrition. Women with limited mobility are likely to have fewer social exchanges and thus limited knowledge about feeding practices, both breastfeeding and complementary feeding (Smith et al. 2003).

Attitudes toward 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 such health outcomes as depression, anxiety, and low self-esteem and self-efficacy (Smith et al. 2003; Ackerson and Subramanian 2008). A woman's lower status implies a greater dependence on her husband and a higher probability of experiencing domestic violence. Physical abuse hinders a woman's ability to provide adequate care through diminished physical capacity, increased psychological stress, and possibly nutritional deprivation. Other indicators that have been found to correlate with empowerment are education (Kamal and Zunaid 2006; Malhotra and Mather 1997), mother's age at marriage, and disharmony among the family (Sethuraman, Lansdown, and Sullivan 2006).

Maternal endowments such as education and health are equally important influences over child nutrition. Aslam and Kingdon (2010) find that a mother's education is critically associated with longer-term health outcomes for her children. Even small levels of education can lead to large improvements in child health and nutrition (Hobcraft, McDonald, and Rutstein 1984; Mensch, Lentzner, and Preston 1985, cited in Aslam and Kingdon 2010). A woman's short maternal stature, which reflects lack of long-term investment in her health, is associated with a higher rate of death for her children and a greater likelihood of her children being underweight and having a reduced rate of growth (Christian 2010; Ozaltin, Hill, and Subramanian 2010). Both education and height are therefore measures of investments made in girls and women throughout their lifetime, and also influence women's empowerment

3. THE ECONOMETRIC SPECIFICATION

To formalize the relationship between child nutrition and women's status, we assume that households use human capital and other goods as inputs to produce a final good, which is child nutrition (Rosenzweig and Schultz 1983; Behrman 1990). We use prevalence of stunting and minimum diet diversity scores as our measures of child nutrition, while our explanatory variables focus on measures of women's empowerment, such as participation in decisionmaking, mobility, and attitudes toward physical violence, and on maternal endowments such as maternal height and schooling. Most studies focusing on empowerment create an aggregate measure by constructing indexes of each empowerment-related outcome, which indicates if the respondent has sole or joint control over a range of decisions, or whether she can visit a list of places unescorted (Hindin 2005). Relative differences between males and females (such as the difference in age or education levels) or more individual or absolute measures (such as the age at marriage, exposure to violence, access to assets) are also used to explore the associations of parental characteristics (or differences in parental characteristics) with improvements in child weight and height (Smith and Haddad 2000; Guha-Khasnobis and Hazarika 2006; Osmani and Bhargava 1998; Nyyssölä 2007; Hallman, Lewis, and Begum 2007; Frost, Forste, and Haas 2005).

We apply similar approaches in our analyses and present results of logit models, adjusting all models for the survey design, clustering errors by survey cluster, and including dummy variables for regions 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 dataset and to identify which individual variables of empowerment belong together. The factor analysis suggested that decisionmaking, attitudes toward violence, and mobility were distinct from one another, as were education and age at first union. Therefore, based on the factor analysis results, indexes were constructed to capture three distinct dimensions of women's empowerment: decisionmaking, mobility, and attitudes toward violence. Rather than use the scores on individual factors from the factor analysis as index values for the different women's status indexes, we used an additive approach to construct indexes on the dimensions identified in the factor analysis. This prevents contaminating the included variables with noise with those variables that do not load strongly on a factor (DeVellis 2003). Maternal education and age at first union, which did not load with the other three factors, were entered as individual variables in analyses.

Decisionmaking

We used an additive index of participation in decisionmaking that indicated if a woman was involved in the decision either alone or jointly. To create this index, we used data on five decisionmaking variables and assigned a score of 1 for each decision in which the woman was involved, either alone or with a partner or relative. The scores on these individual variables were then added and converted into percentages to capture the proportion of the five decisions in which the woman was involved. The five decisionmaking variables related to control over financial resources, decisions regarding daily and large household purchases, decisions regarding own healthcare, and decisions regarding visits to relatives.

Mobility

Freedom of movement is measured by an ordinal scale that ranges from 0 to 2, with 0 implying no mobility, 1 denoting low mobility, and 2 indicating greater freedom of movement. This index is obtained using data from two questions: "Can you go to the health center alone or with children?" and "Do you visit the health center alone or with children?" The index takes on a value of 0 if the woman responds no to both questions, 1 if she responds positively to one question, and 2 if she responds positively to both questions.

Attitudes toward Violence

Attitudes toward domestic violence were quantified by an additive index that takes on values from 0 to 4, based on the number of statements to which the respondent agreed that physical violence was justified. Each respondent was asked whether she felt the use of physical violence was justified in the following situations: if she (1) neglects the children, (2) argues with her husband, (3) refuses sex, or (4) goes out without informing the husband. Although physical, sexual, and verbal abuse of women constitute domestic violence, we focus on *attitudes toward* physical violence in this index primarily because data on attitudes toward violence are available for all women; data on actual experience of violence are available only for a small subsample, which does not provide an adequate sample to assess associations with nutrition outcomes among children. We believe 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. Justification for physical violence is indicative of a social structure that gives power to the husbands and at the same time assigns a very traditional and submissive role to women, which could, in turn, lead to more frequent episodes of violence against women.

We also use measures of women's empowerment that describe the source or setting of power; these include age at marriage, age differentials between the spouses, educational differences between the spouses, and maternal endowments such as education and health status. To isolate the effect of women's empowerment on child nutrition, we control for a number of other factors, such as child age and sex, household wealth, and geographical location.

The equation to be estimated is as follows:

$$\boldsymbol{Y} = \beta_0 + \beta_1 \boldsymbol{WE} + \beta_2 \boldsymbol{H} + \beta_3 \boldsymbol{M} + \beta_3 \boldsymbol{K} + \boldsymbol{e}. \tag{1}$$

Y is a vector of dependent variables consisting of the prevalence of stunting and minimum diet diversity. ***WE*** 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; similarly, ***K*** is a vector of child characteristics such as age and sex; and ***e*** is the error term.

We first examine the influence of the women's empowerment indexes separately rather than introducing all women's empowerment variables together in the same regression models, and we then explore a specification in which all three empowerment indexes are included as regressors. We cannot combine the three indicators into a single scale because the factor analysis shows clearly that they are orthogonal to each other, indicating that they capture different spheres of empowerment.

Dependent variables: A child is classified as stunted if the height-for-age Z-score is below –2. The Z-scores reported here are based on the World Health Organization's (WHO's) international reference population (WHO 2006).

Diet diversity is an important marker of the quality of diets of infants and young children, and simple diet diversity indicators have been developed that have been validated and recommended by WHO (2008). Two recommended indicators are used to capture diet diversity. The first is an additive index that counts the number of food groups consumed. We combined individual foods consumed by the child during the 24 hours prior to the survey to create six food groups: (1) grains, roots, and tubers; (2) legumes and nuts; (3) dairy products; (4) meat products; (5) vitamin A–rich fruits and vegetables; and (6) any other fruits and vegetables. Based on the number of food groups the child had consumed, we created an indicator called the minimum diet diversity (MDD), which takes on a value of 1 if a child consumes four or more food groups, and 0 otherwise. The WHO recommendations specify that the MDD should be based on four groups out of seven; however, the BDHS gathers data on only six food groups, using a 24-hour recall of different types of foods consumed by the child. Given the importance of the cut-off of four food groups, we apply the same cut-off of four groups but note that this is out of only six groups in the BDHS. Recent research has shown the association between the MDD and child nutrition outcomes in Bangladesh, also using the BDHS (Zongrone, Winskell, and Menon 2012).

4. RESULTS

Table 4.1 presents summary statistics on key characteristics of children, their mothers, and their households in our sample. The mean height-for-age Z-score is –1.83, and 45 percent of the children are stunted, which indicates a very high prevalence of child undernutrition (Table 4.1). Only 42 percent of the children in the sample have a minimum diet diversity score of 1, indicating that more than half of the children aged 6.0–23.99 months do not consume four or more food groups.

Table 4.1—Key variables used and their description

Variable	N	Mean	Std. Dev.	Min	Max	Description
Child attributes						
Age in months	5,228	32.30	15.66	0	59	Continuous
Height for age Z-score	4,819	–1.83	1.32	–5.99	5.16	Continuous, –6–+6
Stunting prevalence	4,819	0.45	0.50	0	1	Binary, 0–1
Minimum diet diversity	1,743	0.42	0.49	0	1	Binary, 0–1
Mother's attributes						
Highest educational level						Categorical, 0–3
No education	1,442	27.36				
Primary	1,652	31.34				
Secondary	1,782	33.81				
Higher	441	7.62[a]				
Height	5,222	150.42	5.89	45.9	194.8	Continuous
Age at first marriage	5,274	15.38	2.63	9	37	Continuous
Participation in decisionmaking	5,274	66.20	35.60	0	100	Proportions index
Mobility scale						Ordinal Scale, 0–2
No mobility	420	7.97				
Low mobility	1,095.00	20.77				
High mobility	3,758.00	71.27				
Attitudes toward domestic violence						Additive index, 0–4
Not justified	3,558	67.46				
Justified for one or more reasons	1,716	32.54				
Household attributes						
Wealth index				1	5	Categorical, 1–5
Poorest	1,052	19.95				
Poorer	1,075	20.38				
Middle	993	18.83				
Richer	979	18.56				
Richest	1,175	22.28				

Source: BDHS 2007 (NIPORT/Mitra and Associates/Macro International 2009).
Note: [a] Percentage.

Our sample includes information on children and their mothers. In this sample, 58 percent of the mothers are either uneducated or have not studied beyond the primary level. Only 7 percent of the mothers have received schooling higher than secondary education. The average height for women was 150 centimeters (cms), but 14 percent of the mothers had a height below 145 cms, a cut-off for obstetric risk as defined by WHO. The mean age at first marriage is 15.4 years, and 44 percent of the women were married before age 15. The decisionmaking index shows that, on average, women are generally involved in 66 percent of the household decisions related to expenditures for daily needs or large purchases, visits to family, and their own and their child's health. The mobility index reveals that 71 percent of the women had high mobility and are able to go out alone or accompanied with someone else. Finally, we use the wealth index available in the BDHS to divide the sample into household wealth quintiles. This indicator is constructed from data on household assets, including ownership of durable goods (such as televisions and bicycles) and dwelling characteristics (such as source of drinking water, sanitation facilities, and construction materials), using the method explained in Filmer and Pritchett (2001).

Table 4.2 presents more detailed information on direct indicators of empowerment—decisionmaking, mobility, and intimate partner violence—broken down by their components. Most women are involved to some extent in the household decisionmaking process: 85 percent of the respondents report that decisions about cash earnings are made along with their spouses or another person (Table 4.2). Thirty percent of the men are reported to make decisions regarding the woman's healthcare. Decisions about child health are made mostly in conjunction with a partner or someone else.

Table 4.2—Women's status measured by decisionmaking, mobility, and attitudes toward domestic violence

Women's status measurement	Percent
Percentage respondents who have some say in making decisions (alone or with husband/partner or other person)	
How to spend money	85.49
Own healthcare	60.04
Making large household purchases	62.01
Making household purchases for daily needs	67.96
Visits to family or relatives	63.99
Child's health	75.26
Percentage respondents who have some degree of mobility (alone or with children, husband, relatives, or others)	
Does go to health center alone or with children	61.71
Can go alone or with children	54.25
Percentage of respondents who justified domestic violence	
Wife beating justified if	
Goes out without telling husband	18.91
Neglects children	16.97
Argues with him	22.45
Refuses to have sex with him	9.67

Source: BDHS 2007 (NIPORT/Mitra and Associates/Macro International 2009).

Almost one-third of the women justified physical abuse for at least one reason. Common reasons were arguing with the husband (23 percent) and going out without telling him (19 percent) (see Table 4.2). Around 17 percent of the women justified physical violence on the grounds of neglecting children, and 10 percent for refusing sex.

We find that mothers who do not condone domestic violence have a slightly higher age at marriage and belong to a higher wealth quintile. While the mean age does not vary much, the maximum age at marriage increases from 24 years to 37 years among women who do not condone domestic violence. Similarly, participation in decisionmaking and freedom of movement is higher for women who do not accept domestic violence.

5. CHILD ANTHROPOMETRY AND MATERNAL CHARACTERISTICS

Stunting is characterized by a low height-for-age Z-score and indicates long-standing nutritional deprivation. Bivariate and multivariate logistic regressions are used to examine the effect of each empowerment variable on child nutrition, controlling for child characteristics (age and sex), maternal characteristics (height, schooling, age at first marriage, and age and education differentials with spouse), and household characteristics (wealth, geographical location using dummy variables for region, and education). Separate models were run for each of the empowerment variables, controlling for other factors, and then a model was run where the indicators were included simultaneously.

The results of the logistic regression, expressed as odds ratios, for stunting are presented in Table 5.1. Attitudes toward domestic violence, maternal education, and child age are found to be significantly correlated with child stunting.

In models including attitudes to domestic violence (Model 7), our results show that children of women who accept domestic violence are 1.07 times more likely to be stunted than children of women who do not justify domestic violence. In other regression results, mobility and decisionmaking have no effect on stunting, but we will explore later whether this result is robust to the simultaneous inclusion of other empowerment indicators. An increase in age at first marriage is related to lower odds of stunting, as are maternal education and household wealth.

Maternal and household endowments are important determinants of stunting. Relative to children of women with no education, children of women with secondary or higher education had lower odds of stunting. As expected, maternal height significantly lowered the odds of stunting. Illustrating the role of household endowments, children from households that belong to the middle-income or richer groups also had lower odds of stunting compared with children from the poorest wealth quintile.

Regressions of minimum diet diversity score present an interesting contrast to the results on stunting (Table 5.2). The effects of participation in decisionmaking are statistically significant, while attitudes toward 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 narrows, the minimum diet diversity increases. Higher age at first marriage is also significantly associated with greater diet diversity. Children of better-educated women also have greater odds of having diversified diets, and this effect increases with the level of education. Similarly, children living in households in richer quintiles have higher odds of diversified diets.

Finally, we examined whether these results were robust to the simultaneous inclusion of all three empowerment indicators. Although these indicators may be related, their loadings on the factor analysis suggested that these dimensions of empowerment are orthogonal to each other and can enter simultaneously into the regression. Table 5.3 presents the full models for stunting and dietary diversity. Condoning intimate partner violence increases the odds that a child is stunted, but none of the empowerment indicators significantly affect dietary diversity. What is striking, however, is the importance of maternal endowments as determinants of both stunting and dietary diversity: the coefficients for education and maternal height are strongly significant.

Table 5.1—Effects of domestic violence, mobility, and decisionmaking on stunting (odds ratios)

	Model 1	Model 2	Model3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Domestic violence	1.10* [1.03,1.17]						1.07* [1.00,1.14]					
Mobility		0.96 [0.85,1.07]						1.01 [0.89,1.13]				
Decisionmaking			1.00* [1.00,1.00]						1.00** [1.00,1.00]			
Education differential				1.03* [1.01,1.05]						1.02* [1.00,1.04]		
Age differential					1.00 [0.99,1.02]						1.01 [0.99,1.02]	
Age at first marriage						0.93^{+} [0.90,0.96]						0.98 [0.95,1.01]
Educational level												
Primary							1.07 [0.89,1.29]	1.07 [0.89,1.29]	1.07 [0.89,1.28]			
Secondary							0.82* [0.67,1.00]	0.82* [0.67,1.00]	0.81* [0.67,1.00]			
Higher							0.53* [0.36,0.78]	0.51^{+} [0.35,0.75]	0.52^{+} [0.35,0.77]			
Wealth quintile												
Poorer							0.92 [0.75,1.14]	0.92 [0.74,1.14]	0.92 [0.74,1.14]	0.88 [0.71,1.10]	0.91 [0.73,1.12]	0.90 [0.72,1.11]
Middle							0.70* [0.57,0.87]	0.71* [0.57,0.88]	0.71* [0.57,0.88]	0.66^{+} [0.53,0.83]	0.66^{+} [0.53,0.82]	0.67^{+} [0.54,0.83]
Richer							0.64^{+} [0.50,0.81]	0.64^{+} [0.50,0.81]	0.64^{+} [0.50,0.81]	0.57^{+} [0.45,0.71]	0.54^{+} [0.43,0.69]	0.57^{+} [0.45,0.72]
Richest							0.39^{+} [0.29,0.51]	0.39^{+} [0.29,0.51]	0.39^{+} [0.30,0.51]	0.32^{+} [0.24,0.41]	0.32^{+} [0.24,0.41]	0.32^{+} [0.25,0.42]

Table 5.1—Continued

	Model 1	Model 2	Model3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Maternal height							0.91^{+} [0.89,0.92]	0.91^{+} [0.89,0.92]	0.91^{+} [0.89,0.92]	0.91^{+} [0.89,0.92]	0.91^{+} [0.89,0.92]	0.91^{+} [0.89,0.92]
Child age							1.20^{+} [1.14,1.27]	1.20^{+} [1.14,1.27]	1.21^{+} [1.14,1.28]	1.21^{+} [1.15,1.28]	1.22^{+} [1.15,1.29]	1.21^{+} [1.15,1.28]
Child sex							0.95 [0.81,1.10]	0.95 [0.82,1.11]	0.95 [0.82,1.11]	0.95 [0.82,1.11]	0.93 [0.80,1.08]	0.95 [0.81,1.10]
Barisal							1.06 [0.75,1.48]	1.06 [0.75,1.50]	1.07 [0.76,1.51]	1.02 [0.72,1.44]	1.01 [0.71,1.43]	0.99 [0.71,1.39]
Chittagong							1.19 [0.87,1.64]	1.20 [0.87,1.65]	1.22 [0.88,1.68]	1.14 [0.82,1.58]	1.14 [0.82,1.59]	1.13 [0.82,1.56]
Dhaka							0.98 [0.70,1.37]	0.97 [0.69,1.36]	0.99 [0.71,1.39]	0.96 [0.69,1.35]	0.93 [0.66,1.30]	0.93 [0.67,1.30]
Khulna							0.75 [0.53,1.07]	0.75 [0.53,1.07]	0.77 [0.54,1.10]	0.70** [0.50,1.00]	0.68* [0.48,0.97]	0.70* [0.49,0.99]
Rajshahi							0.88 [0.64,1.21]	0.88 [0.64,1.21]	0.91 [0.66,1.25]	0.82 [0.60,1.13]	0.83 [0.60,1.16]	0.81 [0.59,1.11]
N	4,819	4,818	4,819	4,794	4,708	4,819	4,807	4,806	4,807	4,784	4,698	4,809
F	9.19	0.60	6.62	8.36	0.44	22.85	19.67	18.54	19.04	20.29	20.05	20.59

Source: BDHS 2007. (NIPORT/Mitra and Associates/Macro International 2009).

Notes: Exponentiated coefficients; 95 percent confidence intervals in brackets.
** $p < 0.10$, * $p < 0.05$, $^{+}p < 0.001$.

Table 5.2—Effects of domestic violence, mobility, and decisionmaking on diet diversity (odds ratios)

	Model 1	Model 2	Model3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Domestic violence	0.99 [0.90,1.10]						1.03 [0.92,1.16]					
Mobility		1.16 [0.97,1.38]						1.13 [0.94,1.36]				
Decisionmaking			1.00* [1.00,1.01]						1.00 [1.00,1.01]			
Education differential				0.99 [0.96,1.02]						0.99 [0.96,1.03]		
Age differential					1.03* [0.99,1.02]						1.03* [0.99,1.02]	
Age at first marriage						1.05* [1.01,1.09]						1.06* [1.01,1.12]
Educational level												
Primary							1.17 [0.82,1.67]	1.17 [0.82,1.67]	1.17 [0.82,1.68]			
Secondary							1.57* [1.07,2.32]	1.58* [1.07,2.33]	1.59* [1.07,2.35]			
Higher							4.03*** [2.17,7.51]	3.89*** [2.11,7.19]	3.88*** [2.10,7.19]			
Wealth quintile												
Poorer							1.16 [0.77,1.74]	1.18 [0.78,1.77]	1.16 [0.78,1.75]	1.29 [0.86,1.94]	1.27 [0.84,1.91]	1.22 [0.82,1.82]
Middle							1.91* [1.23,2.97]	1.92* [1.23,2.99]	1.91* [1.23,2.97]	2.22*** [1.43,3.42]	2.13*** [1.39,3.29]	2.10*** [1.37,3.23]
Richer							1.80* [1.10,2.94]	1.81* [1.11,2.96]	1.79* [1.09,2.94]	2.38*** [1.55,3.66]	2.28*** [1.46,3.55]	2.15*** [1.39,3.32]
Richest							2.27*** [1.42,3.62]	2.29*** [1.43,3.65]	2.24*** [1.40,3.59]	3.57*** [2.38,5.37]	3.40*** [2.27,5.09]	3.01*** [1.97,4.60]

Table 5.2—Continued

	Model 1	Model 2	Model3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Maternal height							1.01	1.01	1.01	1.02	1.02	1.01
							[0.99,1.04]	[0.99,1.04]	[0.99,1.04]	[0.99,1.04]	[0.99,1.04]	[0.99,1.04]
Child age							5.75***	5.75***	5.74***	5.46***	5.57***	5.72***
							[4.22,7.84]	[4.22,7.85]	[4.21,7.83]	[4.08,7.31]	[4.17,7.44]	[4.23,7.73]
Child sex							0.88	0.88	0.88	0.87	0.89	0.88
							[0.68,1.12]	[0.68,1.13]	[0.69,1.13]	[0.68,1.12]	[0.70,1.14]	[0.69,1.13]
Chittagong							0.82	0.82	0.80	0.74	0.78	0.75
							[0.54,1.26]	[0.54,1.25]	[0.53,1.22]	[0.49,1.12]	[0.51,1.18]	[0.49,1.13]
Dhaka							1.26	1.24	1.22	1.07	1.11	1.14
							[0.84,1.87]	[0.83,1.85]	[0.82,1.82]	[0.72,1.59]	[0.75,1.65]	[0.77,1.70]
Khulna							1.53*	1.52**	1.48**	1.51**	1.65*	1.56*
							[1.01,2.33]	[1.00,2.31]	[0.97,2.26]	[0.99,2.29]	[1.08,2.53]	[1.03,2.36]
Rajshahi							2.19***	2.20***	2.10***	2.06***	2.04***	2.16***
							[1.46,3.27]	[1.48,3.29]	[1.40,3.14]	[1.38,3.08]	[1.36,3.05]	[1.43,3.25]
Sylhet							0.52*	0.53*	0.51*	0.42*	0.46*	0.41*
							[0.28,0.96]	[0.29,0.98]	[0.27,0.95]	[0.23,0.77]	[0.25,0.84]	[0.22,0.75]
N	1,743	1,742	1,743	1,733	1,706	1,743	1,729	1,728	1,729	1,719	1,692	1,729
F	0.02	2.68	5.36	0.68	7.03	5.61	12.91	12.91	13.34	16.54	15.52	15.69

Source:BDHS 2007 (NIPORT/Mitra and Associates/Macro International 2009).
Notes: Exponentiated coefficients; 95 percent confidence intervals in brackets.
** $p < 0.10$, * $p < 0.05$, *** $p < 0.001$.

Table 5.3—Effects of domestic violence, mobility, and decisionmaking together on stunting and diet diversity (odds ratios)

	Stunting	Minimum diet diversity
Domestic violence	1.07* [1.00,1.14]	0.97 [0.90,1.04]
Mobility	1.02 [0.91,1.14]	1.00 [0.87,1.15]
Decisionmaking	1.00** [1.00,1.00]	1.00*** [1.00,1.01]
Educational level		
Primary	1.07 [0.88,1.29]	1.29* [1.03,1.61]
Secondary	0.81** [0.66,1.00]	1.56*** [1.23,1.99]
Higher	0.53* [0.36,0.80]	2.66*** [1.67,4.23]
Wealth quintile		
Poorer	0.92 [0.74,1.15]	0.98 [0.72,1.32]
Middle	0.70* [0.57,0.87]	1.39* [1.01,1.93]
Richer	0.64*** [0.50,0.81]	1.45* [1.04,2.04]
Richest	0.39*** [0.31,0.49]	1.61* [1.12,2.32]
Maternal height	0.91*** [0.89,0.92]	1.01 [1.00,1.03]
Child age	1.21*** [1.14,1.28]	1.16*** [1.10,1.23]
Child sex	0.95 [0.80,1.12]	0.93 [0.80,1.08]
Barisal	1.06 [0.75,1.49]	1.76* [1.25,2.48]
Chittagong	1.21 [0.88,1.66]	1.40* [1.05,1.87]
Dhaka	1.00 [0.73,1.37]	2.14*** [1.61,2.85]
Khulna	0.77 [0.54,1.10]	2.00*** [1.39,2.88]
Rajshahi	0.91 [0.66,1.24]	2.84*** [2.07,3.91]
N	4,806	3,626
F	17.93	10.53

Source: BDHS 2007 (NIPORT/Mitra and Associates/Macro International 2009).
Notes: Exponentiated coefficients; 95 percent confidence intervals in brackets.
** $p < 0.10$, * $p < 0.05$, *** $p < 0.001$.

6. DISCUSSIONS AND CONCLUSIONS

Our results indicate that child stunting in Bangladesh, especially chronic malnutrition, is significantly affected by attitudes toward domestic violence, maternal education and height, and age at first marriage. Results not presented here also show that acceptance of domestic violence is associated with lower height-for-age Z-scores for children, a result that is robust to the inclusion of mobility and involvement in decisionmaking as regressors. Maternal height and education are inversely related to long-term malnutrition. As expected, higher maternal education and household wealth significantly increase diet diversity. Diet diversity also increases with child age.

Our study contributes to the literature on women's empowerment and child outcomes by identifying which aspects of empowerment are most relevant for child growth and nutrition. Our findings strengthen the argument that attitudes toward domestic violence, age at first marriage, maternal height, and maternal educational attainment are associated with child nutrition. These findings may therefore help identify areas for intervention.

Attitudes that justify or condone domestic violence indicate an unequal balance of power within the household. While we have considered only physical violence based on four questions in our study, the combination of both verbal and physical violence is likely to be much more prevalent than our estimates indicate for a variety of reasons, such as dowry-related violence, in which a bride may be victimized if her family does not comply with dowry demands. Continued exposure to domestic violence could interfere not only with women's decisionmaking abilities or mobility, but also with child nutrition and overall health through exposure and reduced care. Given that intimate partner violence has far-reaching consequences ranging from physical injuries to mental well-being for women themselves, the association we see in these analyses between attitudes justifying violence and chronic child malnutrition is alarming. Low status of women is, thus, a persistent phenomenon that may have enduring effects on the long-term growth of children. A key result of this work is that attitudes toward domestic violence increase the odds of stunting.

WHO has issued recommendations regarding the appropriate age to begin complementary feeding, and the amounts and types of foods that should be given to children. Because women are primary caregivers, it becomes imperative to ensure that they have the necessary means and knowledge to adopt these care practices. Minimum diet diversity is closely associated with better growth outcomes in Bangladesh (Zongrone, Winskell, and Menon 2012). The results obtained here are consistent with previous studies that suggest that greater empowerment of women within the household is associated with behaviors that, in turn, relate to child nutritional status (Smith et al. 2003).

Although mobility and decisionmaking do not emerge as strong determinants of child nutrition, the relative importance of these two factors should not be underestimated. Given the contextual setting, it is possible that these factors do not directly enhance the nutritional status of children but could have important effects on other child outcomes that we do not explore. Since our measure of child nutrition, stunting, is related to long-term growth, it is likely to be strongly correlated with chronic stressors such as violence.

Finally, consistent with the previous literature (for example, Behrman et al. 2009), two factors that emerge consistently as strong determinants of long-term child nutrition and diet diversity are mother's height and schooling. Because maternal height and schooling embody long-term investments in girls' nutrition and schooling, respectively, our results indicate that investments in schooling and in the long-term nutrition of women (and girls) will pay off in the nutrition and health of the next generation.

A limitation of our work relates to the use of cross-sectional data. Although informative for determining the prevalence rate for stunting and its associations with women's empowerment, the cross-sectional nature of the study primarily provides a one-time measure of child nutritional status that cannot be used to determine or attribute causation to any particular risk factor. Since the growth patterns in cross-sectional data are based on many individuals, they do not depict the observed growth pattern of any particular child (McMurray 1996).

Nevertheless, cross-sectional data can be used and interpreted if the conditions of child growth are properly understood. Attractive features of a nationally representative dataset such as the BDHS are a large sample size and socioeconomic and demographic information on households. Because our study uses variables related to empowerment and stunting that capture measures of chronic stressors and persistent deprivation, respectively, we can meaningfully explore associations between stunting and women's empowerment.

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 well-being outcomes; and (3) policy actions, including legal and social protection instruments, that can strengthen women's endowments such as education and their own nutrition, and investments that can lead to greater women's empowerment to directly address the links between empowerment and nutrition.

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Fax: +1-202-467-4439
Email: ifpri@cgiar.org