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School of Economics and Management

Master in Economic Development and Growth

Do mothers exposed to domestic violence and lower status have more malnourished children? Evidence for Bangladesh

Elisa Hernández

elisa.hernandez_vargas.706@student.lu.se

Abstract: Using data from the 2007 Bangladesh Demographic and Health Survey (BDHS), this research uses a logistic probability model to determine the associations between maternal characteristics, such as the exposure to physical domestic violence and low women's status, and the risk of develop problems of malnutrition in children under 5 years. Using anthropometric indicators of malnutrition such as stunting (low height-for-age), underweight (low weight-for-age) and wasting (low weight-for-height), the results indicate that children, whose mothers were exposed to domestic physical violence, are at increased risk of having problems of stunting. Also, it was found that children, whose mothers are classified as low-status women, have a higher risk of develop wasting problems. It is noteworthy that no evidence of gender bias against girls was found in this study. The results call for the implementation of a public policy to create awareness in society Bangladeshi where more attention should be given to this fact, since it generates externalities which affects the vulnerability and health of the children, not only in the short run but also in the long run.

Key words: child malnutrition, intimate partner violence, women's status, Bangladesh.

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Elisa Hernández

Lund University

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Elisa Hernández
elyhvargas@gmail.com

Lund University
Department of Economic History

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Chapter 1

Introduction

Child malnutrition is a public health problem that occurs with greater intensity in developing countries such as those in South Asia where the 50% of the children under age 5 present problems of malnourished (Smith & Haddad, 2000). Even though in the past two decades, overall progress has been achieved regarding to this problem, the issue of child malnutrition remains as a problem that should be reduced (Amugsi, Mittelmark & Lartey, 2013) since it is one of the most common causes of infant mortality (Puffer & Serrano, 1973). This condition is the result of multiple factors such as food consumption, care practices and health in general (Burchi, 2010). A low nutritional status is the result of a long and continuous process of biological imbalances caused by the retarded physical growth and the insufficient daily intake of nutrients.

Universally, through anthropometric measures such as height and weight, it is possible to analyze the child nutritional status. These measures are basically categorized in three concepts: stunting, underweight and wasting. The first concept refers to low height-for-age (HAZ). A child whose value is less than two standard deviations below the minimum reference value set by the WHO (World Health Organization) is considered too short for their age, labeled as stunted child. The second concept refers to low weight-for-age (WAZ). If this value is two standard deviations below the minimum reference value according to the WHO, the child will be classified as underweight. Third, considering the weight-for-height (WHZ), it can be said that if a child has a value below two standard deviations from the mean established by the WHO, the child is considered too thin for their height, being referred as a wasted child. This measure indicates the current status of child nutrition (Onis, 2006). It should be pointed out that the methodology used in order to construct these indicators is based on different values according to different ages.

Although the literature on children's health has stated that the causes of malnutrition are due to biological and economic factors, little attention has been given to other factors that can clearly influence the nutritional status of children. We refer to the

conditions of domestic violence to which the mother is exposed, as well as certain maternal characteristics that may affect the care given to children and therefore their nutritional status. Domestic violence by an intimate partner (IPV) against women, defined as physical, emotional, psychological and sexual abuse by the current partner (Hattery, 2009), can affect the physical growth of the children both in uterus and in early life (Yount, Di Girolamo, 2011) due to disruption in the biological regulatory systems of the children both before and after breast-feeding (Repetti, 2002; Lanius, Vermetten & Pain, 2010).

The exposure to domestic violence against mothers can affect the physical development of the children in different ways. For example, if the woman suffered severe violence while pregnant, it is possible that children had directly suffered the consequences, presenting a low birth weight; so it is more likely that children are at high risk of being underweight (Neggers, Goldenberg, Cliver & Hauth, 2004). Indeed, the later part of human gestation and the first year of postnatal life are crucial for the development of the brain. If the biological systems are damaged in those stages, the children may experience delays in the physical development (Bibace & Walsh, 1980). According to the evidence, those individuals who experienced delays on growth before birth tend to have higher both, physical and mental disabilities in the future (Harrison, Tanner, Pilbeam & Baker, 1993). Thus, the conditions experienced during pregnancy can severely affect the physical development of children permanently. It is worth mentioning that the life stages of human beings before 6 years of age are divided into 3 major stages: prenatal, newborn and infancy. According to the known "Scammon Growth Curve", in the period marked from prenatal to infancy stage the most important parts of the human body are more quickly developed. In fact, according to this curve, the brain develops by 80% in the first 5 years of life (Bogin, 1999).

Moreover, if the mother was exposed to domestic violence during large periods, it is possible that the family environment disfavored children through a culture of carelessness, which will be reflected in the long term, increasing the likelihood of develop problems of stunting. There is also the case that the mere act of observing violence can lead to psychological disorders in children. These children can suffer eating disorders in the long run, being more risky to have problems of stunting and wasting in earlier ages (Yount, DiGirolamo & Ramakrishnan, 2011).

On the other hand, there are cases where despite not suffering from any exposure to domestic violence, home conditions experienced by the mother may indirectly affect the nutrition of the children. These conditions refers to the concept of woman's status, which regards to the degree of access that the woman has over resources, both, at home and at her community (Mason, 1986). A woman listed as low status is directly related to low self-

esteem and low capacity in decision-making at home, including own personal care (Engle, Menon & Haddad, 1999), due to the fact that she is subjected to some degree of marginalization by her partner. One could say that the mechanisms that affect the nutritional status of children under a low women's status may be basically the same as when a woman is exposed to some degree of domestic violence.

Since the mother is the main provider of maternity care, and given the fact that children are largely dependent on her, especially in the first years of life, studying the characteristics of the mother turns out to be a good indicator of child nutritional status. The status of women can affect children's health in several ways. First, if the woman suffered from psychological disorders such as low self-esteem or social interaction difficulties at the stage of pregnancy, it is likely that less attention has been given to both, herself and her child, sometimes refusing to accept help from others (Chatterjee, et al., 1990; Engle, Menon & Haddad, 1999; Riley, 1997). This can cause problems on children who may present low birth weight, due to the fact that they did not receive the necessary nutrients in the fetal stage. In this sense, it would be expected that children are too thin at birth, with a high probability of being underweight. Note that sometimes this condition is maintained during childhood. According to the evidence, children with low birth weight tend to hold this condition in early life (Martorell, Stein & Schroeder, 2001).

Second, if the woman, listed as low status does not provide the necessary care for children, either for physical or psychological reasons, from the first months of life, i.e., after pregnancy, it is likely that children present problems of chronic malnutrition. Poor eating habits generated by a culture of maternal neglect can cause children to present problems of malnutrition in the long run, either because they are too small for their age or too thin for their height, so one would expect a higher likelihood of stunting and wasting problems (Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, 2003). So, while we would expect to observe younger children with underweight problems in the short-term, we would expect older children with stunting problems, since this measure reflects the cumulative growth of the child.

Although these relationships have been scarcely studied (Bair-Merritt, Blackstone & Feudtner, 2006; Kishor & Johnson, 2004; Rico, Fenn, Abramsky & Watts, 2010), evidence has shown that these problems are intensified in developing countries including those of South Asia. Such is the case of Bangladesh, for having one of the highest domestic violence and child malnutrition rates in the world, as well as a low women's status (Smith, 2003). According to the report by the National Institute of Population Research and Training

(NIPORT)¹, one out three Bangladeshis women has experienced some form of domestic violence. Similarly, according to the World Bank (2005), one out of two children under age 5 are suffering from malnutrition, where associations between both concepts have been little studied. On the other hand, even though it has been shown that there is discrimination in the allocation of resources against girls (Miller, 1997; Zimmermann, 2012; Bharati, Shome, Pal, Bharati & Chaudhury, 2011), a fact that can affect their nutritional level, studies about gender and malnutrition have been poorly studied.

The discussion above motivates this research, which is aimed at studying the impact that characteristics of the mother may have on the nutritional status of the children. In our case, we argue that children whose mothers are classified as low-status or who have been exposed to some degree of domestic violence are at increased risk to develop problems of malnutrition in early life, where a situation of disadvantage is expected for girls, being more risky to develop malnutrition problems. For this purpose, using data provided by the Bangladesh Demographic and Health Survey 2007 (BDHS), we estimated a logit model in order to analyze the potential impact of maternal characteristics on the probability of risk of developing malnutrition problems. It should be noted that in order to measure the status of women, two indices have been constructed using factor analysis techniques where the first index captures the power of decision-making at home, while the second captures the societal gender equality.

Among the most important results, it was found that for those children under age 5, whose mother was exposure of physical domestic violence, the risk of being stunted greatly increases. Likewise, it was found that there is a strong association between the low woman's status and the increased risk to develop problems of wasting in children. Note that, contrary to expectations, in our case, the role of gender turned out to be weak condition in the likelihood of developing problems of child malnutrition.

The work shown here stands out from the others for the following reasons: First, this work represents a contribution to the literature on the subject (both in general and particularly to the case of Bangladesh), considering not only the problem of domestic violence, but by considering how other characteristics of women, such as the attitude to be beaten, or the ability of decision-making in the home, can influence the likelihood that their children develop problems of malnutrition. In this way, considering both concepts, we are in position of analyzing the potential impact of each one in order to observe which has a

¹ For more information consult: National Institute of Population Research and Training (NIPORT), Mitra and Associates, and Macro International. 2009. Bangladesh Demographic and Health Survey 2007. Dhaka, Bangladesh and Calverton, Maryland, USA: National Institute of Population Research and Training, Mitra and Associates, and Macro International.

higher impact on child nutrition. Second, because the literature has shown that in some countries of South Asia there is some discrimination in the allocation of resources against girls, in our study, we will include the analysis of "gender bias" in order to investigate the importance of gender on the fact of been malnourished. Third, given the fact that endogeneity problems may arise in this type of analysis (it could be the case in which our variable of interest is correlated with other unobserved variables), in our study we will include this analysis through instrumental variables in order to achieve robust results. This is interesting because in most studies, dealing with either domestic violence or status of women, the endogeneity problem is scarcely treated.

This paper is divided into 7 sections. The following section briefly describes the theoretical context in which the associations related to domestic violence, women's status and child nutrition have been developed, presenting empirical evidence in this regard. An analysis of the data used and the construction of the necessary measures in our empirical model are presented in Section 3. The methodology used is described in section 4, while the results obtained are presented in section 5. The discussion and implications resulted from the previous sections are presented in section 6. Finally, Section 7 concludes.

Chapter 2

Conceptual Framework

2.1 Child Malnutrition: a public health problem

Child nutrition is the result of having a diet devoid of nutrients needed for physical development as well as insufficient maternal practices. As we mentioned earlier, through the three anthropometric measures: stunting, underweight and wasting, it is possible to analyze the child nutritional status. Although there has been a reduction in the category of underweight from 32 to 28 percent in developing countries, very high levels of child malnutrition still prevail in South Asia and sub-Saharan Africa. In fact, the problem of child malnutrition is associated with about half of infant deaths worldwide. Similarly, stunting is associated as one of the major components of infant mortality, disease and disability. According to UNICEF, 80 percent of stunted children in the world are located in 14 countries, where 48 percent of India's children were in this category, followed by countries such as Ethiopia (44%) and Bangladesh (41%), among others. About wasting category, it should be highlighted the case of India and Bangladesh, where 20 and 16 percent of children under age 5, respectively, were found under this category for the period 2007-2011 (UNICEF, 2013).

Several studies have shown that biological and socioeconomic factors define the main causes of child malnutrition, where factors such as the improvement of the access to public services or even the degree of education of the mother have demonstrated to have a positive impact on child nutrition through the decline of stunting. However, these explanations need to be interpreted carefully since there are other factors that may affect the level of child malnutrition. In fact, three types of factors can be identified as the main determinants of the level of child nutrition: immediate, underlying and basic determinants. The immediate factors refer to dietary intake and health status; while the underlying factors are conceptualized in the categories of food insecurity, care for mothers and children and health

quality environments. The basic determinants refer to the access to economic resources (Smith & Haddads, 2000).

2.2 The Link Between IPV and Child Malnutrition

Regarding to the underlying determinants of child malnutrition, we can situate the concept of domestic violence. This term sometimes exchanged with marital violence, interpersonal violence or intimate partner violence (IPV) against women (Jouriles et al., 2008) is defined as physical, emotional, psychological or sexual abuse by the current partner (Ellsberg et al, 2008), which can have severe implications in children through physical or sexual harm, or indirectly through psychological or external damage (Holden, 2003).

Exposure to domestic violence can severely affect the woman causing certain physical and psychological chronic disorders such as gastrointestinal pain, lack of appetite, including depression and traumatic stress disorders. This can have severe long-term effects on those members within the household, especially the children. For example, it has been found that children whose mothers have suffered some degree of violence are at increased risk of being hospitalized for suffering from chronic diseases. Indeed, maternal disorders such as depression are strongly associated with higher infant health problems such as low birth weight, sexual abuse and child growth delays (Chung, McCollum, Lee & Culhane, 2004). Children may be affected by the careless mother, especially in the food supply, because it is her who is generally responsible for providing childcare (Davalos & Santos, 2006). Thus, children of those mothers exposed to IPV may be predicted to develop health problems either in their childhood, through low birth weight (Martorell, Stein & Schroeder, 2001) or in adulthood (Yount, DiGirolamo & Ramakrishnan, 2011).

Although there is no general theoretical model explaining the effect of domestic violence on the nutritional status of children, the literature presents different conceptual frameworks that explain the different pathways through which these relationships can be established. One of the major pathways (see appendix A) is defined by the "risky family environment model" (Repetti et al., 2002). The "risky families" are those characterized by an atmosphere of conflict and aggression, usually accompanied by unsupportive and not negligent relations. Such families generate psychological disorders and disruptions in biological systems in response to stress for household members, especially children. Maintaining biological systems stress response is essential in order to maintain good physical and mental health (Lanius, Vermetten & Pain, 2010). Thus, the damage of these systems may cause problems of delay in physical growth as well as low weight at early ages,

which increases the likelihood of developing stunting and wasting problems (Repetti et al, 2002; Lanius, Vermetten & Pain, 2010).

Thus, a woman suffering from some type of domestic violence may develop certain dangerous behaviors (drug use, alcohol, etc.) as well as psychological trauma (depression, anxiety) or physical problems, which can cause indirect effects on children, since mothers are the main providers of child care (Campbell, 2002). Carelessness by the mother, usually is present in the food supply since the attention to children is considerably reduced, affecting the proper growth and nutrition directly. Note that this is critical during pregnancy, but also in the early years of life, because feeding practices, exposure to disease and psychological treatment, turn out to be crucial to the development of children (Troxel & Matthews, 2004).

2.3 Evidence About the Effect of IPV on Child Malnutrition

Notably, the effects of the exposure to domestic violence against mother are an issue that to date has not been deepened because of the limitation available data (Bair-Merritt, Blackstone & Feudtner, 2006; Kishor & Johnson, 2004; Rico, Fenn, Abramsky & Watts, 2010). Empirical evidence presented for Brazil, India (Walker et al., 2007) and Liberia (Sobkoviak, Yount & Halim, 2011), has shown that exposure to intra-household violence generates considerable impacts on child nutrition. Similarly, using a representative sample of 6,500 British individuals observed in during childhood and adulthood, it was shown that exposure to domestic conflict is associated with lower height. These individuals were more likely to be located in the lowest fifth percentile in height distribution (Montgomery et al., 1997). A major conflict in the home was associated to lower birth weights in children, even when controls such as mother's characteristics were used (Stein, Woolley, Cooper & Fairburn, 1994). Infants whose mothers had lower capacity to assist them were more likely to develop problems of chronic undernutrition (Valenzuela, 1997).

2.4 The Link between Woman's status and Child Malnutrition

A woman listed as low status is directly related to low self-esteem and low capacity in decision- making at home, including own personal care (Engle, Menon & Haddad, 1999). Although there is no consensus on the definition of woman's status, three elements must be considered in order to understand its meaning. First, this concept refers to the status in relation to the husband. Second, this concept refers to the capacity of taking decisions at home. Third, this concept refers to a dimension both, intra-household and extra-household,

i.e., it references to the role of women at home as well as the position in her community (Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, 2003).

The woman's status may affect her health as well as her nutritional status, which may affect the child's weight at birth, a condition that tends to remain during the first years of life. According to Smith (2011), the women's status directly affects the child's care through five main areas: food preparation and storage, feeding practices, psychological care, health and hygiene practices, and care at birth (see appendix B). Several elements are important to mention. First, about the control of resources at home, clearly, the greater control over economic resources the woman has, the more care regarding health will be provided to the children as it is more likely that she makes use of health services if it is she who manages the household income (Engle, Menon & Haddad, 1999). Second, the lower the woman's status, the less likely she will acquire and process information needed for child care (Chatterjee, et al., 1990; Engle, Menon & Haddad, 1999; Riley, 1997). Third, with respect to mental status, confidence and self-esteem, the lower the woman's status, the more dependent she will be on the husband. Women with low self-esteem are less likely to perceive the need for care about their health, let alone their children. Thus, these conditions suffered by the mother can affect the level of children's nutrition, through low birth weight, a condition that is maintained in the early years of life.

2.5 Evidence about the Impact of Woman's status and Child Malnutrition

Regarding the women's status, although significant associations between this maternal condition and child's nutrition have been found (Smith, 2003), the evidence remains limited. In the case of South Asia, it has been found that woman's status influences largely child nutritional status. Thus, the higher status, less problems of child's malnutrition are reported, in both, the short and long term, allowing for reductions in stunting and wasting (Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, 2003). Although there are many indicators in order to measure the woman's status, the majority of them place the Asian countries in the lower position (Haddad, 1999). It is noteworthy to say that while some indicator regarding to women's status takes into account factors such as expectancy at birth, literacy, income and human development index, in our case, due to the nature of our data, we will create an index based on decision-making at home via the 2007 BDHS.

2.6 The Case of Bangladesh

The case of Bangladesh is interesting because it is one of the countries with the highest rates of child malnutrition and domestic violence in the world. Regarding to the former, although there has been considerable progress in child nutrition levels, Bangladesh continues to have very high rates compared to the rest of the world. According to World Bank (2005), about half of the children in Bangladesh had stunted or underweight problems. Regarding to domestic violence, in 2000, the percentage of abuse against rural women ranged between 32 and 67% (Bhuiya, Sharmin & Hanifi, 2003). Concerning to women's status, although for the case of Bangladesh significant associations between low female power and malnutrition (children with low weight for age) have been found (Smith, 2003), the evidence remains scarce.

On the other hand, it is noteworthy that in some countries of South Asia there is some discrimination in the allocation of resources against girls (Miller, 1997; Zimmermann, 2012; Bharati, Shome, Pal, Chaudhury & Bharati, 2011). For this reason, it is interesting to consider this aspect in our research. According to the evidence, in the case of Bangladesh, girls are considered less valuable because of cultural factors. In other words, girls are considered as minor economic incentives in the future, since usually, is the man who brings the highest percentage of home economic resources. The preference towards children can affect the way how food, feeding practices, and the use of medical services (Chen, Huq & D' Souza, 1981) are distributed. For this reason, in our study we considered the role of gender in order to analyze if the condition of being a girl can increase the risk of being malnourished. Thus, although several studies examining the impact of both domestic violence and women's status on child nutrition status have been documented, empirical evidence is still scarce to date.

Chapter 3

Sample and Data

3.1 The Sample for Bangladesh, 2007.

For this research, we have taken data from the 2007 BDHS, which is conducted by the National Institute for Population Research and Training of the Ministry of Health and Family Welfare from March 24, 2007, to August 11, 2007. One of the main objectives of the BDHS is to provide detailed information on representative households in Bangladesh on the fields of fertility, infant mortality, family planning methods, domestic violence, HIV/AIDS, maternal and child health, among others. On the design of the sample, the 2007 BDHS has considered all ever-married women between 15 and 49 years who slept in the household selected the last night previous to the interview.

The framework for the sample used by the 2007 BDHS is the Population Census of the Republic of Bangladesh, organized by the Bangladesh Bureau of Statistics (BBS). The sample frame was designed using 259,532 enumeration areas (EAs) created by the 2001 census. An EA is a geographic area consisting of a convenient number of households (dwelling units). Usually, every EA has on average 100 households and it has information on location, type of residence, number of residents in the home, and all the features considered in the design of the sample. In the case of Bangladesh, each EA consists of a small number of villages.

The sample for the 2007 BDHS consists of a stratified sample selected in two stages. For each of the six administrative areas of Bangladesh, stratification was carried out by separating each region in rural and urban areas as appropriate. The urban areas of each division were subsequently stratified into three strata: i) statistical metropolitan areas (SMA); ii) municipal areas and; iii) Other urban areas².

In the first stage, 361 EAs were selected with probability of selection proportional to size of each EA (by size we mean the number of members living in this household) and independent selection of each sampling stratum was considered. The resulting households

² Because the areas of Barisal and Sylhet do not have SMA, 22 sampling strata have been taken into account.

from stage one were selected as a sampling frame for the second stage. The sample design for the 2007 BDHS, does not allow replacements or changes in the list of pre-selected households to avoid potential bias. Thus, a cluster in the 2007 BDHS may be an EA or a segment of an EA, since some of them are too large and contain more than 300 households.

In summary, for the six administrative regions of Bangladesh, 361 clusters were selected, of which 134 are located in urban areas and 227 are located in rural areas. Thus, 11,485 women were interviewed: 4,360 in urban areas and 7,125 in rural areas. It should be noted that urban areas were oversampled due to the low proportion (23 percent of total households in the country representative) compared to rural areas. The response rate for the women interviewed was 98 percent in average. The 2007 BDHS provides a selection of women between 15 and 49 years old with children under age 5 whom were considered for anthropometric measures such as height and weight, considered later for certain indicators of child nutrition. For weight measurements in children under five, the 2007 BDHS took into account international approval provided by UNICEF.

3.2 Limitations of the Data

Although one of the objectives of the 2007 DHS Program is to provide high quality information to promote scientific studies, and although the new domestic violence module represents the largest effort made in the collection of this type of data, at least for the Bangladesh, there are some limitations that should be mentioned.

One of the problems facing by the 2007 DHS is the lack of access to information. In the case of domestic violence module, the lack of response or inconsistencies in the different questionnaires lead to the existence of missing values. In this case, the response sensitivity is extremely important in our case as it can generate a bias in the results . Although statistically, the sample for Bangladesh is representative for the whole country, the existence of non-response reduces the sample considerably. The 2007 DHS has faced this problem through sophisticated statistical methodologies such as the use of weights, which helps to keep the nationally representative. This is important because sometimes the sample is selected with unequal probability in areas where the data should be extended for statistical purposes. Consider a hypothetical example: the cost to interview some population in the northern region is extremely expensive as compared to the South, or, consider the case where there was a failure in the data collection in that area. In both cases, the lack of data may bias the results. The representativeness can be maintained through the use of sampling weights since this technique allows correct different response rates.

Furthermore, the introduction of longitudinal variables in the survey could improve the consistency of research using such data. It could help to follow the individuals through different periods of life. In this case, children who have lived in an environment of violence against the mother can be analyzed across time. This is important because the effects of it on malnutrition can be seen sometimes in the long term. However, the 2007 DHS only provides information on women who suffered some form of domestic violence in the 12 months preceding the interview.

3.3 Exposures

To construct the survey, one woman within each household was randomly selected in order to obtain information on various indicators about herself and her children. For domestic violence section, of 4,489 women eligible for the survey, only seven had to be excluded from the sample due to the lack of privacy at the time of the survey. That is, if at the time of the interview, the husband was present. Also, 15 women eligible for interview were excluded from the sample due to other reasons, usually, because she was not at home at the time of the survey³. Women selected were those ranged 15-49 with at least one child under 5 years.

In the case of Bangladesh, intimate partner violence (IPV) was divided into two categories; physical violence and sexual violence. For the study of physical violence, the 2007 BDHS considered seven questions regarding the behavior of the current husband. So, if the woman reported having faced any of the following conditions, she was classified under this category: i) pushing, shaking, or something throwing her; ii) slapping; iii) twisting her arm or pulling her hair; iv) punching her with something that could hurt her; v) kicking, dragging or beating; vi) burning or choking her on purpose and; vii) threatening or attacking her with a knife, gun or other type of weapon. For the case of sexual violence, it was identified if the woman answered positive to a question designed by the 2007 BDHS: physically forced to have sexual intercourse even when she refused to do so.

The responses mentioned before were used to construct a binary variable which takes the value of one if the woman answered yes to at least one of the seven questions above and zero otherwise. Thus, for domestic violence measures, four cases were considered⁴: i) physical IPV only; ii) sexual IPV only; iii) physical and/or IPV and; iv) No IPV.

³ It should be noted that for our final sample, we considered only 4467 women for the module of domestic violence.

⁴ It is noteworthy that for this analysis we will focus only on physical IPV due to the fact that in this category the larger number of observations can be found. Thus, we will take the remaining definitions for a sensitivity analysis section.

Furthermore, because we are interested on analyzing the impact that women's status can have on child nutrition, we constructed two indices in order to capture the relative power than the mother has within and outside the household. The indicators were chosen based on their theoretical relevance and data availability. In order to measure the level of decision making at home, indicators which provide direct evidence of power within the household should be considered. For this reason, the first index: low decision-making, considers cases where the woman has little presence in decision-making through the following questions: i) final say on own health care; ii) final say in making household purchases; iii) final say in making household purchases for daily need and; iv) person who decides how to spend the money of the woman. Thus, we created binary variables which take the value of one if the husband or someone else in the household has the final say in making decisions, and zero if the woman is the one who makes the decisions at home.

For the second index: low societal gender equality, we have considered four questions: i) justified wife beating if she goes out without telling husband; ii) justified wife beating is she neglects the children; iii) justified wife beating is she argues with her husband and; iv) justified wife beating if she refuses to have sex with her husband. Similarly, we created binary variables that take the value of one if the woman answered positive at least one of the questions above and zero otherwise. It is worth mentioning that these variables represent a good indicator of women's status since they help to clarify the theoretical framework define by Smith, et al., (2003). In other words, the chosen variables result to be good proxies of the elements needed for label the status of the woman: mental health, confidence, self-est, control of time and income, among others (see appendix B).

Thus, factor analysis was used in order to consider the weight that determines each variable chosen into one index for each concept⁵ (Kim & Mueller, 1978). Regarding to the first index, given the fact that the correlations among variables are not strong, they are adequate for using a factor analysis (see appendix C). On the four factors identified, only

⁵ This data reduction technique has the aim to represent a set of variables in terms of a smaller number of hypothetical and unobserved variables. The first step is to examine the interrelationships among the variables selected through a correlation matrix that shows the relationships among these variables. The second step corresponds to the extraction of the initial factors that can explain the observable correlation (or covariance) among the observed variables. In order to decide the number of factors that can be retained, the rule of Kaiser or eigenvalue criterion (eigenvalue greater or equal to one) can be followed. For each identified factor, the factor analysis produces the "loadings" for each variable. Factor loadings are equivalents to correlations between factors and variables where only one common factor was involved. The index is created through a lineal combination of the observed variables with the corresponding loadings. It is important to say that the original observed variables were standardized before analysis in order to avoid that their ranges affects the index coefficients.

one factor capture sufficient variance (50% of the common variance) to be retained. The first index was obtained as a linear combination of the original variables with loadings as weights (β_i), and subsequently standardized as follows:

$$\text{Low decision making index} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$$

Similarly, for the second index, one factor was retained because it accounts for 62% of the common variance (see appendix D). It is represented through the following equation:

$$\text{Los societal gender equality} = \gamma_0 Z_1 + \gamma_0 Z_1 + \gamma_0 Z_1 + \gamma_0 Z_1$$

The final indices were placed on a 0-1 scale for easy interpretation.

3.4 Outcome Measures

The 2007 BDHS includes anthropometric measures for those children under age 5 who were measured and weighed. In order to provide a complete indicator for the nutritional status of children, we have used three anthropometric measures as proxies of the degree of child malnutrition. These measures refer to the Z-scores that define low height for age (HAZ), low weight for height (WHZ) and low weight for age (WAZ). Thus, binary variables have been created for each case, taking the value of one if the Z-score of the child is below the minimum value established internationally, which is two standard deviations below the mean as references for the WHO, and zero if the Z-score is above that value. Thus, the following categories are: stunting, wasting and underweight if HAZ, WHZ and WAZ are lower than the set value, respectively.

3.5 Controls

Because both, theoretically and empirically, some variables are related to IPV, woman's status and child malnutrition, in our study we have included certain variables related to these two issues in order to understand in more detail the effects of both concepts on the degree of malnutrition in children.

For children's age, we have constructed a categorical variable which takes the value of one if the child is under one year; two, if the child is between 1 and 2 years; three, if the child is between 2 and 3 years; four, if the child is between 3 and 4 years and five, if the child is between 4 and 5 years. Given the fact that in some Asian communities boys are more valued than girls, since it was thought they represent greater economic incentives in the future (Miller, 1997; Zimmermann, 2012; Bharati, Shome, Pal, Chaudhury & Bharati,

2011), we considered a gender interaction variable in order to analyze the potential impact of being a boy instead girl on the fact of being malnourished.

Regarding to the characteristics of the mother, we have classified the woman's age into three groups: 15-24 (young), 25-34 (middle age) and 35-49 (older women) years old. About her educational level, we have considered a categorical variable which takes the value of zero if the woman cannot read and one, if the woman is able to read parts of a sentence and two, if the woman is able to read a complete sentence. Because religion plays a very important role into the Bangladeshi culture, we have included a dichotomous variable which takes the value of one if the woman practices Islam and two is she practices Hinduism. Since the nutritional status of the mother plays an important role in the nutritional status of the children (James, Ferro-Luzzi, Sette & Mascie-Taylor, 1999), we have included the maternal body mass index (BMI) defined as her weight in kilograms divided by the square of her height in meters, which is a proximate measure of nutritional status.

About the characteristics of the father, we have considered two factors: age and level of education. Regarding to the latter one, we have considered a variable which contains information about the highest level of education attended. About the characteristics of the household, we have considered the total number of household members as well as well as the number of children resident in the household under age 5. Regarding to the type of residence, we have include a categorical variable which takes the value of one for households located in urban areas and zero for household located in rural areas. Given the fact that in the case of Bangladesh there are 6 major regions, in or study we have included one variable regarding to geographical division through a categorical variable for the different regions: Baristal, Chittagong, Dhaka, Khulna, Rajshahi and Sylhet. As a proxy of socioeconomic status, we considered the wealth index provided by the 2007 BDHS. This indicator is constructed through information on the household assets, including durable goods and some basic household services. Thus, all the households interviewed are classified into five wealth quintiles from the poorest (first quintile) to the richest (last quintile).

3.6 Descriptive statistics

Table I shows some characteristics of Bangladeshi households, highlighting important aspects of both, children and their parents. On the nutritional status of children less than 5 years, from a total sample of 5313 children selected, about half of them suffered malnutrition problems: 44% stunted and 42% underweight. To a lesser extent, the

percentage for the wasted category was ranked around 20%. In our sample, the ratio between boys (52%) and girls (48%) is proportional, where 10% of the children are under one year, while the proportions for the other categories are placed around 14% and 30%.

For a selected sample of 4467 women, 49% reported having been exposed to some form of physical violence. This percentage is made up mostly for women who have been slapped (46%), pushed (30%). To a lesser extent, the percentage of women who reported having been subjected to sexual violence ranged around 18%, while about half of the selected women reported being exposed to both types of violence or one of them.

About the woman's status indices, the closest to zero, the lower the degree of "low status of women," and the closer to one, the greater the degree of this category. Thus, on average, the intensity of these indices is relatively low, since they are less than 0.5. Notably, about maternal BMI, on average, Bangladeshi women have levels above the minimal nutritional value (18.5). This means that in general, these women present few problems of malnutrition. About age of women, the highest percentage is located in the latter category, i.e., women over 35 and under 49, which are more likely to be exposed to domestic violence compared to young women (Rishor & Johnson, 2004). Regarding to the level of education, on average, about 50% of women have difficulty reading, proportion similar to the husband, who on average has 40 years of age. About the religious status, the Islam strongly dominates that region, covering 90 % of the sample.

On the characteristics of the households surveyed, on average, 77% of the population is located on rural areas, while 23% is located on urban areas. About the wealth index, equitable distribution of wealth is observed since no major differences were observed between quintiles. About the size of the households, on average, 5 members live in each household, of which only 1 corresponds to children less than 5 years. Finally, it can be observed that the populations of Draka and Rajshahi concentrate the highest proportion of households in our sample.

Table 1: Characteristics of mothers and children under 5 years. Bangladesh,2007

Variable	Mean, %	(SD)	[Min, Max]
Child's Characteristics¹			
Nutrition Child's status (%)			
Stunted	44.31		
Underweighted	42.07		
Wasted	19.74		
Gender (%)			
Female	47.63		
Male	52.37		
Age in Months (%)			
0-11	09.99		
12-23	13.90		
24-35	23.25		
36-47	25.88		
48-59	26.98		
Mother's Characteristics²			
Domestic violence (%)			
Only Physical IPV	48.63		
Women's status			
Low decision-making status index	0.336	(0.20)	[0,1]
Low societal gender equality index	0.156	(0.28)	[0,1]
BMI in kg/m ²	20.66	(3.43)	[12.31,38.86]
Age in years (%)			
Younger	26.28		
Middle age	38.97		
Older	34.75		
Literacy (%)			
Cannot Read at all	51.06		
Able to read some parts	07.12		
Able to read whole sentences	41.82		
Religion (%)			
Islam	92.01		
Hinduism	07.99		
Partner's Characteristics			
Literacy (%)	48.94		
Age	40.45	(10.78)	[18,85]
Household's Characteristics			
Type of residence (%)			
Urban	23.11		
Rural	76.89		
Quintile for household wealth (%)			
First	24.84		
Second	22.40		
Third	17.97		
Fourth	18.95		
Fifth	15.84		
Number of household members	05.27	(2.27)	[1,7]
Number of children under five years	1.392	(0.70)	[1,9]
Geographical division (%)			
Barisal	04.38		
Chittagong	11.01		
Dhaka	32.66		
Khulna	14.82		
Rajshahi	34.63		
Sylhet	02.50		

Source: 2007, BDHS. Author's construction using data weighted according to the methodology suggested in the 2007 BDHS.

Notes: a) Number of children: 5,313; b) number of eligible women for for IPV:4467. b) Physical IPV(48.63%); sexual IPV(17.74%); physical and/or sexual IPV(53.28%) and; no IPV(46.72%).

Chapter 4

Empirical Strategy

4.1 The Econometric Model

When the dependent variable is not continuous or it does not follow a normal distribution, as in the case of dichotomous variables, it is necessary to assume that the underlying probability distribution assumes a binomial form as Bernoulli distribution with median u . The u estimator is p and it is interpreted as the probability of occurrence of an event, while $p/[1-p]$ is called the "odds ratio (OR)". In general, a typical transformation for a binomial model is carried out by the "logit" transformation.

$$\text{logit}(p) = \ln[p/(1-p)] = \alpha + \beta X + \epsilon$$

To estimate the relationship between our main variable: child nutrition, which has a binary response ($y=1$ if the child has malnutrition and $y=0$ otherwise), and physical IPV⁶, we determined three major separate models (since we have three different outcomes for malnutrition: stunting, underweight and wasting) as follows:

$$\ln[Y_1/(1-Y_1)] = \alpha + \beta_{IPV}IPV + \sum_{k=1}^K \beta_k X_k + v_i, v_i \sim N(0,1)$$

Where the probability that our dependent variable is equal to one can be calculated as follows:

$$\text{Prob}(Y_1=1) = [\exp(\gamma)]/[1+\exp(\gamma)]$$

Such that:

$$\gamma_i = \alpha + \beta_{IPV}IPV + \sum_{k=1}^K \beta_k X_{k,i}, \forall i=1,2,3$$

⁶ Physical IPV is as binary response variable which takes the value of one if the woman reported having been exposed to some type of physical domestic violence and zero otherwise.

Thus, the vector X represents the K control variables explained in previous sections which we used in our analysis in order to provide more conclusive results. The parameters α and β represent the coefficients estimated by the model. These coefficients are used to calculate the odds ratio, which determines the ratio of two odds of occurrence of an event (Demaris, 1992). On the other hand, in order to estimate the impact of women's status⁷ on child nutrition, we have identified three separate models in the same form as we did for IPV.

In this framework, the binomial logistic regression results can be presented in two ways: the odds ratios and probabilities. The odds ratio is defined as the ratio of two odds of one event in one group compared to another group. If the odds ratio is above one, it indicates the existence of positive relations between the variables. If the odds ratio is below one, this indicates the existence of negative relations, while an odds ratio of one indicates the absence of associations. An odds ratio of 2, for example, indicates that the odd of the outcome variable is twice as high for the group "a" compared with the group "b". In the case of probabilities, interpreted by the marginal effects, this can be defined as the ratio between a small change (infinitesimal) in our independent variable and the change in the probability of the outcome variable. For example, a coefficient of -0.04 indicates that the probability of the outcome variable is 4 percentage points lower for group "a" compared with group "b". Note that a relative change in the odds is not the same as a relative change in the probabilities. Thus, odds ratios and marginal effects should be viewed as complements rather than substitutes, since the first one indicates the direction of probability, and the second indicates the frequency in which this relationship occurs. In this context, estimates from logistic regressions are presented through the odds ratios in Tables 2, 3 and 4, while Table 5 condensates such results using marginal effects in order to clarify our estimates.

Results on the associations between IPV and child malnutrition through logistic regressions are presented in Table 2. It should be noted that since we are primarily interested in physical IPV, for our analysis we only considered this definition while the other definitions (sexual IPV, physical and/or IPV, no IPV) will be analyzed later in the sensitivity analysis section. Because our outcomes of interest are three measures of child malnutrition: stunting, underweight and wasting, we have presented the results for each measure of child malnutrition using three models with three different objectives. First, logistic regressions were estimated without taking into account the possible impact of other

⁷ It should be noted that the concept of women's status was analyzed in two sections. While in the first section we took into consideration the low decision- making woman's status index, in the second section the low societal equality index was considered.

variables (odds ratios unadjusted) that may be related to child malnutrition in order to observe possible changes in the results once more variables are added to model. This will help to clarify the true impact of domestic violence on child nutrition. Second, due to the existence of non-causal associations between our variable of exposure (violence) and our outcomes due to the influence of third variables (confounding variables), in the second model, control variables have been included in order to observe possible changes in our outcome variable (adjusted odds ratios). Notably, a confounding variable is associated with the outcome, but it is not causally associated with the exposure variable. Also, the confounding variable is not an intermediate variable in the causal pathway between the exposure and the outcome (Szklo & Nieto, 2012). Third, because one of our objectives is to analyze malnutrition by gender, the third model includes gender interaction in order to observe if the condition of coming from a woman exposed to certain level of violence in addition to being a girl can increase the probability of being malnourished.

Chapter 5

Results

5.1 Physical IPV Against Mother and Child Malnutrition

Considering the first measure of child malnutrition: stunting, it was found that the difference between the adjusted odds ratios and unadjusted odds ratios (columns 1 and 2) is practically null ($OR^s=1.61$; $95\%C.I.=1.04-2.50$ & $OR=1.62$; $95\%C.I.=0.97-2.67$), showing a positive and statistically significant association between physical IPV and child malnutrition. It means that the effect of physical IPV is considerably important. Thus, those children from mothers exposed to physical violence are 1.6 times more likely to be stunted compared to children whose mothers were not exposed to physical IPV. Note that in the third model (column 3), the odds ratio for IPV has increased considerably once gender interactions are added ($OR=2.24$, $95\%C.I.=1.04-4.08$). However, the interaction term is not statistically significant. Notably, as we can observe in both adjusted odds ratios (column 2 and 3), children between 0 and 11 months are 0.16 times less likely to be stunted ($OR=0.16$; $95\%C.I.=0.06-0.41$).

For the case of the second measure of child malnutrition: underweight, even though no statistically significant relationship between IPV and child malnutrition were found, the expected patterns were encountered since the coefficients are greater than one, showing a positive association between domestic violence and underweight (columns 4, 5 and 6). Note that according to our estimates, other characteristics of the mother such as age and BMI resulted have a greater influence on this measure than the fact of being exposed to physical violence. Thus, the probability of generating problems of underweight appears to be lower if the mother is older compared to younger mothers ($OR=0.57$; $95\%C.I.=0.31-1.06$). Also, for one unit increase in the BMI index, the risk of being underweight decreases by 10 percentage points ($OR=0.90$; $95\%C.I.=0.82-0.99$).

⁸ In the next sections we will use the terminology of confidence intervals (C.I.) to exemplify the statistical significance. Thus, if both intervals are above or below of the value one, it is expected that odds ratios are statistically significant.

Table 2: Logistic regression estimates for associations of physical IPV against mothers with malnourished children

	Height- for-age Z score (child is stunted)						Weight-for-age Z score (child is underweight)						Weight-for-height Z score (child is wasted)					
	Unadjusted		Adjusted		Adjusted		Unadjusted		Adjusted		Adjusted		Unadjusted		Adjusted		Adjusted	
	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Physical IPV	1.61**	(0.43)	1.62*	(0.41)	2.24**	(0.88)	1.13	(0.24)	1.04	(0.16)	1.32	(0.48)	1.00	(0.28)	0.93	(0.30)	1.15	(0.54)
Physical IPV*gender					0.53	(0.27)					0.62	(0.29)					0.63	(0.49)
Gender (Ref=boys)					1.36	(0.58)					1.07	(0.45)					0.78	(0.44)
Geographical division (<i>Ref= Barisal</i>)																		
Chittagong			1.41	(0.58)	1.51	(0.64)			1.27	(0.63)	1.32	(0.67)			3.45**	(2.12)	3.66	(2.33)
Dhaka			0.93	(0.36)	0.99	(0.41)			1.12	(0.51)	1.16	(0.54)			1.46	(0.88)	1.52	(0.93)
Khulna			0.71	(0.31)	0.76	(0.33)			0.85	(0.41)	0.88	(0.43)			1.88	(1.17)	1.97	(1.23)
Rajshahi			1.39	(0.55)	1.49	(0.59)			1.26	(0.55)	1.32	(0.59)			1.09	(0.63)	1.18	(0.71)
Sylhet			1.73	(1.51)	1.88	(1.58)			1.23	(0.92)	1.31	(0.98)			0.99	(0.82)	1.01	(0.88)
Type of residence (<i>Ref=Urban</i>)																		
Rural			1.12	(0.35)	1.12	(0.36)			0.70	(0.21)	0.71	(0.21)			0.98	(0.32)	1.05	(0.35)
Literacy (<i>Ref=No able to read</i>)																		
Able to read parts			1.04	(0.53)	1.07	(0.54)			0.60	(0.35)	0.60	(0.35)			0.87	(0.53)	0.90	(0.52)
Able to read all			1.17	(0.37)	1.21	(0.40)			1.18	(0.38)	1.23	(0.40)			0.88	(0.41)	0.93	(0.44)
Religion (<i>Ref=Islam</i>)																		
Hinduism			0.68	(0.28)	0.66	(0.27)			0.42	(0.24)	0.41	(0.23)			1.16	(0.84)	1.12	(0.81)
Woman's age (<i>Ref=Younger</i>)																		
Middle age			0.85	(0.26)	0.88	(0.28)			0.57*	(0.17)	0.59*	(0.18)			0.53	(0.22)	0.52	(0.22)
Older			1.15	(0.62)	1.21	(0.67)			0.52	(0.27)	0.54	(0.28)			0.29	(0.25)	0.30	(0.26)
Woman's BMI			0.95	(0.04)	0.95	(0.04)			0.90 **	(0.04)	0.90**	(0.04)			0.86**	(0.05)	0.86	(0.05)
Child's age (<i>Ref=12 to 23 months</i>)																		
0-11			0.16***	(0.08)	0.16***	(0.08)			0.24***	(0.09)	0.64***	(0.10)			0.43*	(0.21)	0.46	(0.22)
24-35			0.57	(0.20)	0.58	(0.21)			0.63	(0.23)	0.89	(0.23)			0.52*	(0.19)	0.52	(0.19)
36-47			0.71	(0.27)	0.71	(0.27)			0.86	(0.31)	1.09	(0.32)			0.76	(0.35)	0.81	(0.37)
48-59			0.53	(0.19)	0.54	(0.20)			1.08	(2.94)	0.25	(0.41)			0.93	(0.42)	0.97	(0.45)
Husband's education																		
Husband's age			0.91	(0.13)	0.90	(0.13)			0.91	(0.15)	0.90	(0.15)			0.96	(0.21)	0.96	(0.22)
Husband's age			1.03	(0.02)	1.03	(0.02)			1.03*	(0.02)	1.03*	(0.02)			1.02	(0.03)	1.03	(0.03)
Households' members			0.97	(0.07)	0.96	(0.07)			0.89*	(0.06)	0.89*	(0.06)			0.83	(0.09)	0.82	(0.09)
Children's under five years			1.30	(0.29)	1.32	(0.28)			1.02	(0.25)	1.03	(0.25)			1.64*	(0.48)	1.70	(0.42)
Wealth index (<i>Ref= first</i>)																		
Second			1.53	(0.42)	1.54	(0.46)			1.34	(0.46)	1.34	(0.47)			1.29	(0.56)	1.31	(0.54)
Third			0.73	(0.29)	0.71	(0.28)			0.77	(0.30)	0.75	(0.29)			0.33*	(0.21)	0.32	(0.20)
Fourth			1.54	(0.68)	1.62	(0.71)			1.23	(0.65)	1.26	(0.65)			1.04	(0.55)	1.05	(0.59)
Fifth			0.66	(0.31)	0.65	(0.32)			0.76	(0.40)	0.76	(0.41)			0.89	(0.55)	0.94	(0.59)

Source: 2007, BDHS. Author's construction.

Notes: The table above presents the estimations for adjusted and unadjusted odds ratios (OR); i)***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level; ii) standard errors in parenthesis.

Notably, the effect of being underweight is negative for those children under 1 year compared with children between 12 and 24 months (OR=0.24; 95%C.I.=0.10-0.53). About the age of the father, it was found that even though the coefficient is statistically significant, the effect of this variable on the risk of being malnourished is relatively low (for one year increase in age, the risk of being underweight for children under age 5 increases by 3 percentage points). About the size of the household, it was found that for one member increase, the risk of being underweight decreases by 11 percentage points for those children under 5 years. This would imply that larger families have better conditions for children such we can expect a decrease in the risk of being malnourished compared to small families. One possible reason could be that more attention is given to children due to the fact that there are more members in the household. Also, more family member may increase the availability of economic resources.

In the case of the third measure of child malnutrition: wasting, according to our estimates, although the associations found are not statistically significant, the expected pattern were found since these associations remain as positive (columns 7, 8 and 9). About geographical division, the risk of being wasted increase by 3.45 times for those children localized in Chittagong compared to those localized in Barisal (OR=3.45; 95% C.I.=1.02-11.62)⁹. Note that as before, the effect of the BMI index has relatively large impact on child nutrition. Thus, for one increase in the BMI index, the probability of being wasted decreases by 14 percentage points (OR=0.86; 95%C.I.=0.77-0.97). With regards to child age, according to our estimates, the odd of developing wasting problems is lower for those children aged between 0-11 and 24-35 months (OR=0.42;95%C.I.=0.16-1.13 & OR=0.52; 95%C.I.=0.25-1.05), compared with children between 11 and 23 months. About the socioeconomic status, for those children placed on the third wealth quintile, the risk of being wasted is 0.3 times less compared to those children placed on the first quintile (OR=0.33; 95 % CI = 0.10-1.13).

⁹ It is noteworthy that this result may be due to the choice of the reference category (Barisal region), which has a relatively low percentage compared to other regions. For this reason, in order to clarify this fact, in this model the reference category was changed, founding that the results are similar to the original model in terms of statistical significance, although the magnitude of the odds is lower.

5.2 Low Decision-making Index and Child Malnutrition

Table 3 displays the results obtained for low decision-making index and the relationship to child malnutrition. Regarding the first measure of child nutrition: stunting, even though the relationships are not statistically significant, the coefficients have the expected pattern (columns 1, 2 and 3). It indicates that for one unit increase in this index (meaning higher low women's status), the risk of being malnourished increases as well. Also, according to our estimates, the probability of developing problems of stunting is lower for children whose mothers profess Hinduism compared to mothers who profess Islam (OR=0.59; 95%C.I.=0.34-1.07).

Significantly, maternal characteristics such as BMI have a significant impact on the nutritional status of children, where for one unit increase in the BMI index, the risk of being stunted decreases by 6 percentage points (OR=0.94; 95%C.I.=0.87-0.97). Furthermore, it was found that for those children under one year, the probability of risk of being stunted is less compared to children between 12 and 24 months (OR=0.21; 95%C.I.=0.12-0.38). Unlike our previous model that controls with domestic violence, in this case, the role of husband's education plays an important role, where higher levels of father's education were associated with lower odds (OR=0.76; 95%C.I.=1.02-2.28). Although it would be expected that the higher the wealth index the lower the risk of being malnourished, according to our results, we found that for the second wealth quintile the risk of being malnourished is 1.5 times higher compared to the first wealth quintile (OR=1.53; 95% C.I.=1.02-2.28). On the other hand, contrary to what might be expected, it was found that for those children placed in the second wealth quintile, the risk of being malnourished is higher compared to the first quintile (poorest household). This may be because there are other socioeconomic variables that impact further the nutritional status of children.

For our second measure of malnutrition: underweight, the same pattern as before can be observed. Although not statistically significant, the odds ratios have the expected patterns, which indicates the existence of positive associations between these variables (columns 4, 5 and 6). Note that as in the previous cases, the effect of maternal BMI and education by the father seems to have an important role on child nutrition (OR=0.88, 95%C.I.=0.82-0.94 & OR=0.77; 95%C.I.=0.63-0.96, respectively). Also, lower odds of underweight are found for those children under 1 year compared to children between 12 and 24 months (OR=0.42;95%C.I.=0.22-0.74). It is important to note the change in associations between the age groups of children. Thus, for the group of 48-59 months, the association

becomes positive. In other words, for higher infant age, the more risk of underweight (OR=1.57; 95%C.I.=0.92-2.67).

Finally, for the third child measure of malnutrition: wasting, the associations are not statistically significant (columns 7, 8 and 9). It should be noted the role of religion, where the risk of being wasted is about 3 times higher for children whose mothers profess Hinduism compared to mothers who profess Islam (OR=2.77; 95%C.I.=1.50-5.12). We also found that the probability of generating wasting problems is lower for those children between 24 and 35 months, compared to those children between 12 and 24 months (OR=0.54; 95%C.I.=0.30-0.96).

Table 3: Logistic regression estimates for associations of low decision-making index with malnourished children

	Height- for-age Z score (child is stunted)				Weight-for-age Z score (child is underweight)				Weight-for-height Z score (child is wasted)									
	Unadjusted		Adjusted		Unadjusted		Adjusted		Unadjusted		Adjusted							
	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)									
Index of low decision-making	1.17	(0.42)	1.57	(0.65)	1.41	(0.81)	1.37	(0.54)	1.43	(0.62)	1.25	(0.81)	1.14	(0.54)	0.99	(0.48)	0.86	(0.63)
Index of low decision-making*gender					1.27	(1.08)					1.33	(1.01)					1.35	(1.40)
Gender (Ref=boys)					0.80	(0.27)					0.89	(0.30)					0.72	(0.28)
Geographical division (<i>Ref= Barisal</i>)																		
Chittagong			1.36	(0.39)	1.36	(0.39)			1.57	(0.49)	1.57	(0.51)			1.92	(0.80)	1.91	(0.79)
Dhaka			1.09	(0.31)	1.07	(0.30)			0.88	(0.24)	0.88	(0.24)			0.97	(0.35)	0.95	(0.34)
Khulna			0.79	(0.23)	0.79	(0.23)			0.78	(0.23)	0.78	(0.22)			1.40	(0.60)	1.39	(0.60)
Rajshahi			1.14	(0.33)	1.15	(0.33)			1.38	(0.36)	1.39	(0.36)			1.65	(0.60)	1.67	(0.60)
Sylhet			1.45	(0.69)	1.43	(0.69)			1.39	(0.60)	1.38	(0.58)			1.98	(0.93)	1.96	(0.92)
Type of residence (<i>Ref=Urban</i>)																		
Rural			1.00	(0.19)	1.00	(0.19)			0.73	(0.14)	0.73	(0.15)			1.23	(0.25)	1.26	(0.25)
Literacy (<i>Ref=No able to read</i>)																		
Able to read parts			1.82	(0.72)	1.83	(0.73)			0.71	(0.30)	0.70	(0.26)			0.67	(0.34)	0.68	(0.34)
Able to read all			1.15	(0.25)	1.16	(0.25)			1.08	(0.25)	1.07	(0.24)			1.00	(0.26)	1.01	(0.27)
Religion (Ref=Islam)																		
Hinduism			0.59*	(0.18)	0.60*	(0.18)			1.20	(0.38)	1.21	(0.39)			2.77***	(0.86)	2.81***	(0.87)
Woman's age (<i>Ref=Younger</i>)																		
Middle age			0.99	(0.20)	0.99	(0.20)			0.75	(0.18)	0.75	(0.17)			0.66	(0.18)	0.65	(0.18)
Older			1.10	(0.37)	1.10	(0.37)			1.15	(0.36)	1.16	(0.36)			0.69	(0.32)	0.70	(0.32)
Woman's BMI			0.94**	(0.03)	0.93**	(0.03)			0.88***	(0.03)	0.88***	(0.03)			0.90***	(0.03)	0.90***	(0.03)
Child's age (<i>Ref= 12 to 23 months</i>)																		
0-11			0.21***	(0.06)	0.21***	(0.06)			0.42***	(0.13)	0.41***	(0.13)			0.59	(0.20)	0.59	(0.20)
24-35			0.82	(0.20)	0.82	(0.20)			0.88	(0.24)	0.88	(0.23)			0.54**	(0.16)	0.54**	(0.16)
36-47			1.19	(0.30)	1.20	(0.30)			1.42	(0.37)	1.44	(0.37)			0.67	(0.19)	0.68	(0.20)
48-59			0.71	(0.19)	0.71	(0.19)			1.56*	(0.42)	1.57*	(0.43)			0.61	(0.19)	0.61	(0.20)
Husband's education			0.76***	(0.07)	0.75***	(0.07)			0.77**	(0.08)	0.77**	(0.08)			1.01	(0.13)	1.01	(0.13)
Husband's age			1.00	(0.01)	1.00	(0.01)			1.00	(0.01)	1.00	(0.01)			1.02	(0.02)	1.03	(0.02)
Households' members			0.94	(0.04)	0.94	(0.04)			0.98	(0.04)	0.98	(0.04)			0.93	(0.04)	0.93	(0.05)
Children's under five			1.34*	(0.24)	1.34*	(0.24)			1.26	(0.22)	1.27	(0.21)			1.39	(0.27)	1.38	(0.26)
Wealth index (<i>Ref= first</i>)																		
Second			1.53**	(0.31)	1.53**	(0.32)			0.95	(0.22)	0.95	(0.22)			1.04	(0.28)	1.04	(0.28)
Third			0.97	(0.21)	0.98	(0.22)			0.72	(0.16)	0.72	(0.16)			0.79	(0.26)	0.80	(0.26)
Fourth			1.21	(0.34)	1.20	(0.34)			1.21	(0.40)	1.22	(0.40)			1.17	(0.40)	1.16	(0.40)
Fifth			0.77	(0.24)	0.77	(0.24)			0.63	(0.22)	0.63	(0.22)			0.63	(0.25)	0.63	(0.26)

Source: 2007, BDHS. Author's construction.

Notes: The table above presents the estimations for adjusted and unadjusted odds ratios (OR); i)***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level; ii) standard errors in parenthesis.

5.3 Low Societal Gender Equality Index and Child Malnutrition

Low societal gender equality index and its relationship to child malnutrition is presented in Table 4 (columns 1, 2 and 3). Regarding to the first measure of child malnutrition; stunting, it must be noted that in the first model the unadjusted odd ratios are statistically significant and greater than one. However, once more variables were added to the model, the significance level is no longer observed in relation to such variable, indicating that in the first model the role of woman's status is overestimated (column 1). Thus, contrary to what was expected, it seems that there are other variables of greater weight that affect child nutrition such as father's education (OR=0.76; 95%C.I.=0.64-0.90).

For the second measure of child malnutrition: underweight, and women's status, the patterns are similar as the previous cases (columns 4, 5 and 6). As in the previous case, we found that the impact of maternal BMI and father's education level are relatively important in the nutritional status of children (OR=0.88; 95%C.I.=0.82-0.93 & OR=0.78, 95%C.I.=0.62-0.96, respectively). Regarding the different groups of children's age, negative associations were found for almost all children in relation to childrens between 12 and 24 months.

Finally, for our third measure of child malnutrition: wasting, we found that the model improves considerably as more variables are included, which indicates that in the first case, the role of woman's status on the child nutrition is underestimated (columns 7, 8 and 9). Importantly, this was the only case where the interaction term with gender was statistically significant. Thus, for one unit increase in the societal gender equality index (higher low women's status), the risk of have problems of wasting is more than twice for boys (OR=2.28, 95%C.I.=1.01-5.12). It should be noted that for those girls from mother with lower status, one unit increase in this index decrease the risk of being wasting by 78 percentage points (OR=0.22, 95%C.I.=0.06 to 0.86). Another important fact worth mentioning is the role of religion, so the likelihood of developing wasting problems for those children whose mothers profess Hinduism are about 3 times higher compared to those mothers who profess Islam (OR=2.7; 95%C.I.=1.47-5.19). For children under 3 years, the odds is less (OR=0.54, 95%C.I.=0.30-0.96) compared to those children between 12 and 23 months.

Table 4: Logistic regression estimates for associations of low societal gender equality index with malnourished children

	Height- for-age Z score (child is stunted)						Weight-for-age Z score (child is underweight)						Weight-for-height Z score (child is wasted)					
	Unadjusted		Adjusted		Adjusted		Unadjusted		Adjusted		Adjusted		Unadjusted		Adjusted		Adjusted	
	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Low societal gender equality index	1.64**	(0.40)	1.44	(0.38)	1.24	(0.49)	1.48	(0.36)	1.36	(0.34)	1.60	(0.62)	1.09	(0.35)	1.01	(0.34)	2.28**	(0.94)
Low societal gender equality index *gender					1.32	(0.81)					0.76	(0.40)					0.22**	(0.15)
Gender (Ref=boys)					0.82	(0.17)					1.02	(0.18)					1.03	(0.25)
Geographical division (Ref= Barisal)																		
Chittagong			1.32	(0.38)	1.32	(0.38)			1.54	(0.48)	1.53	(0.48)			1.92	(0.80)	1.88	(0.78)
Dhaka			1.10	(0.31)	1.93	(0.31)			0.89	(0.24)	0.88	(0.24)			0.97	(0.35)	0.93	(0.33)
Khulna			0.79	(0.23)	0.78	(0.23)			0.77	(0.22)	0.77	(0.22)			1.41	(0.60)	1.34	(0.58)
Rajshahi			1.13	(0.32)	1.13	(0.32)			1.37	(0.36)	1.38	(0.36)			1.65	(0.60)	1.68	(0.61)
Sylhet			1.50	(0.71)	1.50	(0.72)			1.44	(0.62)	1.44	(0.61)			1.99	(0.94)	1.94	(0.91)
Type of residence (Ref=Urban)																		
Rural			1.02	(0.19)	1.02	(0.19)			0.74	(0.14)	0.75	(0.14)			1.23	(0.24)	1.32	(0.27)
Literacy (Ref=No able to read)																		
Able to read parts			1.81	(0.71)	1.84	(0.72)			0.71	(0.30)	0.71	(0.30)			0.67	(0.34)	0.67	(0.33)
Able to read all			1.14	(0.25)	1.15	(0.25)			1.07	(0.24)	1.07	(0.24)			1.00	(0.26)	1.00	(0.26)
Religion (Ref=Islam)																		
Hinduism			0.61*	(0.18)	0.62	(0.18)			1.22	(0.40)	1.22	(0.40)			2.77***	(0.86)	2.77	(0.89)
Woman's age (Ref=Younger)																		
Middle age			0.96	(0.20)	0.96	(0.20)			0.74	(0.17)	0.73	(0.17)			0.66	(0.18)	0.65	(0.17)
Older			1.06	(0.36)	1.06	(0.35)			1.11	(0.36)	1.11	(0.36)			0.69	(0.32)	0.69	(0.33)
Woman's BMI			0.94**	(0.03)	0.93**	(0.03)			0.88***	(0.03)	0.88***	(0.03)			0.90***	(0.03)	0.89	(0.03)
Child's age (Ref= less than 24)																		
0-11			0.21***	(0.06)	0.22***	(0.06)			0.42***	(0.13)	0.13	(0.13)			0.59	(0.20)	0.57	(0.20)
24-35			0.81	(0.20)	0.81	(0.20)			1.44	(0.23)	0.37	(0.23)			0.54**	(0.16)	0.54	(0.16)
36-47			1.20	(0.30)	1.21	(0.31)			1.57	(0.37)	0.43*	(0.37)			0.67	(0.19)	0.70	(0.20)
48-59			0.71	(0.19)	0.71	(0.19)			0.42	(0.42)	0.13**	(0.43)			0.61	(0.19)	0.63	(0.20)
Husband's education			0.76***	(0.07)	0.76***	(0.06)			0.78**	(0.08)	0.78**	(0.08)			1.01	(0.13)	1.00	(0.13)
Husband's age			1.00	(0.01)	1.00	(0.01)			1.00	(0.01)	1.00	(0.01)			1.02	(0.02)	1.03	(0.02)
Households' members			0.95	(0.04)	0.95	(0.04)			0.99	(0.04)	0.99	(0.04)			0.93	(0.05)	0.93	(0.05)
Children's under 5			1.33	(0.23)	1.32	(0.22)			1.25	(0.21)	0.99	(0.21)			1.45	(0.27)	1.39	(0.26)
Wealth index (Ref= first)																		
Second			1.51**	(0.31)	1.51**	(0.31)			0.95	(0.21)	0.94	(0.22)			1.05	(0.28)	1.07	(0.29)
Third			0.95	(0.21)	0.97	(0.21)			0.71	(0.16)	0.71	(0.16)			0.82	(0.27)	0.81	(0.27)
Fourth			1.21	(0.34)	1.20	(0.33)			1.24	(0.40)	1.22	(0.40)			1.26	(0.40)	1.25	(0.46)
Fifth			0.77	(0.24)	0.76	(0.23)			0.64	(0.23)	0.64	(0.22)			0.69	(0.25)	0.70	(0.29)

Source: 2007, BDHS. Author's construction.

Notes: The table above presents the estimations for adjusted and unadjusted odds ratios (OR); i)***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level; ii) standard errors in parenthesis.

5.4 Marginal Effects Estimates for characteristics of the mother and malnourished children

The results using marginal effects are presented in Table 5. Note that for simplicity and clarity, we have considered only the model with gender interactions. As it can be seen, in the case of the first model (columns 3, 6 and 9 in table 2), which considers the effect of physical IPV on child nutritional status, the increase of the probability of being malnourished is observed more intensely in the category of stunting, where the probability of this type of malnutrition increases by 17 percentage points in those children from mothers exposed to IPV. For those children whose mothers profess Hinduism, the risk of have problems of underweight decreased by 18 percentage points compared with those who profess Islam. On the impact of the age of the mother, we can see that the older the mother is, the less likely that their children have problems of malnutrition. That is, younger mothers are more exposed to having malnourished children. It should be noted that the older the children are, the greater the probability of having malnutrition problems. Thus, while for children aged from 0 to 11 months, the probability of being malnourished decreased 38 percentage points for children between 36 and 47 months, the probability of being malnourished is reduced only by 8 percentage points compared to children between 12 and 23 months.

Regarding the model II (columns 3, 6 and 9 in table 3), which examines the relationship between low decision-making power by the mother and the level of child malnutrition, we found a non-statistically significant relationship between this maternal condition and child nutritional status. Thus, other characteristics of the mother and father have higher relevance in the nutrition level of children. While for children whose mothers profess Hinduism, the probability of being stunted decreases 2 percentage points, the probability of being wasted increased by 20 percentage points. About maternal BMI, as previously found, the effect on the maternal BMI seems to be important on the child nutrition status. Unlike model I, for this model, the higher the child's age is, the less likely to be stunting. Thus, for children between 48 and 59 months, the probability of being stunted decreased 32 percentage points, while if the child is less than one year, the probability of being underweight decreased only 3 percentage points compared with children between 12 and 23 years.

Table 5: Marginal effects estimates for the associations IPV, woman’s status and malnourished children

	Model I			Model II			Model III		
	HAZ	WAZ	WHZ	HAZ	WAZ	WHZ	HAZ	WAZ	WHZ
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Main Variable	0.17**	0.01	0.02	0.07	0.05	-0.02	0.05	0.10	0.12**
Interaction*gender	-0.14	-0.10	-0.06	0.05	0.06	0.05	0.06	-0.06	-0.22**
Gender (Ref=boys)	0.07	0.02	-0.03	-0.05	-0.03	-0.05	-0.04	0.00	0.00
Geographical division (<i>Ref=Barisal</i>)									
Chittagong	0.09	0.06	0.19	0.07	0.10	0.10	0.06	0.09	0.10
Dhaka	-0.00	0.03	0.05	0.02	-0.03	0.00	0.02	-0.03	0.09
Khulna	-0.06	-0.03	0.08	-0.05	-0.05	0.05	-0.05	-0.06	0.00
Rajshahi	0.09	0.06	0.02**	0.03	0.07	0.07	0.03	0.07	0.04
Sylhet	0.14	0.06	0.00	0.08	0.07	0.10	0.09	0.08	0.08
Type of residence (<i>Ref=Urban</i>)									
Rural	0.02	-0.07	0.00	0.00	-0.07	0.03	0.00	-0.06	0.04
Literacy (<i>Ref=No able to read</i>)									
Able to read parts	0.02	-0.10	-0.01	0.13	-0.07	-0.05	0.13	-0.07	-0.05
Able to read all	0.04	0.04	-0.00	0.03	0.02	0.00	0.03	0.01	0.00
Religion (<i>Ref=Islam</i>)									
Hinduism	-0.09	-0.18*	0.16	-0.11*	0.04	0.19***	-0.10*	0.04	0.18
Woman’s age (<i>Ref=Younger</i>)									
Middle age	-0.03	-0.11	-0.09	-0.00	-0.06	-0.06	-0.01	-0.07	-0.06
Older	0.04	-0.13	-0.14*	0.02	0.03	-0.05	0.01	0.02	-0.05
Woman’s BMI	-0.01	-0.02**	-0.02***	-0.02**	-0.03***	-0.02***	-0.01**	-0.03***	-0.02
Child’s age (<i>Ref= 12 to 24 months</i>)									
0-11	-0.38***	-0.27	-0.10*	-0.04	-0.03**	-0.08	-0.31	-0.18**	-0.09
24-35	-0.12	-0.10	-0.08	0.04	0.08	-0.09**	-0.05	-0.03	-0.06
36-47	-0.08*	-0.03	-0.03	-0.08	0.10*	-0.06	0.43	0.08**	-0.07
48-59	-0.14	-0.02***	-0.00	-0.32***	-0.18	-0.08	-0.08***	0.10***	-0.09
Husband’s education	-0.02	-0.02	-0.01	-0.06***	-0.06**	0.00	-0.06***	-0.05*	0.00
Husband’s age	0.01	0.00*	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Households’ members	-0.01	-0.03*	-0.03	-0.01	0.00	-0.01	-0.01	0.00	-0.01
Children’s under five years	0.06	0.01	0.07*	0.06*	0.05	0.05*	0.06	0.05	0.05
Wealth index (<i>Ref=first</i>)									
Second	0.09	0.06	0.04	0.10**	-0.01	0.01	0.09**	-0.01	0.01
Third	-0.07	-0.06	-0.11**	-0.00	-0.07	-0.03	-0.01	-0.07	-0.03
Fourth	0.11	0.05	0.01	0.04	0.05	0.02	0.04	0.05	-0.03
Fifth	-0.09	-0.06	-0.01	-0.06	-0.10	-0.06	-0.06	-0.09	-0.05

Source: 2007, BDHS. Author’s construction.

Notes: a) The table above presents the marginal effects for our three outcomes of interest: height-for-age (HAZ); weight-for-age (WAZ) and; weight-for-height (WHZ).

b) For models I, II and III, the main variables are: Physical IPV, low decision making women’s status and low societal gender equality, respectively.

c) ***Statistically significant at 1% level, ** statistically significant at 5% level, *statistically significant at 10% level.

Finally, on model III, we found that the status of the mother has a different effect for both boys and girls. However, even the associations were statistically significant, the signs obtained were not the expected ones. While it was thought that girls could suffer any discrimination resulting in higher levels of malnutrition compared to boys, the evidence obtained shows otherwise. So, if the mother has a low social status, the likelihood that children are wasting increased considerably, where the fact of being a girl decreases the degree of being wasting. An important fact is the change of sign found for underweight category, where for the first years the probability of being underweight decreased about 20 percentage points, while for children over 3 years, the probability increases by 10 percentage points.

5.5 Sensitivity Analysis

In this section, we have estimated the models presented above (tables 2, 3 and 4) using different definitions for both, domestic violence and women's status, in order to analyze how the results vary when different definitions are used. As seen in Table 6, for the domestic violence module, 4 definitions are considered: i) physical IPV (which we use throughout our work); ii) sexual violence; iii) physical and/or sexual IPV and; iv) non-IPV. As we can see, only statistical evidence for the first case was found. This indicates that according to our results, sexual IPV and other definitions including this concept, seems to have a weak impact on the level of child malnutrition. Note that in the case of the category of "no IPV", once the control variables are added to the model, no statistical significance was observed.

Table 6: Sensitivity analysis for the concept IPV and Woman's status

	Height-for-age (HAZ)			Weight-for-age (WAZ)			Weight-for-height (WHZ)		
	UOR	AOR	AOR	UOR	AOR	AOR	UOR	AOR	AOR
Domestic Violence									
<i>Physical IPV</i>	1.62**	1.61*	2.24**	1.13	1.04	1.32	1.01	0.93	1.12
<i>Sexual IPV</i>	1.23	1.09	1.07	1.07	0.79	0.79	1.03	0.90	0.87
<i>Physical and/or Sexual IPV</i>	1.49	1.27	1.24	1.21	0.89	0.90	0.95	0.83	0.82
<i>No IPV</i>	0.66*	0.67	0.57	0.94	1.08	0.97	0.94	1.05	0.88
Women's status indexes									
<i>Low societal gender equality</i>	1.64*	1.44	1.24	1.48	1.36	1.60	1.09	1.01	2.28**
<i>Low decision-making status</i>	1.17	1.57	1.41	1.23	1.43	1.25	1.14	0.99	0.86
<i>Median decision-making status</i>	1.15	1.49	1.36	1.33	1.37	1.22	1.12	1.00	0.87

Source: 2007, BDHS. Author's construction.

Notes: a) The table above presents the estimations for adjusted and unadjusted odds ratios (AOR and UOR, respectively) using different definitions for our main variable. The coefficients of control variables are not reported.

b) ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level.

Overall, we can say that in the case of Bangladesh, according to our methodology, statistical evidence was found only on physical domestic violence and its impact on child malnutritional status. This result differs from the work presented by Rahman et. al, (2012) and Ziael, (2012) in which evidence for both, physical and sexual IPV, and the increase of being stunting for children under 5 years was found.

For the case of women's status indices, a new index of decision making was constructed. This index called: "median decision-making status", difers to the index "low decision-making status" in the sense that it consideres households where husband and wife take together the main decision at home. However, no statistical evidence was found about its effect on child malnutrition. It means that only in the extreme cases where the woman has a considerable low autonomy respect to her husband in the decision-making at home, the impact of it on child malnutrition can be found.

5.6 Potential Endogeneity Problems

Although theoretically the relationship between IPV and women's status with child nutrition has been shown to be important in the literature regarding child health, the potential endogeneity problems that may arise have been poorly treated. This is extremely important since there could be variables correlated with our variable of interest, either IPV or women's status, that are unobservable. In this way, more that provide causal interpretations, only descriptive interpretation may be done as it may fall into over estimations of the results. A traditional way to solve these endogeneity problems is through the use of instrumental variables. However, in nonlinear models, as in our case, the analysis is complex. In our case, the omission of this potential problem may cause the results to be biased, therefore generating merely descriptive interpretations.

In this context, the existence of a good instrument defines our field of action. In the case of women's status, the data provided by the 2007 BDHS made difficult the election of a good instrument. However, in the case of IPV, the 2007 BDHS includes a variable that provides information about domestic violence exposition in the home of origin of the mother, through information on whether the father of the woman used to beat her mother. This denotes a good indicator of violence that is directly correlated with IPV of women, because if her father used to beat his mother, this indicates one fact of domestic violence, a situation that can be repeated in the new home. Theoretically, these explanations are found in "the family disruption model". According to this model, exposure to physical violence suffered in the home of origin of the mother can affect children indirectly through "spillover" effects from one family to another (Margolin, 2005; Troxel & Matthews, 2004).

For example, domestic violence experienced by the child's grandparents may have an influence on the child's home. In other words, households characterized by some form of violence can have effects on other households, thus creating a chain effect. This is important because, if the household in which the mother lived before marriage was characterized by some form of violence, say for example, if the father used to beat the mother, it is likely, according to this model, that the new home is also characterized by some form of violence. Thus, family and community violence affect the child's immediate environment.

In this framework, using the variable provide by the 2007 BDHS, “if the father’s of the woman used to beat his wife” as an instrument, we tested the potential endogeneity problem through Dublin-Wu-Haussan test but no evidence of endogeneity was found in any of the three outcomes of child malnutrition. However, this does not indicate that there may be other instruments that can change that result. Thus, this issue could be a topic to be developed in future research.

Chapter 6

Discussion and Implications

Although the mechanisms that affect child nutrition, either by exposure to domestic violence or by the low status of women are similar, in the case of the first one it is expected that the mechanisms are intensified. Regarding the first variable of interest: domestic violence, the results obtained in this study show a statistically significant association between physical IPV and stunting; note that in our representative sample for Bangladesh, about 49% of the women selected, reported having being exposed to physical violence, while 44% of children under 5 were listed under the category of stunting.

The associations found in this study are consistent with subsequent studies which indicate the importance of domestic violence on child malnutrition in other contexts, such as the case of Brazil, India (Walker et al., 2007), Liberia (Sobkoviak, Yount & Halim, 2011) and England (Montgomery et al., 1997). Note that in the case of India, the data are not representative of the country because it comes from a hospital report, so we cannot generate general conclusions. Unlike the case of Liberia, where sexual domestic violence provided an important role on child nutrition, in the case of the sample for Bangladesh, no evidence about it was found.

Of the three outcomes variables considered as proxies of child malnutrition, evidence was found only in the category of stunting. This indicates that, for children whose mothers were exposed to physical IPV, the risk of developing problems of stunting is higher compared to children whose mothers did not suffer physical violence. Note that these results differ with other results presented for Bangladesh. While in our case, evidence was found only for the category stunting and physical IPV, Ziaei, et al., (2012) found evidence for the categories: stunting and underweight, finding that those children of mother exposed to domestic violence presented a higher risk of being stunted and underweight. Furthermore, it is noteworthy that once gender interactions are included in the model, the impact of physical domestic violence is significantly higher for boys than for girls. According to the pattern observed in both, the coefficients of the odds ratios and the marginal effects, we can

conclude that the higher the child's age, the greater the likelihood of risk of developing malnutrition problems. Thus, older children are riskier children. This is clear in the case of the stunting category because this measure reflects the cumulative effects of malnutrition.

Once we have noted the association between physical IPV and risk of being stunted, it is important to discuss the possible mechanisms that generate this pattern. It should be noted that as we said before, stunting represent the cumulative effect of chronic malnutrition. It means that the effect on domestic violence may be observated on the long run. Although data on domestic violence indicate whether the woman was exposed in the 12 months prior to the realization of the survey, it is possible that if the woman suffered violence in the past year, she has suffered violence chronically. As we discussed before, according to the literature reviewed, those mothers exposed to domestic violence are usually mothers who tend to have problems of depression and low self-esteem (Rahman, 2012), where the quality of care to children is reduced considerably (Chung, 2004). Thus, through a culture of carelessness in the preparation and delivery of food, children may tend to have delays in physical growth as a result of not receiving adequate nutrients for long periods. It can explain the high level of children stunted with mother who were exposed to physical domestic violence, as it was evidenced in our research. On the other hand, as Lanus (2010) specifies, there are times when the mere act of observing the violence at home by children, tend to generate psychological disorders that cause lack of appetite, which, in the long run may cause problems in physical growth, particularly if the violence is experimented repeatedly during childhooh.

Regarding the second explanatory variable of interest: the status of women, it should be pointed out that even though the relations were expected according to theory, only statistical evidence for "low societal gender equality index" and wasting was found. In this case, those children from justified mothers beating, were more likely to develop risk of wasting.

It is important to mention that these women are less autonomous and more dependent of their husband, with a reduced capacity of taking decision about her medical care, as well as for their children. As some authors have pointed into the literature, women of this type are less likely to perceive information about the need of care for themselves and less for their children (Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, 2003). Also, according to Smith at al, (2003), women of low status generally have an oversight of personal care, as well as physical health, where children are the most affected as the quality of maternal practices as preparation food and hygiene practices are reduced. For this reason, it is expected that the children of these mothers have problems of low weight, either

at birth or in the first years of life, because the culture of carelessness at home increases the risk of vulnerability in children.

However, because the category of wasting reflects the current nutritional status of children, it is more likely that if they suffer from higher neglecting by the mother, this increases the probability of developing infectious diseases (Doak et al, 2000), which influences birth weight, a condition that is maintained in the early years of life (Martorell, Stein & Schroeder, 2001). Note that although the impacts would be expected to be greater for those children under 1 year since they are the more dependent on the mother, in our case, no significant evidence for this group was found.

Although one might expect that the condition of being a girl increases the risk of being malnourished, because according to the evidence presented for Asian countries, especially Bangladesh, girls are characterized by having discrimination in the allocation of resources, one fact that directly affect their nutritional status (Miller, 1997; Zimmermann, 2012; Bharati, Shome, Pal, Chaudhury & Bharati, 2011), in general, no strong evidence was found about the role of gender on child malnutrition. It is worth mentioning that even though in the case of the category wasting, a significant association was found on gender, according to our results, the position of girls is better compared to boys. This means that, contrary to the expectations resulted from the literature, in our case, the situation seems to be favourable for girls, i.e., those girls whose mothers are labeled as women of low-status, presented less risk of develop problems of wasting compared to boys whose mother are under this category. On the other hand, note that in general, issues such as religion and father's education variables were found to be of great importance in the nutritional status of children.

In this context, the associations found in this work imply the necessary and urgent attention from policy makers. This research is interesting because it highlights the problems suffered in the home, such as physical domestic violence, which generate externalities on children's health, such as the risk of developing malnutrition problems. In this regard, governments could increase the attention given to this fact through educational programs aimed to the women and their husbands, in order to raise awareness of these implications. In this sense, creating greater awareness in both mothers and their partners, could help to reduce the problems of malnutrition in early life of children.

Chapter 7

Concluding Remarks

7.1 Summary

The work presented here contributes to the literature by finding an important association between physical domestic violence against woman and the increase of risk of being stunted for the case of Bangladesh. It can be explained because the woman exposed to this assault, who is usually a woman suffering from not only physical but psychological disorders, significantly reduces the quality of maternal care, either preparation of food, hygiene and overall health. This is extremely important in the early years of life since children depend largely on the mother. Notably, in our study, we found that older children have higher risks of being stunted compared to children between 12 and 23 months. This is clear because stunting reflects the effects of long-term malnutrition, and a culture of carelessness by the mother is reflected in the long term growth retardation of children.

Additionally, in the case of Bangladesh, an interesting association between the low societal gender equality index and the category of wasting was found. Note that, because wasting represents the current nutritional status, it is more likely that these relationships are found at an early age, especially in newborn infants. One of the theoretical reasons that may explain why these children are too thin for their height, is the fact that women of low-status do not provide the sufficient food required to their children. These women have very little capacity in decision-making at home, where major decisions are made by the husband or other family members. The fact that these women suffer such marginalization causes that the resource management performs in an inefficient one, where the mother has a lower capacity to decide in case of illness in children. Furthermore, women of low status are related to depressed women with certain psychological disorders in extreme cases, where

children are the most vulnerable, because as in the case of domestic violence, attention and care is decreased.

It is worth mentioning that the literature on children's health has stated that the determinants of malnutrition can be categorized in three aspects: immediate factors, underlying factors and basic factors. While the immediate factors refer to the daily intake of nutrients as well as the overall health status, the latter refers to concepts such as food insecurity, maternal care, and home environment. The basic factors refer to the economic resources available at home. In this sense, although there are many relationships that can be established, for several years, biological and economic factors (classified in the category: immediate and basic factors) have dominated as the most important factors explaining child malnutrition.

Until recently, the thought that the characteristics of households could indirectly affect child nutritional status was a topic never studied and perhaps rarely thought. Moreover, the study of the characteristics of women only focused on issues such as education, occupation and age for the mother, for example. It was not until the emergence of some empirical evidence, focusing on exposure to domestic violence against women, that these relationships became important. Today, although the empirical evidence is still scarce, several studies have shown that domestic violence has a significant impact on child nutrition. In the case of Bangladesh, this association becomes more interesting because it is one of the countries with high levels of both, domestic violence and child malnutrition. In this sense, the work presented here contributes to the literature about this issue, presenting important evidence about the impact of certain characteristics of the mother such as the exposition to domestic violence and low status and the impact on child nutrition.

Notably, unlike those formed expectations, no evidence was found for gender bias against girls. That is, although in the literature we can find that there is discrimination in the allocation of resources against girls, so then one would expect higher probability of being malnourished for them, the results here show that although the only significant case was for category wasting, both the sign and magnitude were not the expected ones, where according to our results, the situation favors girls. This implies that, in our case, using the data and methodology explained in previous sections, gender does not represent such an important role in child malnutrition, as it was thought.

7.2 Limitations of the Study and Future Research

Although this work was carried out with strict care and meets the objectives set at the outset, it is important to note some limitations that can be taken up in future research.

First, the availability of data on domestic violence is a problem that until recently has begun to be solved through the introduction of new sections of violence such as in the case of the 2007 BDHS. However, the mere fact of reporting this condition is a fact that culturally is difficult to admit in public. For this reason, it is likely that associations between violence and child malnutrition are actually higher than those estimated. Nevertheless the lack of other sources which provide this type of data, makes difficult to generate comparisons between our estimates and other empirical evidence which uses different sources.

Second, to determine the potential impact of either, domestic violence or the status of women in child nutrition in both the short and long term, longitudinal studies should be applied. However, in the case Bangladesh, the existing data do not allow this type of study, allowing only cross-sectional studies.

Third, although our study found no evidence on the possible impact of gender on child malnutrition, other methodologies can be applied to see if this relationship holds. For example, for child malnutrition indicators used in this investigation, a possible alternative is the construction of each variable by gender. In other words, two different measures can be constructed either for stunting, underweight or wasting, where as one refers to girls, the other refers to the children. This is important because there are possible physical differences between them, so taking a standard value for both may not be the right choice.

Fourth, as mentioned above, the existence of potential endogeneity problems is a latent problem that often permeates research. Although in our case it was possible to apply the use of an instrument for the variable of domestic violence, finding no evidence of endogeneity, there may be instruments that may change the results. However, this will depend on the quality of data is available.

Bibliography

- Amugsi, D. A., Mittelmark, M. B., & Lartey, A. (2013). An analysis of socio-demographic patterns in child malnutrition trends using Ghana demographic and health survey data in the period 1993--2008. *BMC public health*, *13*(1), 960.
- Bair-Merritt, M. H., Blackstone, M., & Feudtner, C. (2006). Physical health outcomes of childhood exposure to intimate partner violence: a systematic review. *Pediatrics*, *117*(2), e278-e290.
- Bharati, S., Shome, S., Pal, M., Chaudhury, P., & Bharati, P. (2011). Is son preference pervasive in India?. *Journal of Gender Studies*, *20*(3), 291-298.
- Bhuiya, A., Sharmin, T., & Hanifi, S. M. A. (2011). Nature of domestic violence against women in a rural area of Bangladesh: implication for preventive interventions. *Journal of Health, Population and Nutrition (JHPN)*, *21*(1), 48-54.
- Bibace, R., & Walsh, M. E. (1980). Development of children's concepts of illness. *Pediatrics*, *66*(6), 912-917.
- Bogin, B. (1999). *Patterns of human growth* (Vol. 23). Cambridge University Press.
- Burchi, F. (2010). Child nutrition in Mozambique in 2003: the role of mother's schooling and nutrition knowledge. *Economics & Human Biology*, *8*(3), 331-345.
- Campbell, J. C. (2002). Health consequences of intimate partner violence. *The Lancet*, *359*(9314), 1331-1336.
- Chatterjee, M., Ulusoy, M., McGuire, J., Popkin, B. M., Blejer, M. I., Guerrero, I., ... & Cole, J. (1990). Indian women: their health and economic productivity. *Nufusbilim Dergisi/Turkish Journal Of Population Studies*, *12*(1), 93-100.

- Chen, L. C., Huq, E., & d'Souza, S. (1981). Sex bias in the family allocation of food and health care in rural Bangladesh. *Population and development review*, 55-70.
- Chung, E. K., McCollum, K. F., Elo, I. T., Lee, H. J., & Culhane, J. F. (2004). Maternal depressive symptoms and infant health practices among low-income women. *Pediatrics*, 113(6), e523-e529.
- Dávalos, M. E., & Santos, I. V. (2006). Domestic Violence and Child Nutrition in Latin America: A Bargaining Power Approach. *Available at SSRN 905936*.
- Doak, C. M., Adair, L. S., Monteiro, C., & Popkin, B. M. (2000). Overweight and underweight coexist within households in Brazil, China and Russia. *The Journal of Nutrition*, 130(12), 2965-2971.
- Engle, P. L., Menon, P., & Haddad, L. (1999). Care and nutrition: concepts and measurement. *World Development*, 27(8), 1309-1337.
- Haddad, L. (1999). Women's status: levels, determinants, consequences for malnutrition, interventions, and policy. *Asian Development Review*, 17(1/2), 96-131.
- Harrison, G., Tanner, J., Pilbeam, D., and Baker, P. Human Biology 3rd ed., New York: Cambridge University Press, 1993.
- Hattery, A. (2009). *Intimate partner violence*. Rowman & Littlefield Publishers.
- Holden, G. W. (2003). Children exposed to domestic violence and child abuse: Terminology and taxonomy. *Clinical child and family psychology review*, 6(3), 151-160.
- James, W. P., Ferro-Luzzi, A., Sette, S., & Mascie-Taylor, C. G. (1999). The potential use of maternal size in priority setting when combating childhood malnutrition. *European journal of clinical nutrition*, 53(2), 112-119.
- Jouriles, E. N., McDonald, R., Slep, A. M. S., Heyman, R. E., & Garrido, E. (2008). Child Abuse in the Context of Domestic Violence: Prevalence, Explanations, and Practice Implications. *Violence and Victims*, 23(2).
- Kim, J. O., & Mueller, C. W. (Eds.). (1978). *Introduction to factor analysis: What it is and how to do it* (No. 13). Sage.

- Kishor, S., and K. Johnson. 2004. Profiling domestic violence: A multi-country study. Calverton,
- Lanius, R. A., Vermetten, E., & Pain, C. (Eds.). (2010). *The impact of early life trauma on health and disease: The hidden epidemic*. Cambridge University Press.
- Margolin, G. (2005). *Children's exposure to violence exploring developmental pathways to diverse outcomes*. *Journal of interpersonal violence*, 20(1), 72-81.
- Martorell, R., Stein, A. D., & Schroeder, D. G. (2001). Early nutrition and later adiposity. *The journal of nutrition*, 131(3), 874S-880S.
- Mason, K. O. (1986, March). The status of women: Conceptual and methodological issues in demographic studies. *In Sociological Forum* (Vol. 1, No. 2, pp. 284-300). Kluwer Academic Publishers.
- Miller, B. D. (1997). Social class, gender and intrahousehold food allocations to children in South Asia. *Social Science & Medicine*, 44(11), 1685-1695.
- Montgomery, S. M., Bartley, M. J., & Wilkinson, R. G. (1997). Family conflict and slow growth. *Archives of Disease in Childhood*, 77(4), 326-330.
- Neggers, Y., Goldenberg, R., Cliver, S., & Hauth, J. (2004). Effects of domestic violence on preterm birth and low birth weight. *Acta Obstetrica et Gynecologica Scandinavica*, 83(5), 455-460.
- Onis, M. (2006). WHO Child Growth Standards based on length/height, weight and age. *Acta Paediatrica*, 95(S450), 76-85.
- Puffer, R. R., & Serrano V, C. (1973). Patterns of mortality in childhood: report of the Inter-American Investigation of Mortality in Childhood. In *PAHO Scientific Publication* (No. 262). Organización Panamericana de la Salud.
- Rahman, M., Poudel, K. C., Yasuoka, J., Otsuka, K., Yoshikawa, K., & Jimba, M. (2012). Maternal exposure to intimate partner violence and the risk of undernutrition among children younger than 5 years in Bangladesh. *American journal of public health*, 102(7), 1336-1345.
- Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: family social environments and the mental and physical health of offspring. *Psychological bulletin*, 128(2), 330.

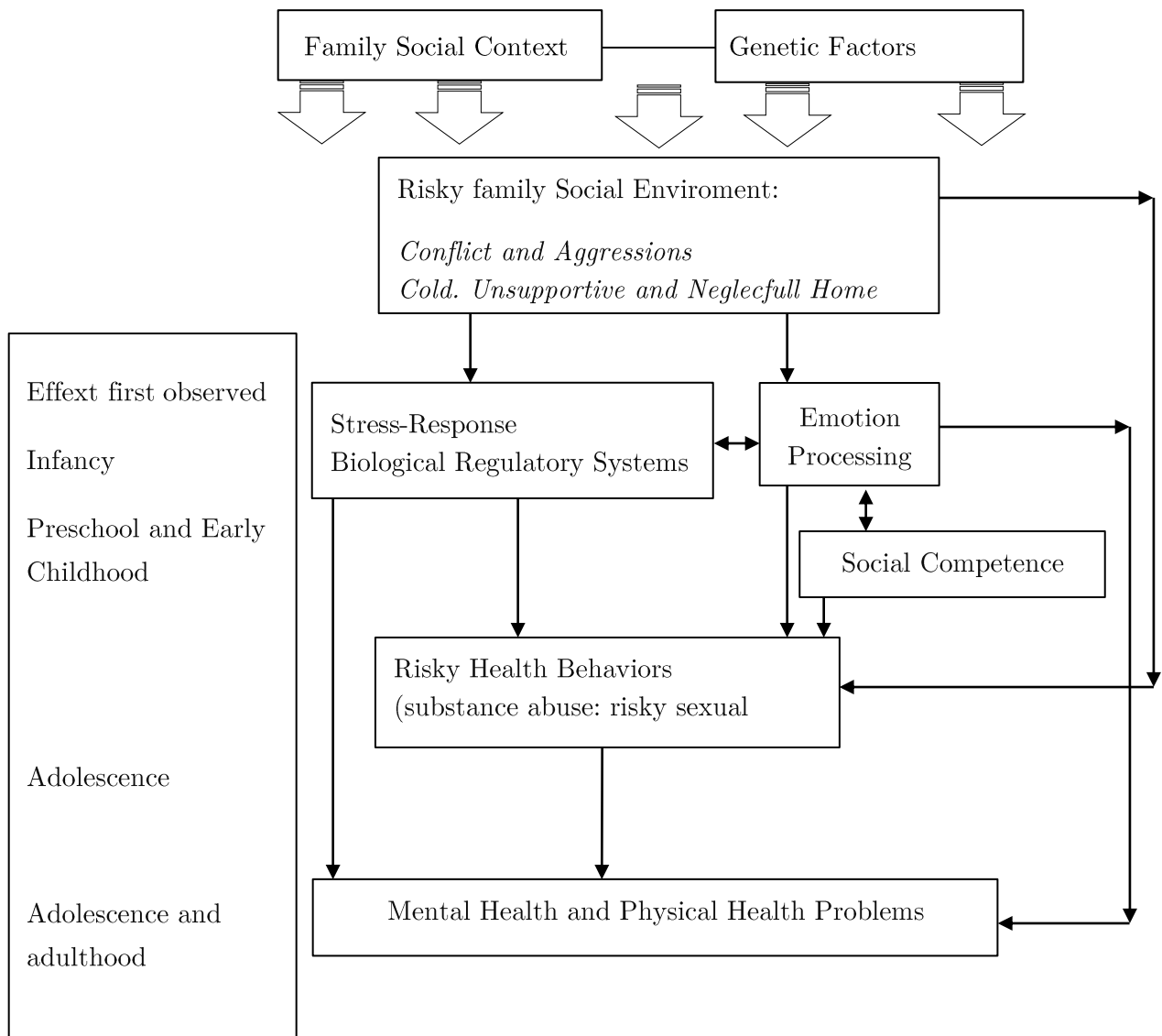
- Rico, E., Fenn, B., Abramsky, T., & Watts, C. (2011). Associations between maternal experiences of intimate partner violence and child nutrition and mortality: findings from Demographic and Health Surveys in Egypt, Honduras, Kenya, Malawi and Rwanda. *Journal of epidemiology and community health*, *65*(4), 360-367.
- Smith, L. C., & Haddad, L. J. (2000). *Explaining child malnutrition in developing countries: A cross-country analysis* (Vol. 60). Intl Food Policy Res Inst.
- Smith, L. C., Ramakrishnan, U., Ndiaye, A., Haddad, L., & Martorell, R. (2003). The Importance of Women's Status for Child Nutrition in Developing Countries (Vol. 131). Intl Food Policy Res Inst.
- Sobkoviak, R. M., Yount, K. M., & Halim, N. (2012). Domestic violence and child nutrition in Liberia. *Social science & medicine*, *74*(2), 103-111.
- Stein, A., Woolley, H., Cooper, S. D., & Fairburn, C. G. (1994). An observational study of mothers with eating disorders and their infants. *Journal of Child Psychology and Psychiatry*, *35*(4), 733-748.
- Szklo, M., & Nieto, F. J. (2012). *Epidemiology: beyond the basics*. Jones & Bartlett Publishers.
- Troxel, W. M., & Matthews, K. A. (2004). What are the costs of marital conflict and dissolution to children's physical health?. *Clinical Child and Family Psychology Review*, *7*(1), 29-57.
- UNICEF. Improving child nutrition. The achievable imperative for global progress. New York: UNICEF; 2013.
- Valenzuela, M. (1997). Maternal sensitivity in a developing society: The context of urban poverty and infant chronic undernutrition. *Developmental psychology*, *33*(5), 845.
- Walker, S. P., Wachs, T. D., Meeks Gardner, J., Lozoff, B., Wasserman, G. A., Pollitt, E., & Carter, J. A. (2007). Child development: risk factors for adverse outcomes in developing countries. *The lancet*, *369*(9556), 145-157.
- World Bank. 2002. Bangladesh Integrated Nutrition Project: Implementation Completion Report. Report No. 25183. Washington, DC: World Bank.

- Yount, K. M., DiGirolamo, A. M., & Ramakrishnan, U. (2011). Impacts of domestic violence on child growth and nutrition: a conceptual review of the pathways of influence. *Social Science & Medicine*, 72(9), 1534-1554.
- Ziaei, S., Naved, R. T., & Ekström, E. C. (2012). Women's exposure to intimate partner violence and child malnutrition: findings from demographic and health surveys in Bangladesh. *Maternal & child nutrition*.
- Zimmermann, L. (2012). Reconsidering gender bias in intrahousehold allocation in india. *Journal of Development Studies*, 48(1), 151-163.

Appendices

Appendix A

The Risky Family Model

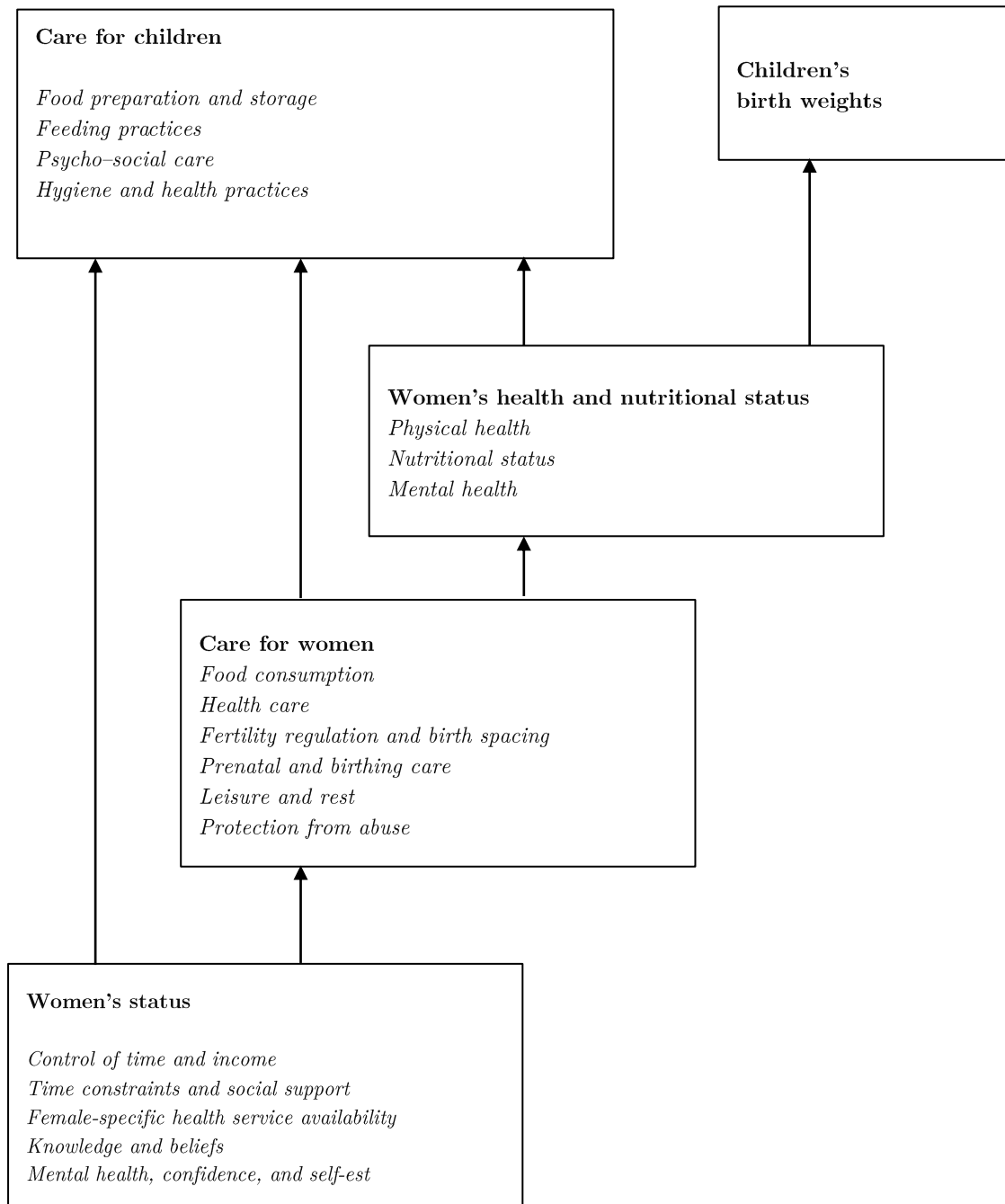


Source: Repetti, (2000).

Note: This figure, presented by Reppetti, (2000), explains "The Risky families model", which clarifies the effects of domestic violence environment on children.

Appendix B

Figure 1: Women's status, care for children, and children's birth weights



Source: Smith, Ramakrishnan, Ndiaye, Haddad & Martorell, (2003).

Appendix C

Table C.1: Correlation matrix for indicators of low decision making status

	Final say on own health care	Final say in making household purchases	Final say in making household purchases for daily need	Person who decides how to spend the money of the woman
Final say on own health care	1.000			
Final say in making household purchases	0.454***	1.000		
Final say in making household purchases for daily need	0.245***	0.486***	1.000	
Person who decides how to spend the money of the woman	0.267***	0.227***	0.160***	1.000

Source: 2007, BDHS. Author's construction.

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level

Table C.2: Index of low decision-making women's status: factor analysis output

Panel A	Factor	Eigenvalue
	1	1.948
	2	0.893
	3	0.713
	4	0.445
	Factor loadings	
Panel B	1	Cumulative
Final say on own health care	0.720	0.487
Final say in making household purchases	0.824	0.710
Final say in making household purchases for daily need	0.695	0.889
Person who decides how to spend the money of the woman	0.517	1.000
Panel C	Scoring coefficients	
	Factor 1	
Final say on own health care	0.369	
Final say in making household purchases	0.423	
Final say in making household purchases for daily need	0.357	
Person who decides how to spend the money of the woman	0.265	

Source: 2007, BDHS. Author's construction.

Notes: Number of observations=2563. Retained factors=1. Method: Principal component factors.

Appendix D

Table D.1: Correlation matrix for indicators of low societal gender equality

	Justified wife beating if she goes out without telling husband	Justified wife beating is she neglects the children	Justified wife beating is she argues with her husband	Justified wife beating if she refuses to have sex with her husband
Justified wife beating if she goes out without telling husband	1.000			
Justified wife beating is she neglects the children	0.548***	1.000		
Justified wife beating is she argues with her husband	0.510***	0.502***	1.000	
Justified wife beating if she refuses to have sex with her husband	0.467***	0.432***	0.480***	1.000

Source: 2007, BDHS. Author's construction.

Notes: ***Statistically significant at 1% level, **statistically significant at 5% level, *statistically significant at 10% level

Table D.2: Index of low decision-making women's status: factor analysis output

Panel A	Factor	Eigenvalue
	1	2.472
	2	0.585
	3	0.495
	4	0.448
	Factor loadings	
Panel B	1	Cumulative
Final say on own health care	0.808	0.618
Final say in making household purchases	0.792	0.764
Final say in making household purchases for daily need	0.794	0.389
Person who decides how to spend the money of the woman	0.748	1.000
Panel C	Scoring coefficients	
	Factor 1	
Final say on own health care	0.327	
Final say in making household purchases	0.320	
Final say in making household purchases for daily need	0.321	
Person who decides how to spend the money of the woman	0.303	

Source: 2007, BDHS. Author's construction.

Notes: Number of observations=2563. Retained factors=1. Method: Principal component factors.