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Domestic Abuse and Child Health

Samantha Rawlings
Zahra Siddique

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Samantha Rawlings
University of Reading

Zahra Siddique
University of Reading
and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Domestic Abuse and Child Health*

We examine the effects of different kinds of domestic abuse (physical violence, emotional abuse, sexual abuse and physical violence while the victim is pregnant) on health outcomes of children born to victims. We use data on approximately 0.6 million children born between 1975 and 2013 across thirty different developing countries to investigate this relationship. Comparing children of abused mothers with otherwise similar children whose mothers were not victims of abuse, we find these children are 0.4 percentage points more likely to die within thirty days, 0.9 percentage points more likely to die within a year and 1.5 percentage points more likely to die within the first five years of being born. They are also 1.8 percentage points more likely to be low birth weight and, conditional on survival, 1.1 percentage points more likely to be stunted. Our findings allow us to quantify the costs of domestic abuse beyond costs borne directly by victims (or mothers) and gain a better understanding of the child health production process in a developing country context.

JEL Classification: I14, I15, J12, J13

Keywords: child health, domestic violence

Corresponding author:

Zahra Siddique
Department of Economics
School of Politics, Economics and International Relations
University of Reading, Whiteknights
Reading, RG6 6AA
United Kingdom
E-mail: Z.Siddique@reading.ac.uk

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1 Introduction

Domestic abuse, defined as physical, emotional or sexual abuse by an intimate partner, has important consequences for large numbers of female victims across the globe. Using data from 81 countries, Devries et al. (2013) state that 'globally, in 2010, 30.0% [95% confidence interval (CI) 27.8 to 32.2%] of women aged 15 and over have experienced, during their lifetime, physical and/or sexual intimate partner violence.' These prevalence rates are particularly high in developing regions such as Central Sub-Saharan Africa (65.64%) and South Asia (41.73%).

Domestic abuse has important direct costs borne by victims: it is one of the leading causes of homicide deaths among women, as well as being associated with poor health (such as higher rates of depression, alcohol related disorders and sexually transmitted diseases) and reduced earnings. Domestic abuse is also more likely to occur during early marriage and pregnancy (Kishor and Johnson, 2004). This leads to an important negative externality associated with domestic abuse which is borne by children of victims who have worse health outcomes at birth and early childhood, putting these children at a disadvantage in life. In this paper we investigate and provide preliminary findings on the relationship between domestic abuse suffered by mothers and health outcomes of their children by using nationally representative Demographic and Health Survey (DHS) data from across thirty different developing countries.

Existing empirical research on the relationship between domestic abuse and child health, mostly in the fields of public health and medicine, has documented a negative correlation between the two (see Yount et al. (2011) for a meta-analysis; Yount et al. (2011) also describe direct and indirect pathways linking domestic abuse to child health). However, this literature uses small non-random samples or data from developed countries only. It is only recently that data, via the introduction of domestic violence modules in the DHS, has become available providing comparable information on domestic abuse and child health across a wide range of developing countries. Using this data allows us to utilize information on approximately 0.6 million children born between 1975 and 2013. We are not aware of any other empirical work of this scope which has been carried out in developing countries where large fractions of poor women are victims of domestic abuse.[1]

[1]Two studies investigate the relationship between domestic physical abuse and child health using large-scale data sets; both use data on child health of domestic violence victims from the US. The first study (Silverman et al., 2006) uses data on women giving birth in 26 US states as part of the 2000-2003 Pregnancy Risk Assessment Monitoring System and finds that women experiencing intimate partner violence are at increased risk for poor maternal health (such as high blood pressure, vaginal bleeding, severe nausea/vomiting/dehydration, kidney or urinary tract infections, frequent hospital visits) as well as poor infant health (such as delivery pre-term, low birth-weight, more likely to require intensive care). The second study (Aizer, 2011) uses data on female hospitalizations and birth outcomes for the state of California between 1991 and 2002 and finds that serious incidents of domestic violence, which result in hospitalization, cause a reduction in birth weight by 163

We are able to examine the effects of different kinds of domestic abuse such as physical violence, emotional abuse, sexual abuse and physical violence limited to when the victim is pregnant. We are also able to quantify this effect on a number of child health measures capturing child mortality (at thirty days, one year and five years after birth) and anthropometry (whether the child was of low birth weight, is stunted or wasted). The effects we estimate should be interpreted as the effects on child health of being born in families where mothers have been victims of different kinds of abuse. We also estimate these effects after inclusion of numerous controls, such as those for mother's long term health, allowing us to compare health outcomes of children whose mothers have been victims of abuse to those of reasonably similar children whose mothers are not victims. Finally, we estimate these effects after inclusion of country-child year of birth fixed effects to ensure that our estimated effects are not driven by shocks occurring in particular countries in specific child birth years.

We find that children born in families where the mother was a victim of domestic abuse are 0.4 percentage points more likely to die within thirty days, 0.9 percentage points more likely to die within a year and 1.5 percentage points more likely to die within five years of being born compared to similar children whose mothers are not victims of domestic abuse. All these effects are statistically significant and sizeable, given that just 3.2% of all children born to non-victims in our sample die within thirty days, 6.6% of all children born to non-victims die within one year and 9.7% of all children born to non-victims die within five years of being born.

We also find that children born in families where the mother was a victim of domestic abuse are 1.8 percentage points more likely to have low birth weight compared to similar children born in families where the mother was not a victim of domestic abuse. We find small or no effects of domestic abuse for measures of anthropometric failure such as stunting and wasting. However, children born in families where the mother was a victim of physical violence are 1.4 percentage points more likely to be stunted compared to similar children born in families where the mother was not a victim. These effects are statistically significant but not as sizeable as those for mortality since as many as 16.9% of all children born to mothers who are non-victims in our sample have low birth weight and 25.3% of all children born to mothers who are non-victims are stunted.

Despite that women of low socioeconomic status are more likely to be victims of domestic violence,[2]

grams.

[2] Aizer (2010) documents the negative effect of low income on domestic violence for the US while Angelucci (2008) and Bobonis et al. (2013) document this negative effect for rural Mexico.

we find that inclusion of domestic violence variables reduces observed income gradients in health but not appreciably.[3]

Our findings have implications for the external cost of domestic abuse beyond costs borne directly by the mother. Our work is the first to quantify this cost for a range of child health measures in a developing country context. Since children with worse health at birth have been shown to have not just worse short term outcomes but also worse long term outcomes in terms of adult height, IQ, earnings and education (Black et al., 2007), our results show that children of domestic abuse victims face an important long term disadvantage over their lifetime. Our findings also provide a better understanding of the child health production process in developing countries.

In the next section, we describe the data set and variables used in the paper. In section 3 we provide the framework of analysis which is used in the paper. We then go on to describe our estimation results and implications of these results in section 4. Section 5 peforms robustness checks and section 6 concludes.

2 Data

Data for our analysis comes from the Demographic and Health Surveys (DHS).[4] These are nationally representative surveys that collect information on fertility, health, family planning, and socioeconomic status at the community, household, and individual levels. Ever-married women age 18 to 49 are interviewed and complete fertility histories are collected so that data on all births and any deaths of children respondents have ever had is documented. Surveys are based on standardised questionnaires and thus are comparable across countries; we use forty-one surveys from thirty countries, carried out between the years 2000 and 2013.[5]

Inclusion in the sample is conditional on the surveys including the DHS domestic violence questionnaire module (see section 2.1), resulting in a sample of around 325,000 women, with information on 0.6 million children. Table 1 lists the surveys used, and figure 1 shows a map of countries included in the estimation sample. As can be seen in the figure our estimation sample includes developing countries from South

[3] A large literature in health economics examines the relationship between income and health (see Case et al. (2002), Deaton (2002) and Cutler et al. (2006)), with differences in health across those of different socioeconomic status (poor individuals having worse health than the rich) originating early in life. Since poor women with less education are more likely to face domestic abuse, domestic abuse may be an important mechanism explaining the relationship between income and health (Aizer, 2011).

[4] The data are available at www.measuredhs.com.

[5] Questions concerning domestic violence were asked in earlier surveys in some countries, but it wasn't until 1998-9 that the DHS created a standardised questionnaire for domestic violence (Kishor and Johnson, 2004).

America, Africa and Asia.

Given that there are children in the sample who were born as early as 1968, we further restrict the estimation sample to individuals who were born after 1975. We do this since earlier births are for women who were very young or at high risk when giving birth and this may introduce selection (Bhalotra, 2010); there are also fewer observations the farther we go back in time.

2.1 Domestic abuse

Questions in the domestic violence module within the DHS are based on the Conflict Tactics Scale approach to eliciting information on violence (Straus, 1979). Women interviewed for the domestic violence module were asked a series of questions concerning the behavior of their current partner, or former partner if currently unpartnered. Since information is only collected on one relationship (the most recent), measurement error in exposure to domestic violence may occur if an individual has had more than one partner and there were differences in domestic violence exposure between the two partners. We restrict our estimation sample to individuals who are currently partnered and who have only had one partner (85% of currently partnered women).[6]

Women are also asked when their first marriage was, and how long after this the abuse began. To avoid conflating domestic abuse with child abuse, we omit individuals from the estimation sample who were married and suffered abuse when they were less than 15 years old.[7]

Within the domestic violence module, women are first asked three questions on emotional abuse such as if their partner had ever said anything to humiliate them. They are then asked seven questions concerning whether the husband had ever carried out any *specific* physical abuse acts e.g. pushing, shaking, slapping, twisting the woman's arm, punching, kicking etc. Finally, the woman is asked two or three questions concerning sexual abuse, e.g. whether her husband had ever physically forced her to have sexual intercourse with him.[8] From these questions, the three indicators of abuse are constructed: if the woman suffered physical abuse, emotional abuse, or sexual abuse. We construct a fourth measure: if the woman suffered any of physical, emotional or sexual abuse. In the analysis that follows, we focus primarily on indicators for *any abuse*, and *physical abuse*.

[6] Our findings are not significantly different when we include all women; results available on request.

[7] The measure of 'when abuse occurred' is not perfect as it may be subject to recall error so we do not utilise it in the main analysis, except to identify those who were victims of abuse at young ages.

[8] There is some minor variation across countries in the questions asked; for example, in some surveys, 'country-specific' questions concerning abusive acts are also included.

We study the effects of physical abuse in isolation for two reasons. Firstly, the prevailing literature on domestic abuse generally examines physical abuse rather than other types of abuse (see Silverman et al. (2006) and Aizer (2011)), so focusing on physical abuse only facilitates comparison with the literature. Second, whilst all the surveys in our sample collect information on physical abuse, 4 surveys did not collect information on emotional and/or sexual abuse (see table 1 for these surveys), so focusing on physical abuse only gives us a larger estimation sample.

Finally, in 19 countries (23 surveys; see table 1) the DHS also collected information on whether the woman was ever hit during any pregnancy. We also investigate the impact of this measure on child health.

Figure 2 shows variation in reported domestic abuse and physical violence across each survey used in the estimation sample. There is variation in these rates both across countries and within a particular country at different points in time. In general the rates of any abuse are highest in African countries, with the exception of 2010 Burkina Faso and 2004-2005 Malawi. In the 2007 Democratic Republic of Congo and 2006 Uganda surveys the rates of any abuse are as high as 67.92% and 65.32%. Rates of physical violence only are particularly high in a few Asian countries (such as 2007 Bangladesh), but, as for any abuse, tend to be highest for African countries. In 2007 Democratic Republic of Congo and 2010-2011 Rwanda the rates of physical violence reach 53.50% and 52.77%. Rates of violence during pregnancy (appendix figure A-1(c)) are also highest in African countries, with some exceptions such as 2008 Ghana. In 2006 Uganda and 2007 Democratic Republic of Congo surveys rates of violence during pregnancy reach 11.12% and 10.10%.

2.1.1 Measurement error

One potential concern with self reported domestic abuse is that women may systematically underreport its incidence due to a culture of shame around the topic (Kishor and Johnson, 2004). While responses to domestic abuse questions in the DHS surveys were self-reported, a number of strategies were followed in the collection of data which minimize systematic under reporting and measurement error as well as to ensure confidentiality and safeguard the privacy of respondents. These were: suitable selection of eligible women, an informed consent approach to the module, privacy during the interview, the avoidance of translators in interviews, and appropriate training for interviewers.

Domestic abuse questions were asked of only one woman in each household. If more than one ever-married woman within a household was interviewed in the main DHS survey, one of these was chosen

randomly to be included in the domestic violence module. This was done to ensure that the woman felt comfortable knowing other household members would not be aware she had been asked about domestic violence.

The domestic violence module was included towards the end of the interview, so that the interviewer had built up a rapport with the woman and would be more likely to have gained her trust. Interviewers were trained beforehand to ensure they could implement the above guidelines correctly, ask questions in a non-judgemental way, and deal with any unexpected situations that might arise.

All women were clearly informed at the outset that their answers would be confidential and were given the choice not to answer any questions on the domestic violence module.

Finally, privacy was ensured in two ways: the domestic violence questions would not be asked if there was anyone else in the room or if complete privacy was not possible. The use of interpreters was avoided for this same reason.

Given these safeguards and that women were free to not respond to any of the questions in the DHS interview, it is unlikely that amongst those who responded to the domestic violence questions, that systematic under-reporting was a serious issue.

2.1.2 Item non-response

Another potential concern with self reported domestic abuse is that of item non-response which occurs either due to a refusal to answer the domestic abuse questions, or when questions are not asked due to privacy not being guaranteed. These response rates vary across surveys, but are remarkably stable across type of abuse. For physical violence, non-response rates exceeds 5% (at 6.17% in the 2008-09 Sao Tome and Principe (STP) survey) for just one survey (figure 3). Non-response concerning both emotional abuse and sexual abuse are of a similar magnitude (appendix figures A-2(a) and A-2(b)).

As might be expected, the more sensitive topic of violence during pregnancy has a higher non-response rate, but it is still below 10%. In the surveys which asked whether the individual was ever hit during pregnancy, non-response varies from 3.03% in the 2009-10 Tanzania survey to 9.81% in the 2004 Cameroon survey (appendix figure A-2(c)).

2.2 Child health

The DHS also includes information on a number of child health measures which we utilize in our investigation. We examine a number of child mortality measures as well as child anthropometry measures for children who survive, as described next.

2.2.1 Child mortality

The complete fertility histories provided by the woman as well as information on the age of any children at death, allows us to construct measures of individual child mortality. We focus on neonatal (thirty days), infant (twelve months) and under five (sixty months) mortality. Since age heaping is observed in the data, we include the thirtieth day, twelfth and sixtieth months in each of these measures, respectively. We also exclude from our analysis any children for whom the information is right censored i.e. those who are younger than these thresholds at the time of the survey. Given these restrictions, we have a sample of approximately 0.61 million children born between 1975 and 2012 for neonatal mortality, 0.58 million children born between 1975 and 2011 for infant mortality, and 0.47 million children born between 1975 and 2007 for under-five mortality respectively.

Once again we observe significant across country variation in mortality suffered by children in our estimation sample. Neonatal, infant and under-5 mortality tends to be lowest in South American countries such as Colombia. These mortality rates are higher in African countries such as Mali and Rwanda as well as Asian countries such as Bangladesh and Cambodia. Neonatal mortality reaches a high of 5.89%, infant mortality reaches a high of 12.97% and under-5 mortality reaches a high of 20.44% all in the 2006 Mali survey (figures 4(a) - 4(c)).

2.2.2 Child anthropometry

Information on child birth weight is available for children born in the last three to five years, depending on the survey. Information on actual birth weight is recorded but is scarce. A third of children in the sample were not weighed at birth, with only 15% of children having their weight recorded on a card, so that most observations for birth weight rely on parental recall. Instead, we use information on the child's *size* at birth which is available for more children since it does not rely on them having been weighed at birth. Mothers were asked whether their child was very large, larger than average, average, smaller than average, or very small at birth. We construct an indicator for low birth weight which equals one if the

mother answered that the child was small or very small. Despite potential concerns about the subjective nature of this measure, it has been shown to correlate well with low birth weight within the DHS (Blanc and Wardlaw, 2005). Across surveys, the incidence of low birth weight is highest in the 2005-06 Haiti survey at 30.01% (figure 4(d)).

The height and weight of all children in the household under the ages of three to five is also recorded in the DHS. These are objective measures as children are measured by trained surveyors. We calculate z-scores of child height-for-age and weight-for-height using the 2000 CDC Growth Reference from the US. The z-scores are gender specific and - for height - are also age in months specific. For children under the age of two, length-for-age is calculated. We then construct indicators for stunting (height-for-age < 2 s.d. below reference mean) and wasting (weight-for-height < 2 s.d. below reference mean), for children who survive to interview. Again, we see variation across countries, with the highest rates in African and Asian countries. Fraction of children stunted reaches a high of 41.73% in 2004-05 Malawi survey and 40.22% in the 2000 Cambodia survey. Fraction of children wasted is particularly high in Asian countries (33.53% in 2007 Bangladesh and 29.15% in 2005-06 India, figures 4(e) and 4(f)).[9] Stunting reflects sub-optimal nutritional conditions and a long-run failure to achieve an individuals' potential growth, whilst wasting is a combination of both short- and long-run inputs but is most sensitive to very short-run effects (De Onis and Blössner, 2013).

2.2.3 Child health across mothers who were victims of domestic abuse vs. non-victims

Table 2 shows means of each of our child health variables for sub-samples of children of mothers' who suffered various types of abuse in comparison with those who did not. For all mortality measures, mortality is always higher in sub-samples of children whose mothers suffer abuse of any kind or who are victims of violence while pregnant. For low birth weight, the fraction of children with low birth weight is also always higher in sub-samples of children whose mothers suffer abuse of any kind or who are victims of violence while pregnant. For both stunting and wasting, the fraction of children who are stunted or wasted is higher in sub-samples of children whose mothers suffer physical violence, sexual abuse or who are victims of violence while pregnant. The fraction of children who are stunted or wasted is actually lower in sub-samples of children whose mothers are victims of emotional abuse.

[9] In Figures 4(e) and 4(f), note that the 2006 Uganda and the 2011 Uganda surveys do not appear in these graphs since there were few/no observations on height and weight of children of women selected for the domestic violence module in these two surveys.

While these cross tabulations suggest a negative association between domestic abuse and child health, we are interested in whether this association persists when we look at differences across comparable groups of children. For instance, figures 5 and 6 and appendix figures A-3 and A-4 give parent characteristics across sub-samples of victims and non-victims. Women who were victims of abuse or at risk of being hit during pregnancy were less educated than women who were not victims, and their partners were also less educated compared to partners of women who were not victims. This indicates that parent education is an important variable that we need to control for since it could be education differences across the different sub-samples that drive differences in child health rather than domestic violence.

3 Empirical Framework

Our baseline empirical specification estimates regressions of the form

$$C_{ijt} = \alpha + \beta V_{ijt} + X_{ijt}^{'}\gamma + \sigma_{jt} + \epsilon_{ijt} \tag{1}$$

where the dependent variable C_{ijt} represents a measure of child health for child i born in country j at time t. We estimate regressions where we use indicators for i) neonatal, ii) infant and iii) under-5 mortality, as well as indicators for iv) low birth weight, v) stunting, and vi) wasting for C_{ijt}. V_{ijt} is a measure of domestic abuse; we estimate regressions where we use indicators which take the value one if the mother of child i born in country j at time t suffered a) any type of domestic abuse from their partner and b) physical violence from their partner. In section 4.3 we also examine a specification in which this indicator variable takes the value one if the mother of child i born in country j at time t was hit during any pregnancy.[10] X_{ijt} is a set of control variables which include child, household and parent characteristics as well as dummy variables for survey year. σ_{jt} are country-child year of birth fixed effects and ϵ_{ijt} is the error term. In all our estimations using linear probability models, the predicted values of child health lie predominantly within the $[0, 1]$ interval. We use robust standard errors which adjust for clustering at the country level.

We are primarily interested in the estimate of β, the coefficient on the domestic abuse indicator variable. We anticipate that $\beta < 0$ since all our indicators of child health are negative measures. β should be interpreted as an effect on child health of being born in families where the mothers have been victims

[10] Note that women are not asked about violence during *specific* pregnancies.

of different forms of domestic abuse.

Children whose mothers are victims of abuse may be very different from children whose mothers are not victims. In order to make the two groups comparable we include controls for child, household and parent characteristics that may also have an impact on child health outcomes. The set of control variables X_{ijt} include child characteristics such as gender, whether twin, and birth order. They include household characteristics such as urban status which captures socio-economic status of the household and which might have an impact on child health. Finally, they include parent characteristics such as mother and father education, and mother's age and height. Parent education improves child health outcomes and captures income gradients in health. Mother's height is a measure of the mother's overall stock of health. Since mother's height is only available in 31 of our surveys (see table 1), we investigate the impact of domestic violence with and without it's inclusion. We have used mother's height since it is considered a permanent measure of health (Strauss and Thomas, 2008) and so is preferable to more transitory measures of mother's health such as BMI.[11]

Since we are comparing across countries and different cohorts children whose mothers are victims of abuse with children whose mothers are not victims we add country-child year of birth fixed effects in our regressions. This ensures we use within country and child year of birth variation only to identify the effect of domestic abuse on child health outcomes. Shocks such as wars or epidemics which hit a particular country in a particular child birth year therefore do not drive our results.

Finally, we also include dummy variables for survey year.

4 Domestic abuse and child health

Estimates of the impact of domestic abuse and domestic physical violence are summarized in tables 3 through 8, where each table shows results for a different child health outcome measure. We consistently find a negative relationship between domestic abuse and numerous early childhood health and growth measures which, in turn, have a lasting impact on human-capital outcomes into adulthood.

[11] We have also estimated a specification in which we include controls for mother smoking, since victims may be more susceptible to risky behaviors which might have an effect on child health. This reduces our estimation sample since we do not have information on smoking for all mothers. However, we find our estimates, as reported in later sections, remain unchanged; results available on request.

4.1 Domestic abuse and child mortality

As given in table 3, children born to mothers who are victims of domestic abuse are 0.4 percentage points more likely to die within the first month of being born compared to children born to mothers who are not victims. This effect is statistically significant at the 5% level. It is also stable across specifications and does not vary when we include different control variables, country-child year of birth fixed effects or mother's height. Children born to mothers who are victims of physical violence only are also 0.4 percentage points more likely to die within the first month of being born compared to children born to mothers who are not victims. This effect is also statistically significant at the 5% level. It is quite stable across specifications, decreasing slightly with the addition of different controls (particularly parent education, as victims and their partners are somewhat less educated compared to non-victims) but does not vary with the addition of country-child year of birth fixed effects or mother's height.

Table 4 gives estimates for the infant mortality outcome measure. Children born to mothers who are victims of domestic abuse are 0.8 (without controls for mother's height) and 0.9 (with controls for mother's height) percentage points more likely to die within the first year of being born compared to similar children born to mothers who are not victims. This effect is statistically significant at the 1% level of significance. It is also fairly stable across specifications, decreasing slightly when we add different controls since victims and their partners are less educated compared to non-victims. It increases slightly once we include country-child year of birth fixed effects and mother's height. Children born to mothers who are victims of physical violence only are 0.7 (without controls for mother's height) and 0.8 (with controls for mother's height) percentage points more likely to die within the first year of life compared to similar children born to mothers who are not victims.

Table 5 gives the estimation results for the under five mortality outcome measure. Children born to mothers who are victims of domestic abuse are 1.4 (without controls for mother's height) and 1.5 (with controls for mother's height) percentage points more likely to die within the first five years of being born compared to similar children born to mothers who are not victims. This effect is statistically significant at the 0.1% level. As before, the effect is slightly reduced when we add different controls to our regression, but increases again once we include country-child year of birth fixed effects and mother's height. Children born to mothers who are victims of physical violence only are 1.2 (without controls for mother's height) and 1.3 (with controls for mother's height) percentage points more likely to die within the first five years of life compared to similar children born to mothers who are not victims.

For each of the three mortality measures the impact of domestic abuse is statistically significant at the 5% level of significance. The magnitude of this effect is also sizeable given that the incidence of neonatal mortality is just 3.2%, infant mortality 6.6% and under five mortality 9.7% for children in our estimation sample born to mothers who are not victims of any kind of domestic abuse.

4.2 Domestic abuse and child anthropometry

We further examine the impact of domestic abuse on anthropometric measures such as birth weight, stunting, and wasting, for children who survive, in tables 6 through 8.

Table 6 gives the estimation results for the low birth weight indicator outcome variable. Children born to mothers who are victims of any abuse are 1.5 percentage points more likely to be low birth weight compared to children born to mothers who are not victims. This effect is fairly stable across specifications, decreasing to 1.3 percentage points once we include control variables, but increasing again to 1.5 percentage points after inclusion of country-child year of birth fixed effects. This effect increases further to 1.8 percentage points once controls for mother's height are added. Similarly, children born to mothers who are victims of physical violence only are 1.5 percentage points more likely to be low birth weight compared to children born to mothers who are not victims once controls and country-child year of birth fixed effects are included; they are 1.9 percentage points more likely to be low birth weight compared to children born to mothers who are not victims of physical violence once controls for mother's height are included. These effects are statistically significant at the 1% level of significance.

Table 7 gives the estimation results for an indicator outcome variable which takes the value one if the child is stunted (has height-for-age < 2 s.d. below reference mean). Children born to mothers who are victims of any abuse are 2.9 percentage points more likely to be stunted compared to children born to mothers who are not victims. This effect is reduced to 2.2 percentage points once we include controls and further reduced to 1.1 percentage points once we include country-child year of birth fixed effects. Inclusion of mother's height as an additional control variable does not change this effect, and it remains almost unchanged at 1.1 percentage points. This effect is not statistically significant at the 5% level. However, the effect of physical violence on stunting is stronger. Children born to mothers who are victims of physical violence only are 4.2 percentage points more likely to be stunted compared to children born to mothers who are not victims. This effect is reduced to 2.9 percentage points once we include control variables and further reduced to 1.5 percentage points once we include country-child year of birth fixed

effects. It is 1.4 percentage points when we also control for mother's height, but remains statistically significant at the 5% level. We discuss this result further in section 4.4.

Table 8 gives the estimation results for the outcome indicator which takes the value one if the child is wasted or has weight-for-height < 2 s.d. below reference mean. Children born to mothers who are victims of domestic abuse are 0.1 percentage points more likely to be wasted compared to children of mothers who are not victims. This effect is 0.3 percentage points after inclusion of controls and country-child year of birth fixed effects; it remains unchanged after adding mother's height as a control and statistically insignificant at the 5% level. Children born to mothers who are victims of physical violence only are 0.4 percentage points more likely to be wasted compared to children of mothers who are not victims, and this effect is also statistically insignificant at the 5% level of significance.

To summarise, we find statistically significant effects of both physical and any type of abuse on low birth weight and for physical violence on whether the child is stunted but no effect on whether the child is wasted. Note that the relative magnitude of these effects is small in comparison to mortality since as many as 17% of children whose mothers are not victims of any kind of domestic abuse in our estimation sample have low birth weight, 25% of children whose mothers are not victims of any kind of domestic abuse are stunted and 15% of children whose mothers are not victims of any kind of domestic abuse are wasted.

The reason why we may not see an impact of domestic violence on wasting is that whilst wasting may reflect a chronic shortage of nutrition, it predominately reflects contemporaneous shocks to health, for instance recent weight loss (De Onis and Blössner, 2013), due to e.g. recent diarrhea, malnutrition or other illness (Aturupane et al., 2013). The cascading effects of domestic abuse on child health may be better captured by stunting.

Domestic abuse may have an impact on breastfeeding practises, which in turn have an impact on wasting. However, there is no clear evidence as to whether domestic abuse reduces breastfeeding (via a deficit response) or increases breastfeeding (via a compensatory response). Domestic abuse may reduce preventive care for young children, and this may result in poor nutrition and wasting. Finally, parenting and psycho social interactions of mothers who are victims of domestic abuse may be worse (via a deficit response) or better (via a compensatory response). Such interactions in turn could have an impact on child health and wasting, although again it is not clear whether the overall effect is positive or negative (see Yount et al. (2011) and references cited therein). We find little to no *total* effect of all of these

pathways which link domestic abuse to wasting in our data.

4.3 The relationship between physical violence while pregnant and child health

Some of the surveys which included the domestic violence module also asked the question of whether or not the respondent had been hit during any pregnancy. Since this question was asked in only some of the surveys, we have a smaller estimation sample when we estimate regressions using this measure of domestic abuse. However, use of this measure allows us to examine whether physical violence, limited to when the respondent was pregnant, also has direct effects on various child health measures.

Table 9 provides estimation results when we use physical violence while pregnant as the measure of domestic abuse. The regression specification reported in the table includes the set of controls described in section 3 as well as country-child year of birth fixed effects. We find that children born to mothers who were hit while pregnant have statistically significantly higher chances of dying within the first one and first five years of being born, at 0.6 percentage points and 1.2 percentage points respectively, compared to children born to mothers who were not hit while pregnant at the 5% level of significance. However, we do not find strong effects of this domestic abuse measure on whether or not the child has low birth weight or whether or not the child is stunted or wasted.

The effects of being hit while pregnant are smaller than the effects of domestic abuse and violence on child mortality, as reported in previous sections. This indicates that abuse to which children are directly exposed after being born likely plays a role in increasing mortality. The absence of any strong effect of being hit while pregnant on anthropometric measures indicates, again, that it is abuse to which children are directly exposed after being born that may drive the effect of physical violence on stunting as estimated in previous sections.

4.4 Does the form of domestic abuse matter?

In order to investigate the differential effects of different forms of domestic abuse we also estimate the following specification

$$C_{ijt} = \alpha + \sum_{k \in \{P,E,SA\}} \beta_k V_{kijt} + X'_{ijt}\gamma + \sigma_{jt} + \epsilon_{ijt} \tag{2}$$

where (as before) the dependent variable C_{ijt} represents a measure of child health for child i born in country j at time t. V_{kijt} are measures of domestic abuse which include indicators for whether the mother of child i born in country j at time t suffered physical violence (P), emotional abuse (E) or sexual abuse

(SA). X_{ijt} is a set of control variables which include child, household and parent characteristics as well as dummy variables for survey year, σ_{jt} are country-child birth year fixed effects and ϵ_{ijt} is the error term. Note that in this specification the estimate of β_k gives the effect of domestic abuse measure k on child health, while holding the effect of all other domestic abuse measures constant.

Estimation results for (2) are reported in table 10. As is clear from the estimation results, physical violence plays the most important role in driving the negative relationship between domestic abuse and child health. The effect of physical violence is increased neonatal, infant, and under-5 mortality by 0.4, 0.7 and 1.1 percentage points, respectively. Physical violence is also associated with a 1.1 percentage point increase in the chance that a child is born with low birth weight and a 1.5 percentage point increased chance that a child is stunted, conditional on the child surviving. In comparison, the effect of emotional abuse, while holding physical and sexual abuse constant, is an associated increase in neonatal, infant, and under-5 mortality by 0.2, 0.3 and 0.5 percentage points, respectively. Emotional abuse (somewhat counter intuitively) is associated with a 0.9 percentage points reduction in the chance that a child is stunted. Finally, the effect of sexual abuse, while holding physical and emotional abuse constant, is an associated increase in the chance that the child is born with a low birth weight by 1.4 percentage points and that a child is stunted by 1.1 percentage points.

We noted in section 2.2 that a lower fraction of children are stunted or wasted in sub-samples of children whose mothers are victims of emotional abuse. That emotional abuse is associated with reduced chances of a child being stunted also explains why we find a statistically significant relationship between stunting and physical violence but no relationship between stunting and any abuse (which includes emotional abuse), as reported in section 4.2. As discussed in section 4.2, studies within the medical and public health literature have documented improvements in breastfeeding and more positive psycho social interactions by mothers who are victims of abuse as a compensatory response. Our results indicate that such positive effects tend to dominate any kind of negative effects of abuse on stunting that might arise for *emotional abuse only*, while holding the effect of other kinds of abuse constant.

4.5 Income gradients in health

In order to examine whether domestic abuse has an impact on income gradients in health we estimate the regressions

$$C_{ijt} = \alpha + \sum_{s \in \{MP,\ldots,FH\}} \gamma_{1s} Educ_{sijt} + X'_{2ijt}\gamma_2 + \sigma_{jt} + \epsilon_{ijt} \tag{3}$$

where, as before, the dependent variable C_{ijt} represents a measure of child health for child i born in country j at time t. $Educ_{sijt}$ represents a set of dummy variables that take the value one if the parent of child i born in country j at time t has education level s, where s is either of mother's primary (MP), secondary (MS), and higher schooling (MH) together with father's primary (FP), secondary (FS) and higher schooling (FH). These variables proxy for income and the coefficients γ_{1s} capture income gradients in health. X_{2ijt} is the set of control variables from before which include child, household and parent characteristics as well as dummy variables for survey year but which exclude the schooling dummy variables, σ_{jt} are country-child birth year fixed effects and ϵ_{ijt} is the error term.

We also estimate the regressions

$$C_{ijt} = \alpha + \beta V_{ijt} + \sum_{s \in \{MP,\ldots,FH\}} \gamma_{1s} Educ_s + X_{2ijt}^{'} \gamma_2 + \sigma_{jt} + \epsilon_{ijt} \tag{4}$$

where V_{ijt} is an indicator for physical violence experienced by the mother of child i born in country j at time t. To investigate whether domestic abuse has an impact on income gradients in health we compare the coefficients γ_{1s} across (3) and (4) after inclusion of controls for domestic abuse.

Estimation results are reported in table 11 for child mortality outcomes and in table 12 for child anthropometry outcomes. While we find that the coefficients on the parent education dummies or estimates of γ_{1s} are reduced slightly when we include physical violence, the difference is not large. Therefore, preliminary results suggest that domestic abuse does not account for income gradients in health which have been documented in developing countries.

5 Robustness checks

A potential concern with our analysis is that our dependent variables are at the child level, whilst the explanatory variables of interest pertain to information collected on domestic violence the *mother* ever experienced. Whilst we know that the woman experienced domestic violence, absent timing on when this occurred, we do not know if the child was exposed to this violence. We may therefore inappropriately assign treatment to children whose mothers experience violence but for whom the child did not i.e. if violence occurred after the appropriate treatment window. For instance, a child may have been exposed to violence at age 3 but was therefore not exposed when at risk of, say, infant mortality. As a robustness check, we therefore estimate regressions using *recent violence* only.

We estimate the regression

$$C_{ijt} = \alpha + \beta V_{ijt}^{12months} + X_{ijt}^{'}\gamma + \sigma_{jt} + \epsilon_{ijt} \tag{5}$$

where $V_{ijt}^{12months}$ indicates whether domestic abuse occurred in the last 12 months. This is only available for surveys administered after 2005. As before, we estimate regressions where we use indicators which take the value one if the mother of child i born in country j at time t suffered a) any type of domestic abuse from their partner and b) physical violence from their partner. Here, C_{ijt} is either an indicator for i) neonatal mortality, ii) low birth weight iii) stunting, or iv) wasting. For neonatal mortality and low birth weight, the sample is restricted to births occurring in the 12 months preceding the survey.[12] We do not investigate infant or under-5 mortality measures since there are no children completely exposed to this mortality risk who were born in the 12 months preceding the survey.

Table 13 provides estimates for abuse experienced in the last 12 months. For neonatal mortality and low birth weight, sample sizes are reduced considerably; e.g in the any abuse regressions the samples fall from around 500,000 and 80,000 to around 17,000 and 12,000, respectively. For neonatal mortality, the estimated effects are similar, at 0.7 (0.6) percentage points for any (physical) abuse but are no longer statistically significant at the 5% level of significance. For low birth weight the effect size is very similar to our estimation results from before for any abuse, but smaller for physical violence and in both specifications no longer significant. For stunting and wasting, results are almost identical to our estimation results from before. Overall, the effect size is reasonably robust even when using only the sample of children exposed to recent violence.

6 Conclusion

This paper gives preliminary results on the relationship between domestic abuse faced by mothers on health outcomes of their children in developing countries, where large fractions of poor women are victims of domestic abuse. We are able to utilize comparable data on nationally representative samples of 0.6 million children born between 1975 and 2013 from thirty different developing countries. This data includes numerous measures of domestic abuse, allowing us to investigate the relationship between individual domestic abuse measures and child health outcomes.

[12] Note that we do not need to make such restrictions on the stunting and wasting sample as these are measured conditional on being present in the household at the time of the survey.

We find statistically significant and sizeable effects of domestic abuse on child mortality. Children born to mothers who are victims of domestic abuse are 0.4 percentage points more likely to die within thirty days, 0.9 percentage points more likely to die within a year and 1.5 percentage points more likely to die within the first five years of being born compared to similar children born to mothers who are not victims. We also find a negative effect of domestic abuse on the probability that a child has low birth weight and a negative effect of physical violence on the probability that a child is stunted, but little or no effects of domestic abuse on a child being wasted. We plan to continue to investigate these patterns and mechanisms behind these patterns in future work.

Our work provides a first, systematic analysis quantifying the relationship between various forms of domestic abuse and child health measures in a developing country context. Our results have implications for the costs of domestic violence beyond costs borne directly by the mother and in understanding the child health production process in developing countries where domestic violence may be faced by up to two thirds of ever partnered women.

Tables and Figures

TABLE 1
DHS Countries and Survey Years used in estimation

Country	DHS Survey Years
Azerbaijan	2006[§*]
Bangladesh	2007[†‡§]
Burkina Faso	2010[§]
Cambodia	2000[§], 2005-06
Cameroon	2004[*], 2011[§*]
Colombia	2000, 2004-05[*], 2009-10[‡§*]
Democratic Republic of Congo (DRC)	2007[*]
Dominican Republic	2002, 2007
Gabon	2012[§*]
Ghana	2008[§*]
Haiti	2000[§], 2005-06[§*]
India	2005-06[§]
Jordan	2007
Kenya	2003[§], 2008-09[§]
Kyrgyz Republic	2012[§*]
Liberia	2006-07[§]
Malawi	2004-05[§*], 2010[§*]
Mali	2006[§]
Moldova	2005[§*]
Mozambique	2011[§*]
Pakistan	2012-2013[†§]
Peru	2000[§], 2010-2012[§]
Philippines	2008[*]
Rwanda	2005[§], 2010-11[‡§*]
Sao Tome and Principe (STP)	2008-09 [§*]
Tajikistan	2012[§*]
Tanzania	2009-10[§*]
Timor Leste	2009-10[§*]
Uganda	2006[*], 2011[§*]
Ukraine	2007[*]

[†] Information not collected on sexual abuse.
[‡] Information not collected on emotional abuse.
[§] Information collected on mother height.
[*] Information collected on violence during pregnancy.

TABLE 2

Child outcomes

	Spouse abuse		Physical violence		Emotional abuse		Sexual abuse		Hit during any pregnancy	
	1	0	1	0	1	0	1	0	1	0
Neonatal mortality	0.036	0.032	0.037	0.031	0.035	0.034	0.034	0.032	0.027	0.025
N	220257	392508	205915	486774	126631	126631	56684	611683	13170	249101
Infant mortality	0.075	0.066	0.074	0.064	0.073	0.068	0.074	0.065	0.068	0.058
N	210263	371227	197282	460801	121004	473788	54099	580629	12401	235495
Under 5 mortality	0.110	0.097	0.107	0.094	0.108	0.101	0.111	0.096	0.106	0.085
N	163263	286523	154828	356306	94336	366052	42062	450268	9361	180153
Low birth weight	0.183	0.169	0.185	0.170	0.184	0.172	0.184	0.172	0.160	0.153
N	36004	70240	29693	82750	22651	86835	9001	100377	2791	49206
Stunted child height	0.282	0.253	0.285	0.243	0.262	0.266	0.306	0.248	0.229	0.222
N	40147	76043	37793	94918	21970	96643	9818	118421	2442	49338
Wasted child weight	0.152	0.151	0.152	0.140	0.132	0.156	0.146	0.140	0.085	0.082
N	40151	75185	37863	94107	22068	95828	9816	117556	2458	49339

Notes: Entries indicate the mean value of the row outcome in the sample or sub-sample indicated by the column; N is the number of observations used to estimate this mean value.

TABLE 3

Impact on neonatal mortality

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.004	0.004*	0.004*	0.004*
	(0.003)	(0.002)	(0.002)	(0.002)
Mother height				-0.001***
				(0.000)
Observations	612765	612765	612765	497295
B: Physical abuse				
Spousal physical abuse	0.006	0.004*	0.004*	0.004*
	(0.003)	(0.002)	(0.002)	(0.002)
Mother height				-0.001***
				(0.000)
Observations	692689	692689	692689	574402
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 4

Impact on infant mortality

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.009	0.007**	0.008**	0.009**
	(0.006)	(0.002)	(0.003)	(0.002)
Mother height				-0.001***
				(0.000)
Observations	581490	581490	581490	471931
B: Physical abuse				
Spousal physical abuse	0.010	0.006*	0.007**	0.008**
	(0.006)	(0.002)	(0.003)	(0.003)
Mother height				-0.001***
				(0.000)
Observations	658083	658083	658083	545841
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 5

Impact on under-5 mortality

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.013	0.010**	0.014***	0.015***
	(0.010)	(0.003)	(0.003)	(0.003)
Mother height				-0.002***
				(0.000)
Observations	449786	449786	449786	364439
B: Physical abuse				
Spousal physical abuse	0.013	0.008*	0.012**	0.013**
	(0.009)	(0.004)	(0.004)	(0.004)
Mother height				-0.001***
				(0.000)
Observations	511134	511134	511134	423606
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 6

Impact on low birth weight

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.015	0.013*	0.015**	0.018**
	(0.007)	(0.006)	(0.005)	(0.006)
Mother height				-0.003**
				(0.001)
Observations	106244	106244	106244	79756
B: Physical abuse				
Spousal physical abuse	0.015*	0.013*	0.015**	0.019**
	(0.007)	(0.006)	(0.005)	(0.006)
Mother height				-0.003**
				(0.001)
Observations	112443	112443	112443	85871
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 7

Impact on stunting

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.029	0.022*	0.011	0.011
	(0.018)	(0.008)	(0.006)	(0.005)
Mother height				-0.010***
				(0.001)
Observations	116190	116190	116190	113645
B: Physical abuse				
Spousal physical abuse	0.042*	0.029**	0.015*	0.014*
	(0.018)	(0.008)	(0.006)	(0.005)
Mother height				-0.010***
				(0.001)
Observations	132711	132711	132711	129834
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 8

Impact on wasting

	(I)	(II)	(III)	(IV)
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.001	0.006	0.003	0.003
	(0.014)	(0.008)	(0.005)	(0.005)
Mother height				-0.001
				(0.001)
Observations	115336	115336	115336	112797
B: Physical abuse				
Spousal physical abuse	0.012	0.010	0.004	0.004
	(0.014)	(0.007)	(0.004)	(0.004)
Mother height				-0.001
				(0.001)
Observations	131970	131970	131970	129098
X Controls		Y	Y	Y
Country Year FE			Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner. Estimation samples differ across Panels A and B since item non-response varies across the domestic violence measures. Column (I) includes no controls; Column (II) includes X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; Column (III) includes country-year fixed effects for the child's year of birth; Column (IV) additionally includes mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 9

Impact of being hit during any pregnancy

	Neonatal Mortality	Infant Mortality	Under-5 Mortality
Hit during any pregnancy	0.001	0.006*	0.012*
	(0.001)	(0.002)	(0.005)
Observations	262271	247896	189514
X Controls	Y	Y	Y
Country Year FE	Y	Y	Y
	Low Birth Weight	Stunted	Wasting
Hit during any pregnancy	0.011	-0.002	0.004
	(0.008)	(0.008)	(0.006)
Observations	51997	51780	51797
X Controls	Y	Y	Y
Country Year FE	Y	Y	Y

Notes: X controls are child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview. Country-year fixed effects for the child's year of birth are included. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 10

Differential impact of different domestic violence measures on child health

	(I)	(II)	(III)	(IV)	(V)	(VI)
Physical Violence	0.004***	0.007***	0.011***	0.011***	0.015***	0.005
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Emotional Abuse	0.002*	0.003**	0.005***	0.001	-0.009*	-0.000
	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)	(0.003)
Sexual Abuse	-0.001	0.000	0.002	0.014**	0.011*	0.001
	(0.001)	(0.001)	(0.002)	(0.005)	(0.005)	(0.004)
Observations	612765	581490	449786	106244	116190	115336
X Controls	Y	Y	Y	Y	Y	Y
Country Year FE	Y	Y	Y	Y	Y	Y

Notes: From left to right, the dependent variable is (I) neonatal mortality, (II) infant mortality, (III) under-5 mortality, (IV) low birth weight, (V) stunting, (VI) wasting. X controls are child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview. Mother height and country-year fixed effects for the child's year of birth are included. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 11

Income gradients in health: mortality measures

	(I)		(II)		(III)	
Physical Violence		0.004*		0.007**		0.012**
		(0.002)		(0.003)		(0.004)
Mother has primary schooling	-0.008**	-0.008**	-0.018***	-0.018***	-0.028***	-0.028***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Mother has secondary schooling	-0.012**	-0.012**	-0.027***	-0.027***	-0.042***	-0.041***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.004)
Mother has higher schooling	-0.011*	-0.011*	-0.025***	-0.024***	-0.037***	-0.036***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)
Father has primary schooling	-0.003***	-0.003***	-0.008***	-0.008***	-0.015***	-0.015***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.002)
Father has secondary schooling	-0.006***	-0.006***	-0.016***	-0.016***	-0.028***	-0.028***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Father has higher schooling	-0.009***	-0.009***	-0.022***	-0.022***	-0.036***	-0.035***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)
Observations	692689	692689	658083	658083	511134	511134
X Controls	Y	Y	Y	Y	Y	Y
Country Year FE	Y	Y	Y	Y	Y	Y

Notes: From left to right, the dependent variable is (I) neonatal mortality, (II) infant mortality, and (III) under-5 mortality. X controls are child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview. Mother height and country-year fixed effects for the child's year of birth are included. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 12

Income gradients in health: anthropometric measures

	(I)		(II)		(III)	
Physical Violence		0.015**		0.015*		0.004
		(0.005)		(0.006)		(0.004)
Mother has primary schooling	-0.017	-0.018	-0.042***	-0.041***	-0.032***	-0.032***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.007)
Mother has secondary schooling	-0.048***	-0.048***	-0.110***	-0.110***	-0.048***	-0.048***
	(0.011)	(0.011)	(0.010)	(0.009)	(0.009)	(0.009)
Mother has higher schooling	-0.071***	-0.071***	-0.139***	-0.137***	-0.059***	-0.058***
	(0.013)	(0.013)	(0.017)	(0.016)	(0.015)	(0.015)
Father has primary schooling	-0.021*	-0.021*	-0.021*	-0.021*	-0.028**	-0.028**
	(0.008)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
Father has secondary schooling	-0.032***	-0.032***	-0.064***	-0.064***	-0.030**	-0.030**
	(0.008)	(0.008)	(0.006)	(0.006)	(0.008)	(0.008)
Father has higher schooling	-0.045***	-0.045***	-0.094***	-0.093***	-0.040***	-0.040***
	(0.009)	(0.009)	(0.014)	(0.013)	(0.009)	(0.008)
Observations	112443	112443	132711	132711	131970	131970
X Controls	Y	Y	Y	Y	Y	Y
Country Year FE	Y	Y	Y	Y	Y	Y

Notes: From left to right, the dependent variable is (I) low birth weight, (II) stunting, and (III) wasting. X controls are child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview. Mother height and country-year fixed effects for the child's year of birth are included. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

TABLE 13

Violence in the last 12 months

	Neonatal Mortality	Low birth weight	Stunting	Wasting
A: Any of physical, emotional or sexual abuse				
Spousal abuse	0.007	0.015	0.008	0.005
	(0.003)	(0.010)	(0.006)	(0.006)
Observations	17335	12061	81967	81243
B: Physical abuse				
Spousal physical abuse	0.006	0.008	0.012*	0.005
	(0.004)	(0.010)	(0.005)	(0.005)
Observations	24467	13981	113687	113051
X Controls	Y	Y	Y	Y
Country Year FE	Y	Y	Y	Y
Mother Height	Y	Y	Y	Y

Notes: In Panel A, the regressor of interest is an indicator for whether the mother experienced any of physical, emotional or sexual abuse from her partner in the last 12 months. In Panel B, the regressor of interest is an indicator for whether the mother experienced any physical violence at the hands of her partner in the last 12 months. Controls include X controls: child gender, birth order and year of birth, mother's age at birth and education, father's education, urban status of the household, and indicators for year of interview; country-year fixed effects for the child's year of birth; mother height. (*) indicates statistical significance at the 5% level, (**) indicates statistical significance at the 1% level and (***) indicates statistical significance at the 0.1% level.

Figure 1

Map of countries included in analysis

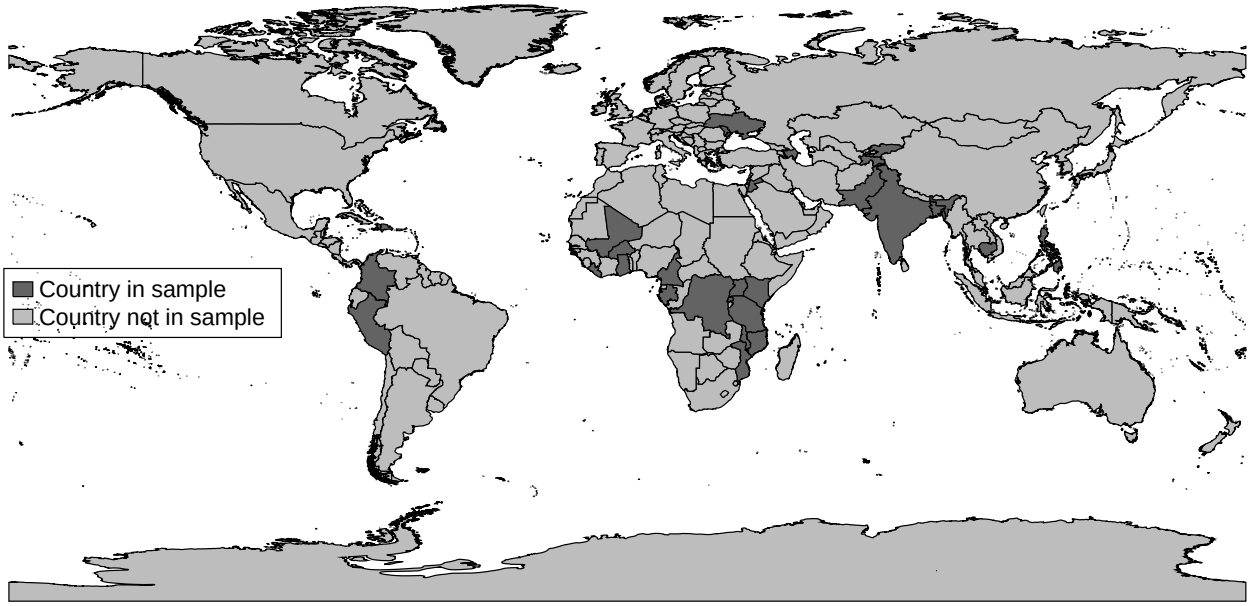
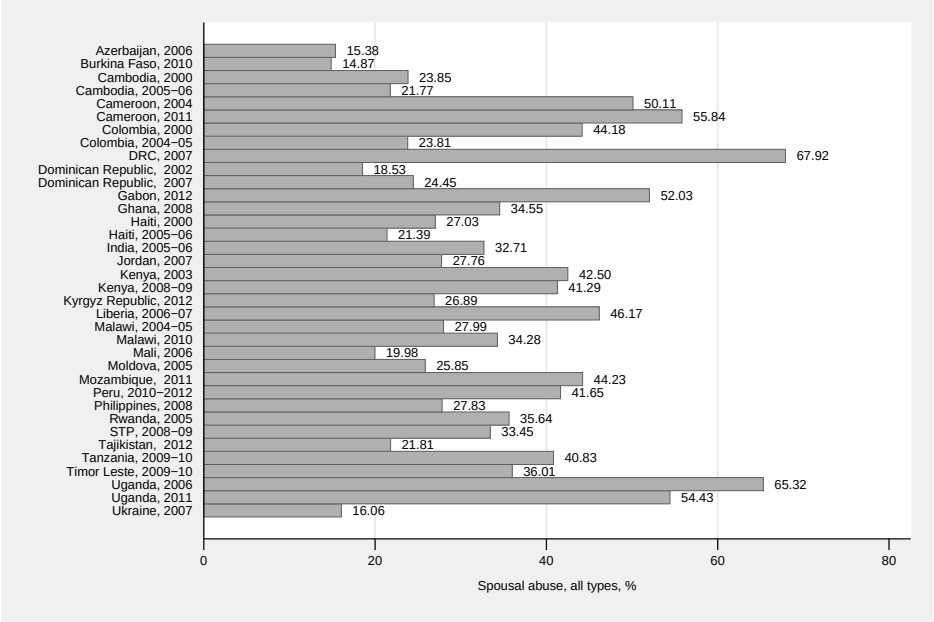
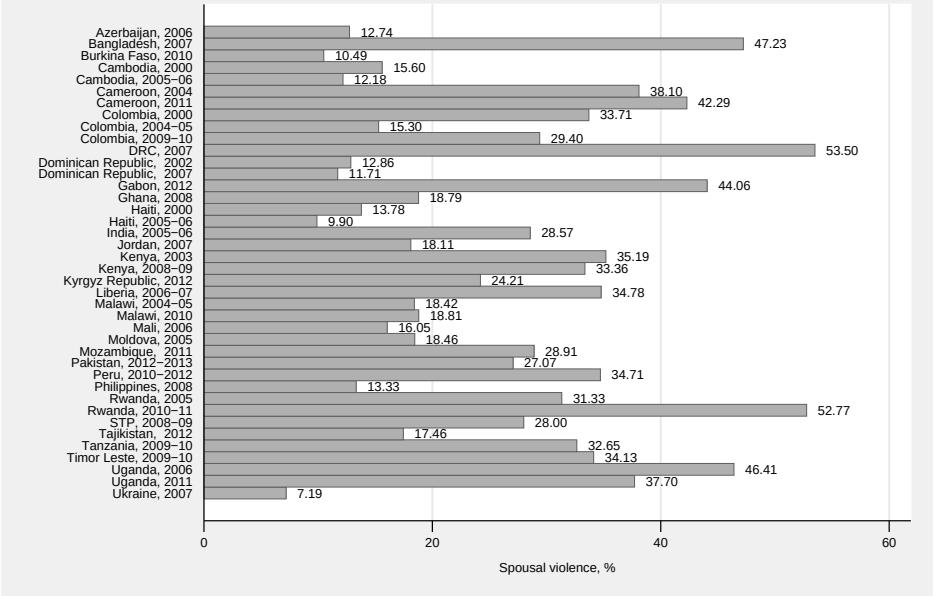


Figure 2
Domestic abuse measures by DHS survey

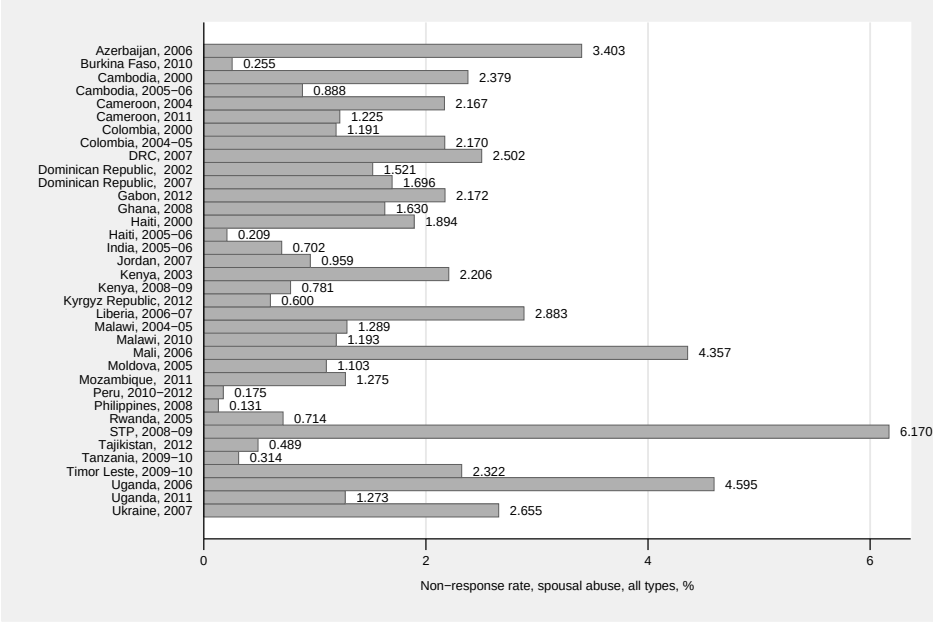


(a) Spouse abuse

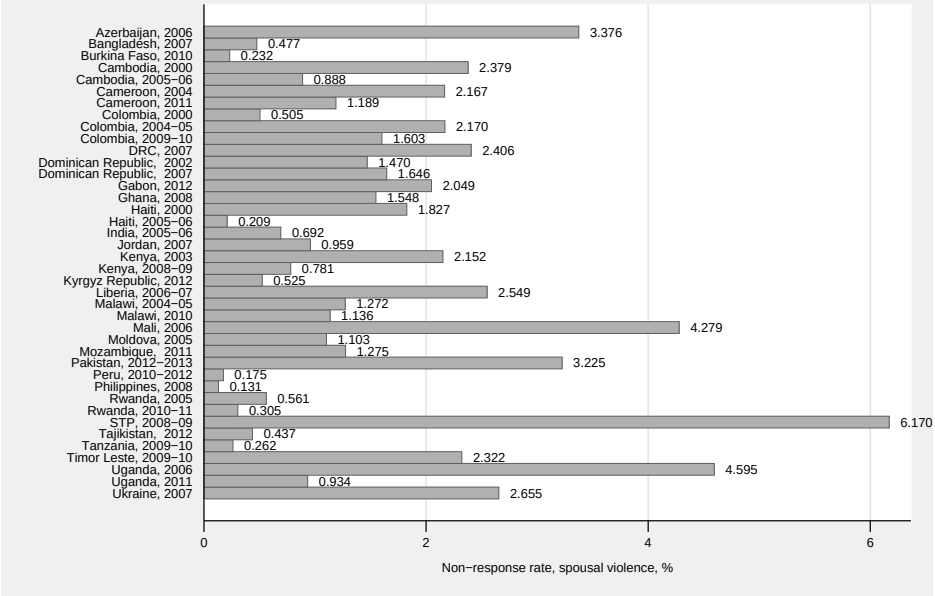


(b) Spouse violence

Figure 3
Non-response in domestic abuse measures by DHS survey

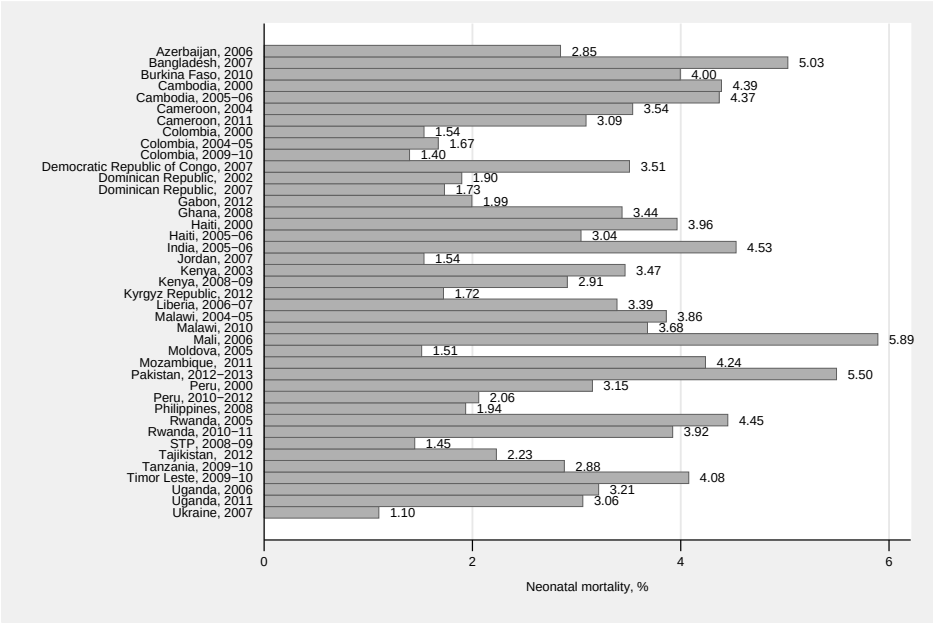


(a) Spouse abuse

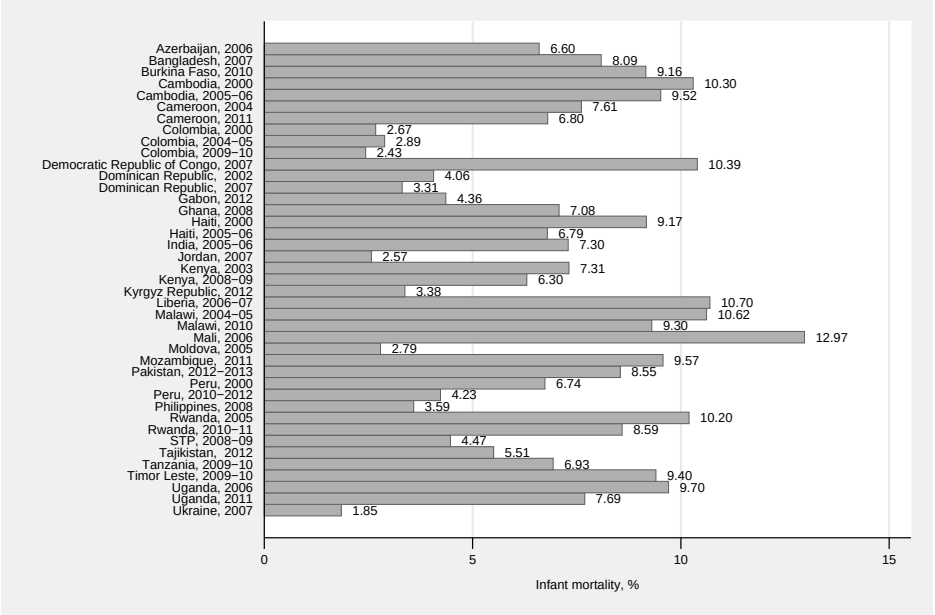


(b) Spouse violence

Figure 4
Child health measures by DHS survey

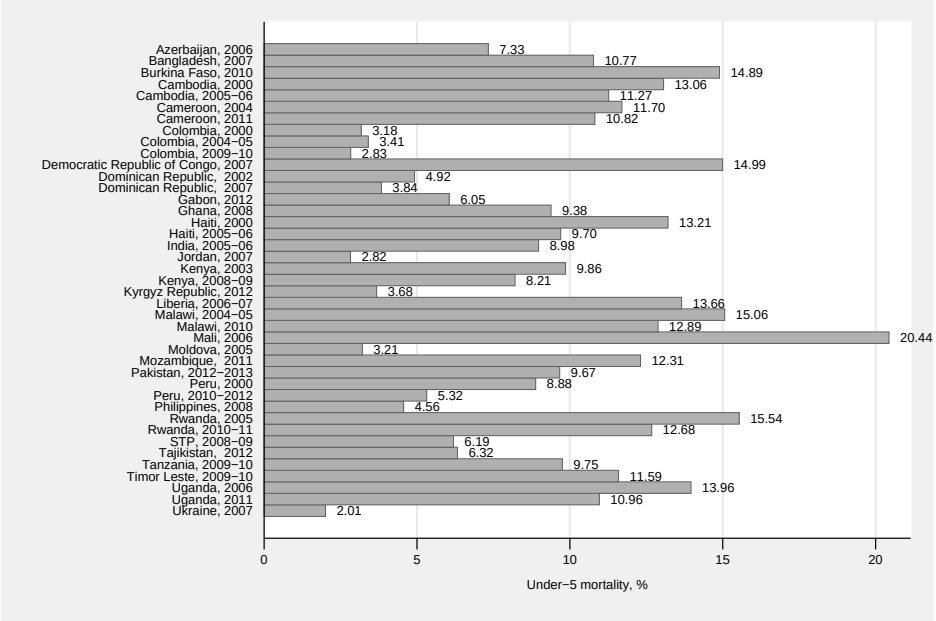


(a) Fraction of children dying within a month of being born, among those born at least a month ago

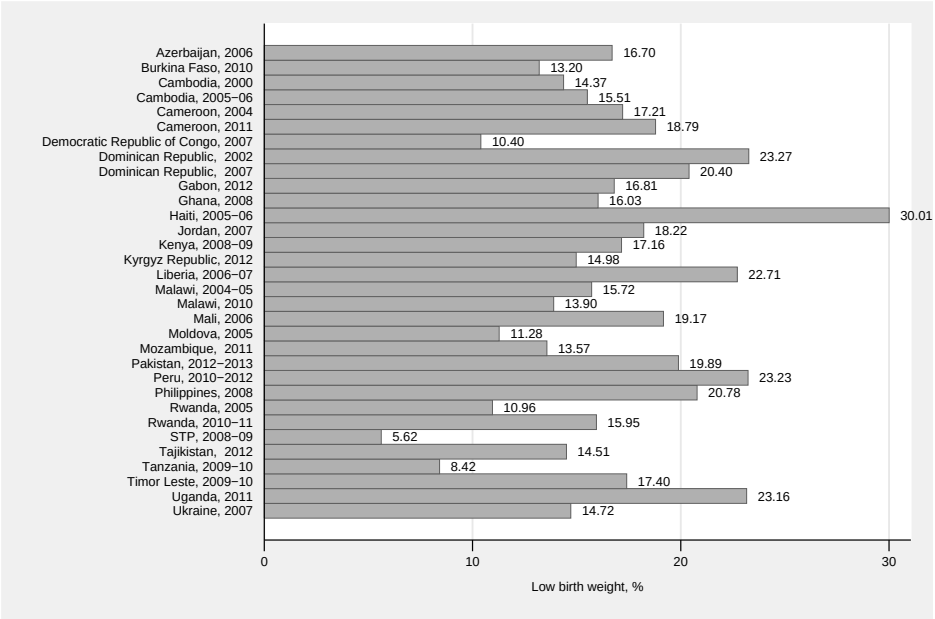


(b) Fraction of children dying within a year of being born, among those born at least a year ago

Figure 4
Child health measures by DHS survey

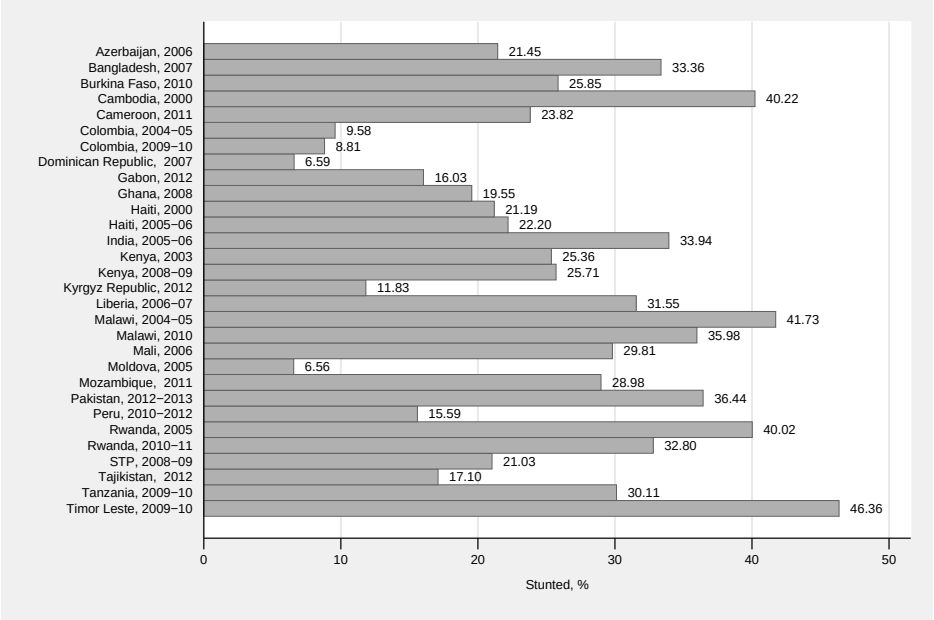


(c) Fraction of children dying within five years of being born, among those born at least five years ago

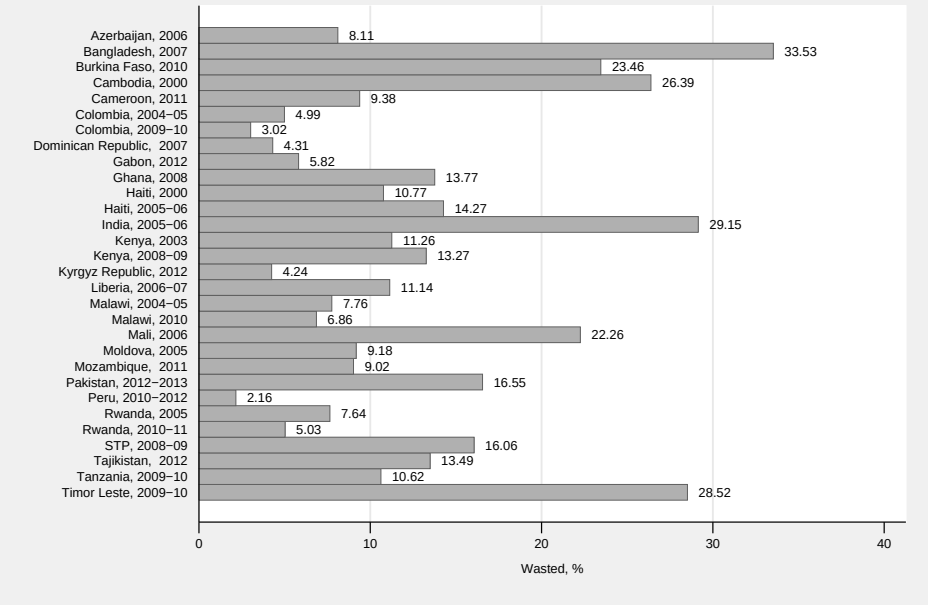


(d) Fraction of children with low birth weight

Figure 4
Child health measures by DHS survey

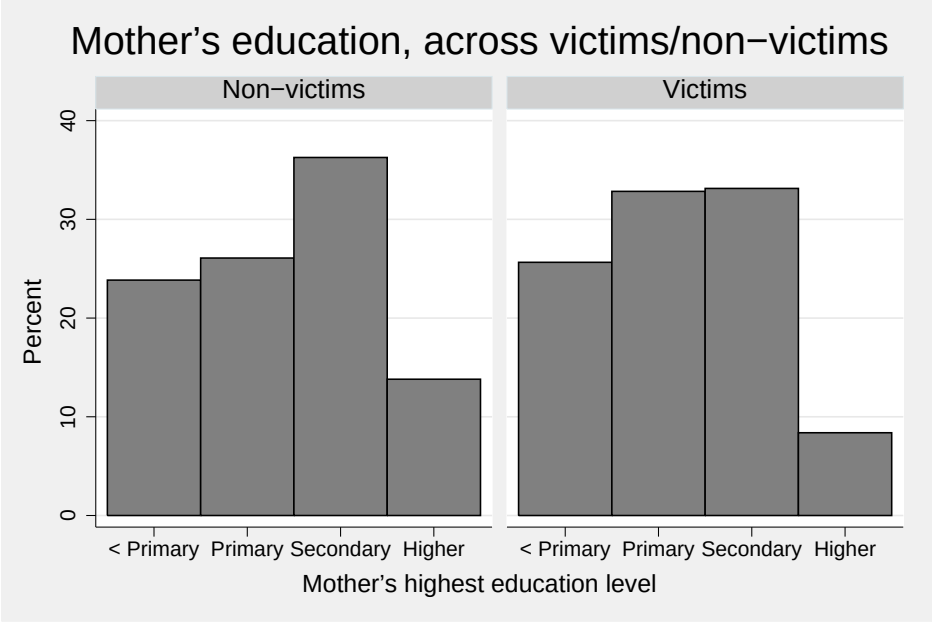


(e) Fraction of children stunted, among those who survive

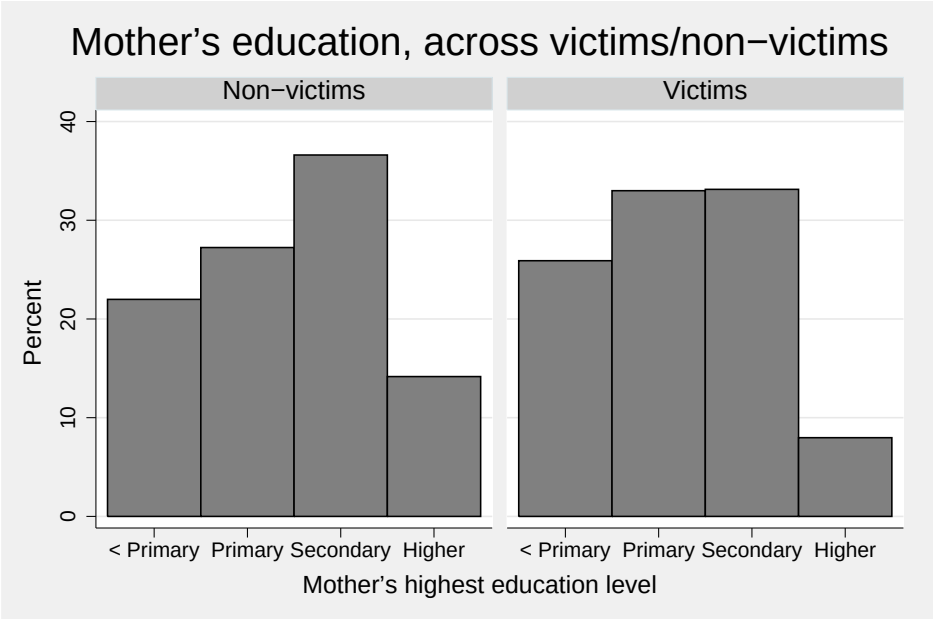


(f) Fraction of children wasted, among those who survive

Figure 5
Mother education across victims/non-victims in the neo-natal sample

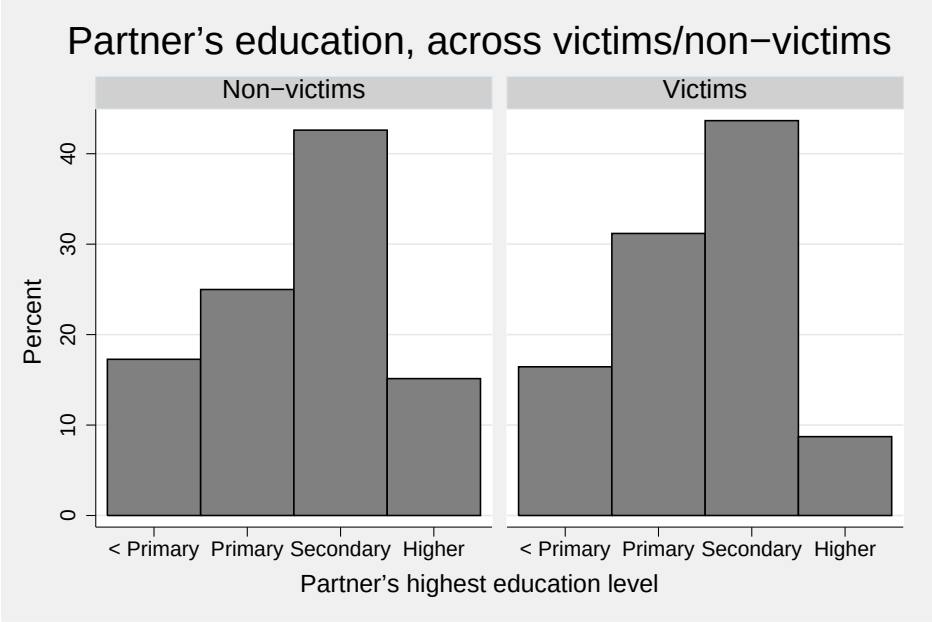


(a) Spouse abuse

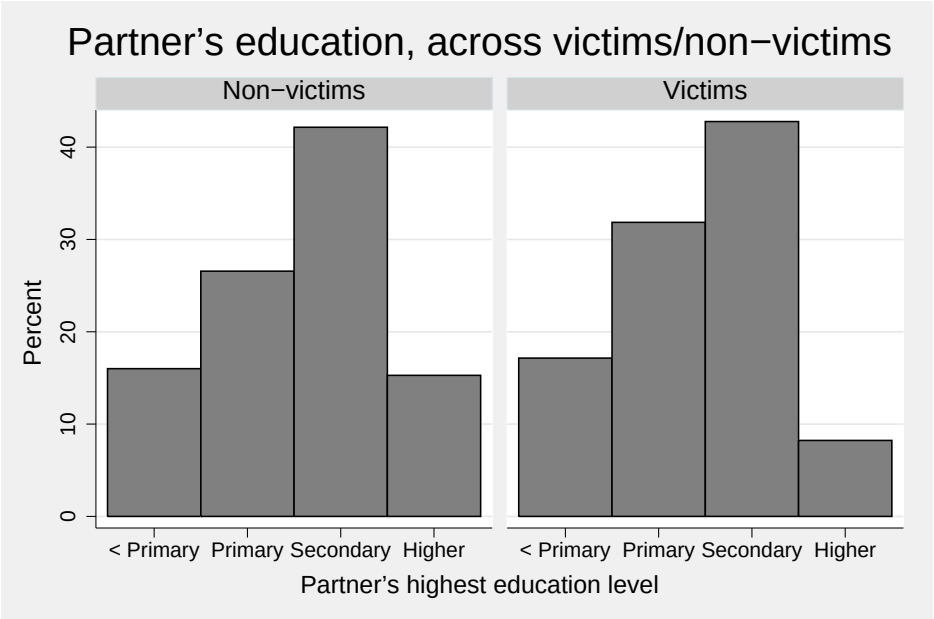


(b) Spouse violence

Figure 6
Partner education across victims/non-victims in the neo-natal sample



(a) Spouse abuse



(b) Spouse violence

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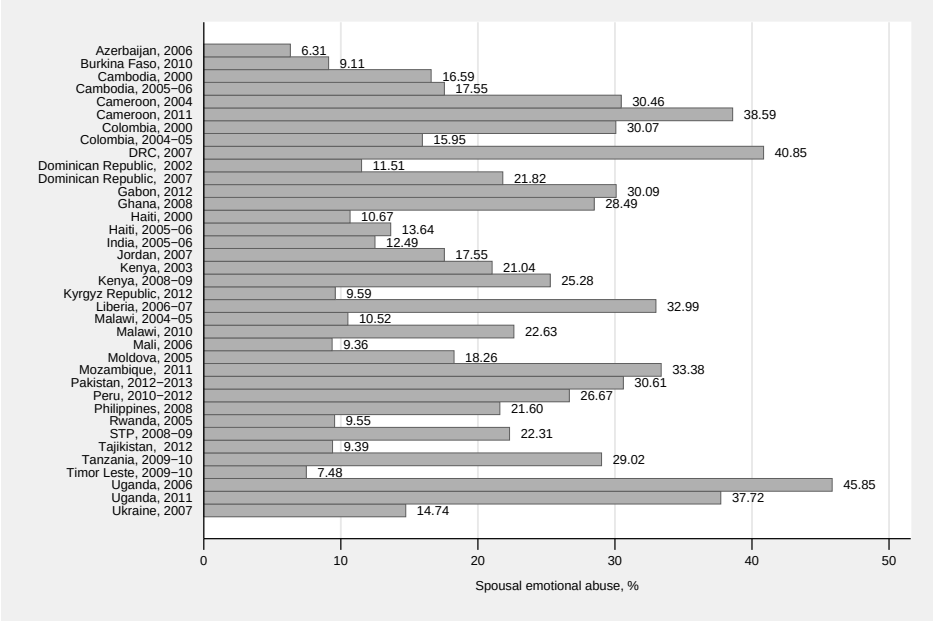
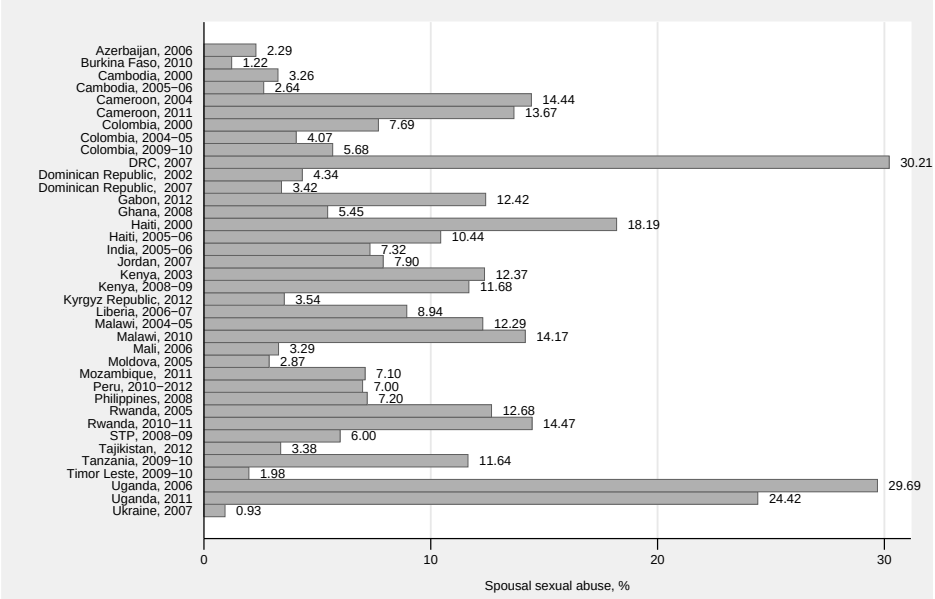
A Appendix Figures

Figure A-1
Domestic abuse measures by DHS survey

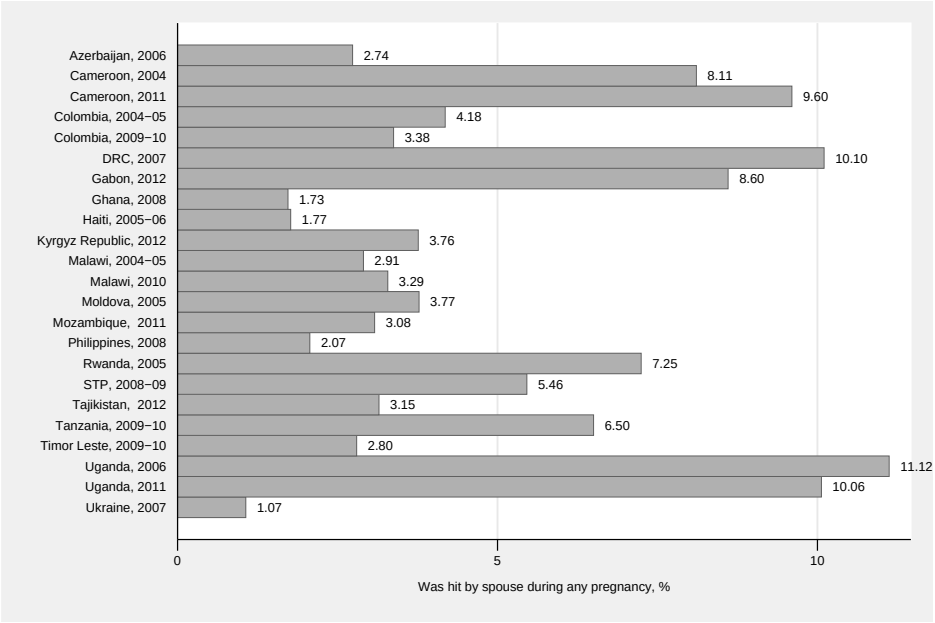


(a) Emotional abuse



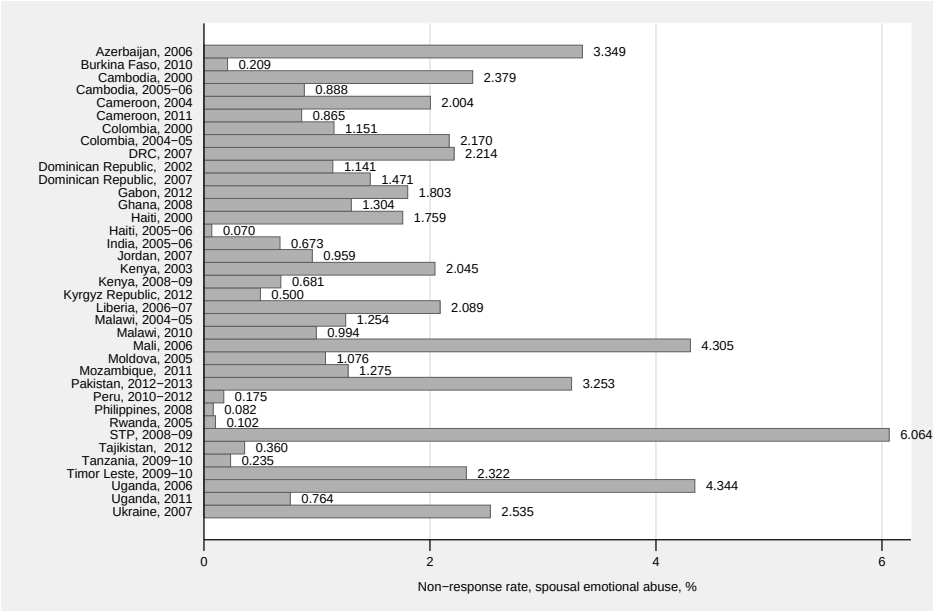
(b) Spouse sexual abuse

Figure A-1
Domestic abuse measures by DHS survey



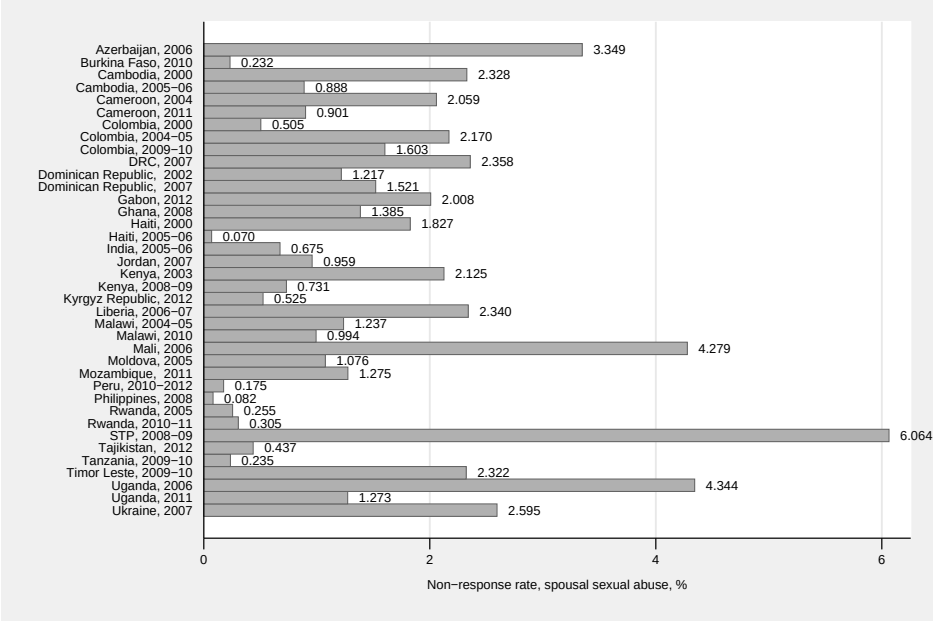
(c) Hit while pregnant

Figure A-2
Non-response in domestic abuse measures by DHS survey

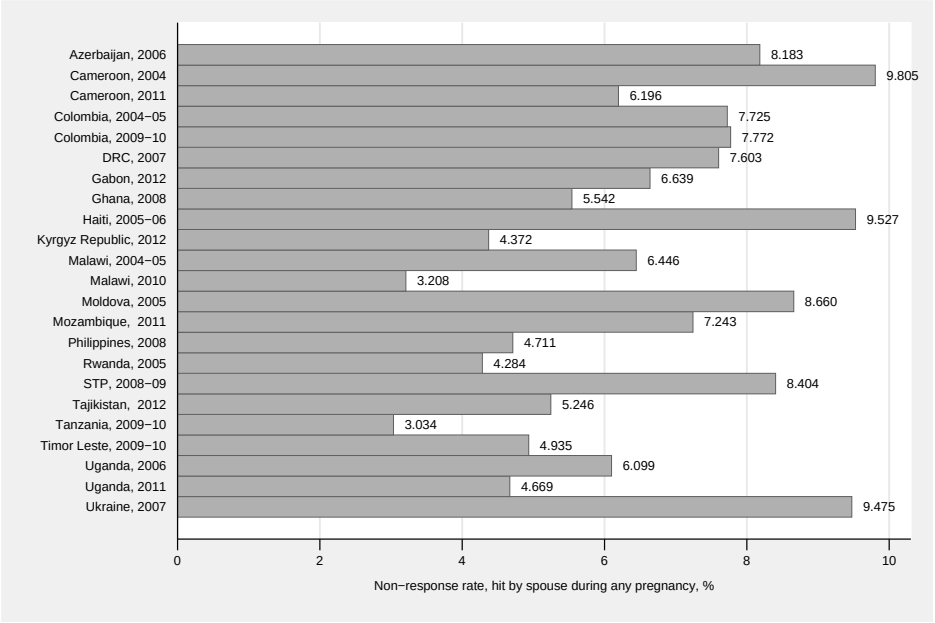


(a) Emotional abuse

Figure A-2
Non-response in domestic abuse measures by DHS survey

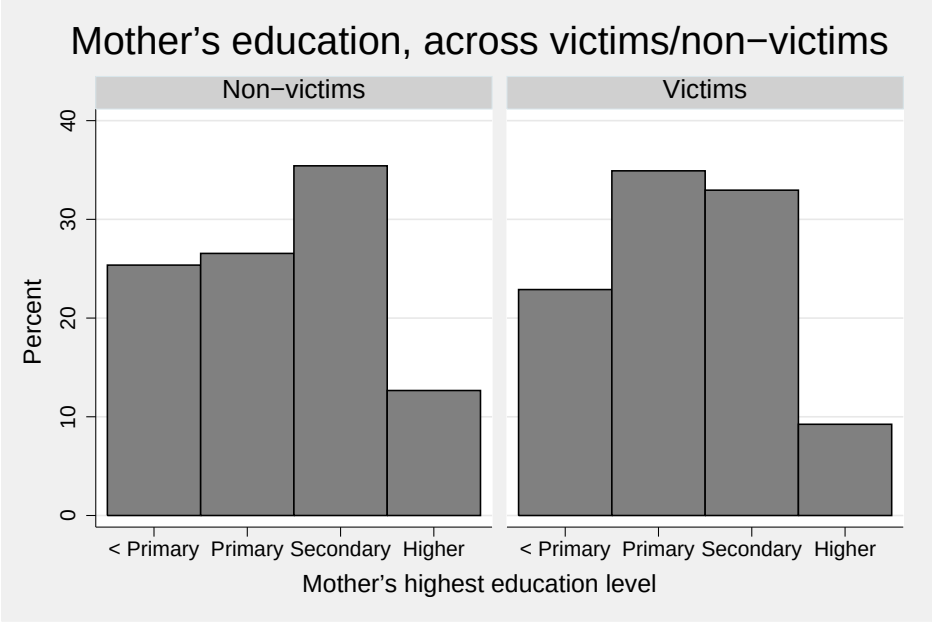


(b) Spouse sexual abuse

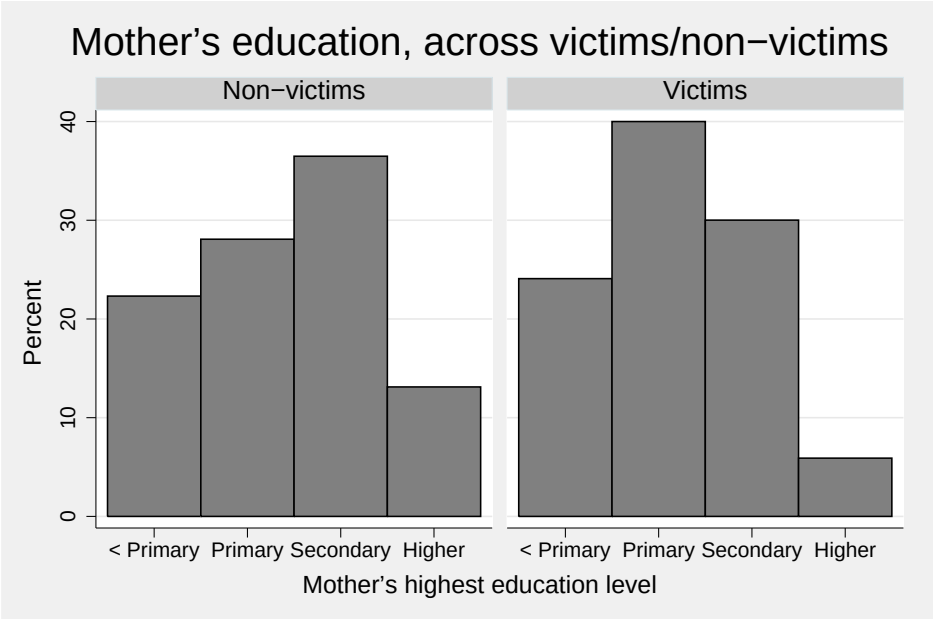


(c) Hit while pregnant

Figure A-3
Mother education across victims/non-victims in the neo-natal sample

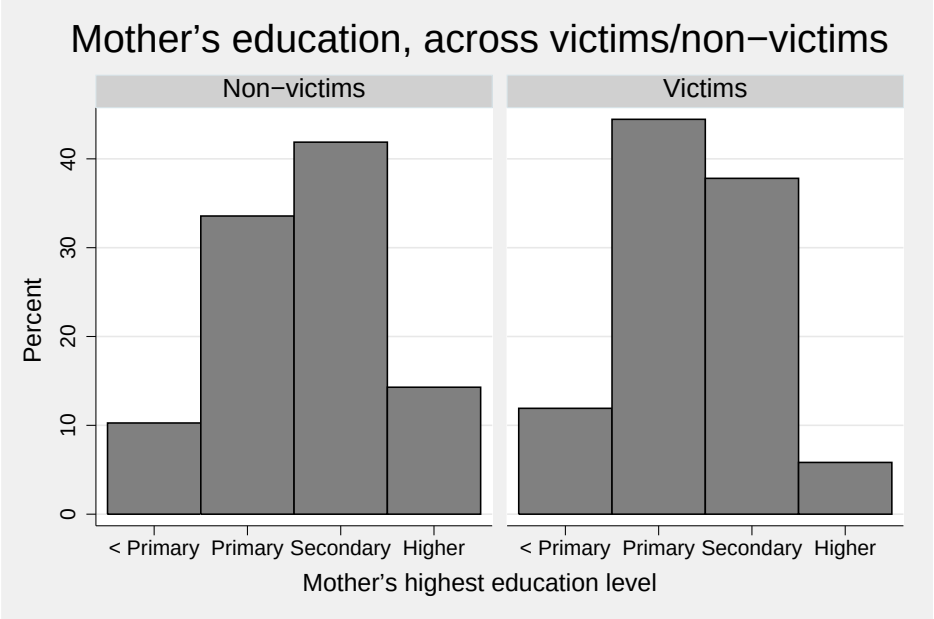


(a) Emotional abuse



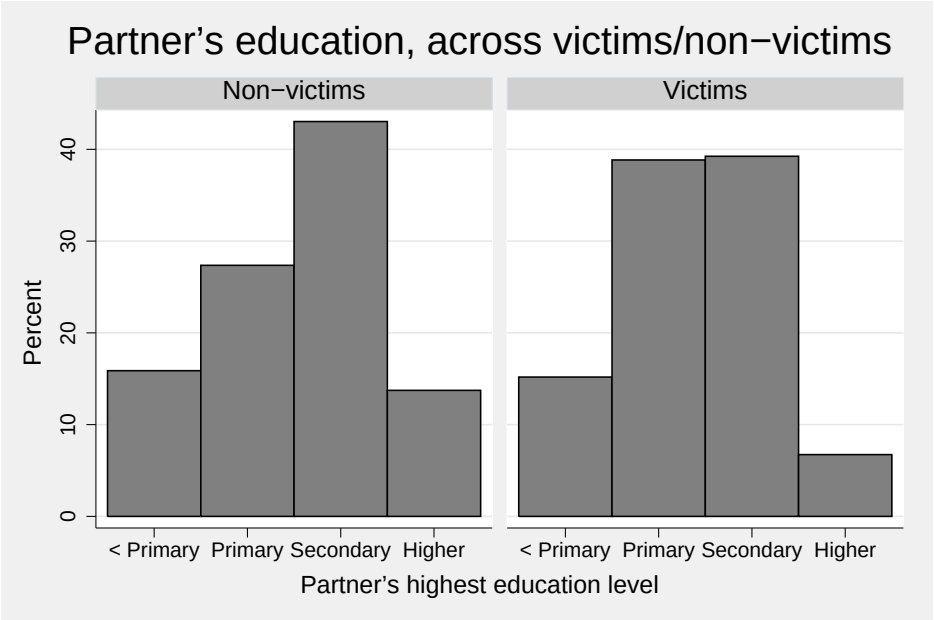
(b) Spouse sexual abuse

Figure A-3
Mother education across victims/non-victims in the neo-natal sample



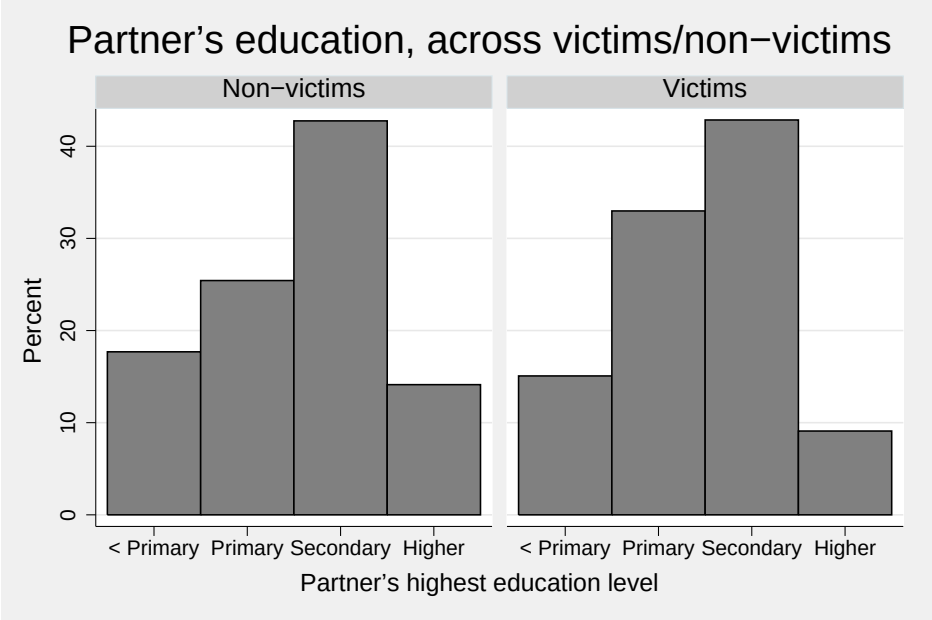
(c) Hit during any pregnancy

Figure A-4
Partner education across victims/non-victims in the neo-natal sample

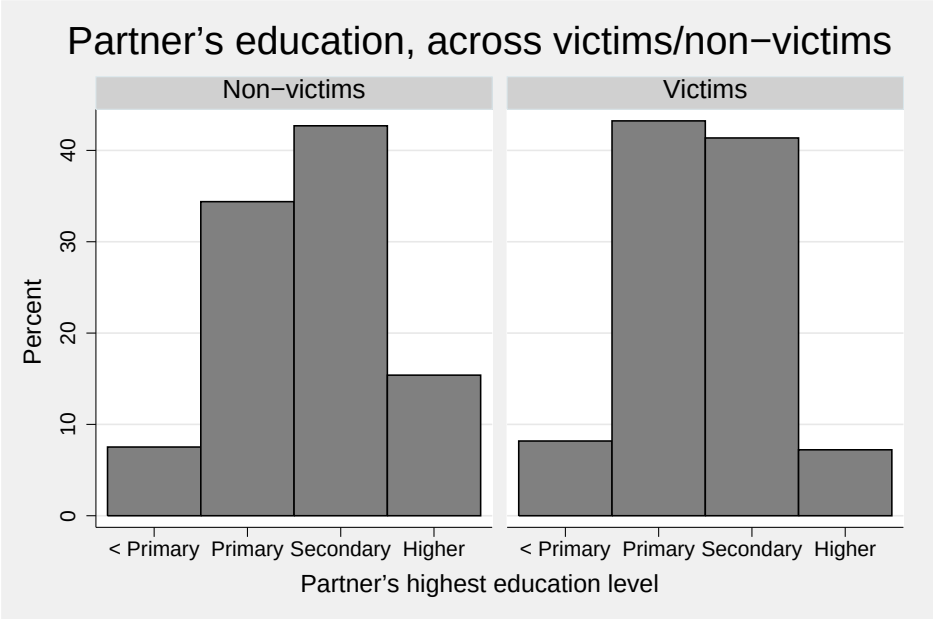


(a) Spouse sexual abuse

Figure A-4
Partner education across victims/non-victims in the neo-natal sample



(b) Emotional abuse



(c) Hit during any pregnancy