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ABSTRACT

Domestic Violence and Child Mortality*

We examine the effect of domestic violence on mortality of children born to female victims using Demographic and Health Survey (DHS) data across thirty two different developing countries. We start by examining associations between interpersonal violence and child mortality while controlling for potential confounds. We find that children of (ever) victimized mothers are 0.4 pp more likely to die within thirty days, 0.7 pp more likely to die within a year and 1.1 pp more likely to die within the first five years of being born in comparison with children born to mothers who never experienced violence. We find similar patterns when examining the effect of violence taking place in the last twelve months on female victims and their children. Our results are similar when we use matching methods. We also examine the causal effect of violence on child mortality using an instrumental variables strategy. Exploiting variation in domestic violence and marital rape laws across countries and over time, we find that laws that criminalize violence against women and/or marital rape lower its incidence. Using this as an exogenous source of variation in domestic violence, we find that children born within the last twelve months to female victims were 3.7 pp more likely to die in the first thirty days of life. Our results indicate significant externalities to violence against women and underline the importance of recent efforts to tackle this violence in developing countries.

JEL Classification: I14, J12, J13

Keywords: child mortality, domestic violence

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1 Introduction

Domestic violence, defined as physical and/or sexual violence 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 violence has 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. It is also more likely to occur during early marriage and pregnancy (see Amaro H and Zuckerman, 1990; Stewart and Cecutti, 1993; Kishor and Johnson, 2004, as well as references cited therein). When children are young, they rely heavily on maternal care so that they may be affected indirectly by maternal exposure to violence (Yount et al., 2011). In particular, domestic violence may impact maternal physical and/or mental health, risk behaviours, use of prenatal care, feeding practices, and infant and toddler care, all of which may impact a child's nutrition and development (Yount et al., 2011). There may therefore be negative externalities of such violence on children of female victims including negative effects on their health.

Existing empirical research on the relationship between domestic violence and child health, mostly in the field of public health and medicine, has documented a negative correlation between the two (see Yount et al., 2011, for a review). However, much of this literature uses small non-random samples from developed countries and does not account for omitted variables which are potentially correlated with both domestic violence and child health. We use nationally representative data sets from thirty-two developing countries to investigate the relationship between domestic violence and child mortality for the developing world and use identification strategies to address potential omitted variables bias in our estimations.

A number of studies examine the relationship between domestic physical violence and child health using large-scale data sets, most of which focus on the health of children born to domestic violence victims from the US. Silverman et al. (2006) use data on women giving birth in 26 US states as part of the 2000-2003 Pregnancy Risk Assessment Monitoring System and find 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). Another study

by Aizer (2011) uses data on female hospitalizations and birth outcomes for the state of California between 1991 and 2002. She finds that serious incidents of domestic violence, where serious is defined as resulting in hospitalization, cause a reduction in birth weight of 163 grams. More recently, Currie et al. (2018) examine the impact of violence during pregnancy on infant health outcomes using linked administrative data from New York City and find a robust negative effect of assaults on birth outcomes.

A key contribution of our paper is the use of data from the Demographic and Health Surveys (DHS), containing comparable information on domestic violence and child health across a wide range of developing countries. This data allows us to utilize information on approximately 0.79 million children born between 1975 and 2016 in our baseline estimations. We are not aware of any other empirical work of this scope which has been carried out in the developing world where large fractions of poor women are victims of domestic violence. Furthermore we use identification strategies to examine the causal relationship between domestic violence faced by mothers and mortality of their children.

We are able to quantify the association between physical and sexual violence by intimate partners on child mortality at thirty days, one year and five years after birth. We condition on a comprehensive set of controls, including mother's long term health. This allows us to compare mortality of children whose mothers have been victims of violence to those of reasonably similar children whose mothers have not been victims. We make this comparison using multiple regression (controlling for X confounds) and matching (where we match on X characteristics), finding similar results across the two methods.

In our baseline specification, we find that children born in families where the mother was (ever) a victim of domestic violence are 0.4 percentage points more likely to die within thirty days, 0.7 percentage points more likely to die within a year and 1.1 percentage points more likely to die within five years of being born compared to similar children whose mothers are not victims of domestic violence. 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, 6.5% of all children born to non-victims die within one year and 9.6% of all children born to non-victims die within five years of being born. These effects are found after inclusion of a comprehensive set of controls and are similar to when we match victims to non-victims on observable characteristics. Our results are robust to inclusion of maternal health.

Since use of domestic violence variables which measure domestic violence ever faced by the mother may not capture violence to which children were directly exposed, either in utero or after birth, we also use a measure of domestic violence faced by the mother in the twelve months preceding the survey. Using this measure, we can now only investigate neonatal mortality in the last twelve months, to ensure both that children in the sample were born within the last twelve months and were fully exposed to mortality risk. We find similar

results; children whose mothers were a victim of physical violence in the last twelve months are 0.4 percentage points more likely to die within thirty days of being born. This effect is sizeable given that just 2.1% of all children born to non-victims in our sample die within thirty days. Our matching estimates are again similar to results using a linear probability model.

Our baseline specifications suggest a positive association between violence and mortality. We estimate the causal effect of violence on mortality using variation in both domestic violence and rape laws (including marital rape) introduced in different countries at different times as a source of exogenous variation in domestic violence faced by the mother in the twelve months preceding the survey. Using indices for domestic violence and rape laws as instruments for physical violence, we find that laws that criminalise violence against women and/or marital rape lower its incidence. We continue to find a positive relationship between domestic violence and child mortality. We find that children born within the last twelve months were 3.7 percentage points more likely to die in the first thirty days of life if their mother suffered physical violence over the last twelve months. Our findings have significant implications for the external cost of domestic violence beyond costs borne directly by female victims of domestic violence.

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 performs robustness checks, and section 6 concludes.

2 Data

Data for our analysis comes from the Demographic and Health Surveys (DHS).[1] 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 eighteen to forty nine are interviewed and complete fertility histories are collected so that information 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 fifty four surveys from thirty two different countries, all carried out between the years 2000 and 2016.[2]

Inclusion in our estimation sample is conditional on the surveys including the DHS domestic violence questionnaire module. Table A1 lists the surveys used, and Figure A1 shows

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

[2] 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).

a map of countries included in our estimation sample. Given that there are children in the sample who were born as early as 1968, we also restrict our estimation sample to children 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).

2.1 Domestic violence

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 un-partnered. Since information is only collected on one relationship (the most recent), measurement error in exposure to domestic violence ever experienced may occur if an individual has had more than one partner and there are 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).[3]

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

Within the domestic violence module, women are asked seven questions concerning whether the husband had ever carried out any *specific* physical violence acts e.g. pushing, shaking, slapping, twisting the woman's arm, punching, kicking etc. There are also asked three questions concerning sexual violence, e.g. whether her husband had ever physically forced her to have sexual intercourse with him.[4] Our domestic violence measures are constructed from these questions, which include whether or not the woman ever suffered i) physical violence, ii) sexual violence, and iii) either of physical or sexual (*any*) violence.

Whilst all surveys in our estimation sample collect information on physical violence, two surveys carried out in Bangladesh and Pakistan do not collect information on sexual violence. Additionally surveys in Jordan do not ask a complete set of questions concerning sexual violence ever experienced. These surveys are dropped from these regressions. Our estimation sample when examining the effect of physical violence is therefore larger than when examining

[3]Our findings are not significantly different when we include all women; results available on request. We do not need to make this restriction when examining the impact of recent violence on neonatal mortality since experience of violence in the last 12 months relates to the current partner.

[4]There is minor variation across countries in the questions asked; for example, in some surveys, 'country-specific' questions concerning abusive acts are also included. Information on emotional abuse is also collected (e.g. "Has your husband every humiliated you") but we do not use these measures in our analysis as they are more subjective.

the effect on sexual violence or *any* violence (see Table A1).

Since 2005, the DHS domestic violence module has also included questions on whether the types of violence described above were experienced in the last twelve months and we use this in further analysis. Table A2 shows the surveys for which this information is available. Our violence measures are then indicators for whether a woman suffered i) physical violence in the last twelve months, ii) sexual violence in the last twelve months and iii) either of physical or sexual (*any*) violence in the last twelve months.

There are six countries (Bangladesh, Cameroon, Colombia, Jordan, Pakistan, and Rwanda) for which information on sexual violence in the last twelve months is not collected, so that again, our estimation sample when examining the effect of physical violence in the last twelve months is larger than when examining the effect on sexual violence or *any* violence in the last twelve months.

Figure A2 shows the variation in reported physical and sexual violence across surveys 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 domestic violence ever experienced are highest in Asian countries (such as Bangladesh) and in African countries. In the 2007 Democratic Republic of Congo survey the rate of ever experienced physical violence is 53.7%. Rates of sexual violence are also highest in African countries, particularly the Democratic Republic of Congo and Uganda. For all other countries rates of sexual violence are close to or less than 20%.

Rates of physical violence, sexual violence and any violence in the last twelve months are smaller than rates of violence ever experienced (Figure A3). The overall patterns tend to be similar across countries and over time.

2.2 Child mortality

The DHS includes complete fertility histories provided by the woman as well as information on the age of any children at death. This allows us to construct measures of individual child mortality. Note that in contrast to child health measures such as height and/or weight, information on child mortality is not conditional on survival to interview. 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 0.92 million children born between 1975 and 2016 for neonatal mortality, 0.88 million children born between 1975 and 2015 for infant mortality, and 0.68 million children born between

1975 and 2011 for under-five mortality in our baseline specifications when we use measures of violence ever experienced by mothers. These sample sizes are reduced to 0.79, 0.75, and 0.58 million children once we condition on controls. When we examine domestic violence experienced by mothers in the last twelve months our estimation sample is reduced to 40,000 children (approximately 35,000 once conditioning on controls) born in the last 12 months, which we use to examine neonatal mortality only.

Once again we observe across country and time variation in mortality suffered by children in our estimation sample (Figure A4). These mortality rates are higher in African countries such as Mali as well as Asian countries such as Bangladesh and Pakistan. Neonatal mortality reaches a high of 5.96%, infant mortality reaches a high of 13.48% and under-5 mortality reaches a high of 24.10% all in the 2006 Mali survey.

2.3 Descriptive statistics across victims and non-victims

Average mortality is higher amongst victims as compared to non-victims of domestic violence (Figures 1 and 2). Table 1 shows the means of child mortality outcomes, as well as all control variables used in our analysis, across the sub-samples of children whose mothers ever experienced physical violence in comparison with children of mothers who did not.[5] For all mortality measures, average mortality is always higher among sub-samples of children whose mothers were ever victims of physical violence. Table 2 shows the means of neonatal mortality across sub-samples of children whose mothers were or were not victims of physical violence in the twelve months preceding the survey. We can again see that average neonatal mortality is higher among children of victims compared to children of non-victims. This is also true when we compare victims of violence in the last 12 months to those women who ever experienced violence, but not in the last 12 months (Table A7).[6]

While these comparisons strongly suggest a negative association between domestic violence and child mortality, the sub-samples are different in other, potentially important ways. For instance, Table 1 also demonstrates that women who are victims of physical violence are generally less educated than non-victims, and their partners are also less educated compared to partners of non-victims. The same is true when we consider violence in the last twelve months. For the majority of our control variables (discussed in more detail in section 3), there are statistically significant differences across victims and non-victims, when considering both violence ever experienced (Table 1) and violence experienced in the last twelve months (Table 2). This is also true when we compare children born to victims of recent violence vs. those

[5] We use physical violence since this provides us with the largest sample; Appendix Table A3 and A4 shows comparisons when we consider the sub-samples for which we have information on *any* and sexual violence, respectively.

[6] Again, we find similar results when we make these comparisons are for victims of i) any violence (Tables A5 and A6) and ii) sexual violence (Tables A6 and A9).

who did not experience violence in the last 12 months but had previously experienced violence (Table A8). For this reason, in our baseline specifications we control for a comprehensive set of controls, and we also implement matching methods.

3 Empirical Framework

3.1 OLS analysis

Violence ever experienced

Our baseline empirical specification is one in which the relationship between child mortality and domestic violence is estimated using linear probability models or LPM:

$$C_{ijt}^{k} = \alpha_0^{k,l} + \alpha_1^{k,l} V_{ijt}^{l} + X_{ijt}^{'} \alpha_3^{k,l} + \rho_j + \tau_t + \sigma_j t + \epsilon_{ijt}^{k,l} \tag{1}$$

where the dependent variable C_{ijt}^{k} is measure k of child mortality for child i born in country j at time t. We estimate regressions where we use binary indicators for neonatal ($k = neo$), infant ($k = infant$) and under-5 ($k = under5$) mortality for C_{ijt}^{k}. V_{ijt}^{l} is measure l of domestic violence. We investigate (separately) indicators which take the value one if the mother of child i born in country j at time t **ever** experienced physical violence ($l = physical$), sexual violence ($l = sexual$), or physical and/or sexual (any) violence ($l = any$) from their partner.

We include a comprehensive set of control variables X_{ijt} to account for observed differences between children whose mothers are victims of violence and those whose mothers are not victims (see section 2.3). These include child characteristics such as child gender, whether twin, and birth order. They include parent characteristics such as mother and father's education, as well as mother's age.[7] We include household characteristics such as urban status and indicators for whether the household is in the poorest two country-specific quintiles of wealth or richest two country-specific quintiles of wealth; the omitted category is the middle quintile.[8] The DHS data do not contain information on household income, so we use wealth, urban status, and parent education - all of which we might expect to improve child health outcomes - to capture income gradients in health. We include survey-specific fixed effects. Also included are country fixed effects (ρ_j), year of birth fixed effects (τ_t) and country specific

[7] We do not include religion since it is not recorded for all the countries in our sample. However, in section 5, we show that our results are robust to the inclusion of religion dummies.

[8] The DHS wealth index is calculated for each country using information collected on household assets and amenities such as whether the household owns a refrigerator or the type of water supply the household has. Note that the wealth index therefore captures more fixed as opposed to transitory variations in living standards.

trends ($\sigma_j t$). ϵ_{ijt} is the error term. We use robust standard errors which adjust for clustering at the country level.

Violence experienced in the last 12 months

A potential concern with estimation results from (1) is that while we know whether the mother *ever* experienced domestic violence, absent timing on when this occurred, we do not know if the child was exposed to this violence. For instance, a child may have been exposed to violence at age three but was therefore not exposed when at risk of, say, infant mortality. Therefore we also estimate regressions using *recent violence* only

$$C_{ijt}^{neo} = \beta_0^{neo,l} + \beta_1^{neo,l} VR_{ijt}^{l} + X_{ijt}^{'}\beta_3^{neo,l} + \rho_j + \tau_t + \sigma_j t + \epsilon_{ijt}^{neo,l} \tag{2}$$

where VR_{ijt}^{l} indicates whether or not domestic violence occurred in the twelve months preceding the survey. As before, we estimate regressions where we use indicators for VR_{ijt}^{l} which take the value one if the mother of child i born in country j at time t experienced physical violence ($l = physical$), sexual violence ($l = sexual$), and *any* violence ($l = any$) from their partner **over the last twelve months**. These measures are only available for surveys administered after 2005 (see Table A2 for the surveys used). We restrict the sample to births occurring in the twelve months preceding the survey to ensure children were exposed to the violence described by their mother. Thus we estimate equation 2 on the sample of all births in the last 12 months. Here, the dependent variable C_{ijt}^{neo} is an indicator for neonatal mortality only. We do not investigate infant or under-5 mortality measures for this specification since there are no children completely exposed to this mortality risk who were born in the twelve months preceding the survey. This specification therefore has the advantage of pinning down the timing of the violence.

The set of control variables X_{ijt} is the same as in equation (1); also as in equation (1) we include country fixed effects (ρ_j), year of birth fixed effects (τ_t) and country-trends ($\sigma_j t$).[9] As before, we estimate robust standard errors which adjust for clustering at the country level.

3.2 Matching

Tables 1 and 2 highlight the inherent differences in observable characteristics between victims and non-victims of violence. We therefore compare mortality of children born to women who experienced violence to those who did not, using matching methods. We use propensity score

[9]Distinct from equation (1), we omit indicators for survey year since they are now collinear with child birth year.

matching, and for violence ever experienced we match on our set of control variables X_{ijt}, as well as country fixed effects (ρ_j) and year of birth fixed effects (τ_t). For violence experienced in the last 12 months, the reduced sample size leads to perfect predictors, which preclude us matching on year of birth and country fixed effects, so we match on our set of control variables X_{ijt}, an indicator for country, and a child year of birth trend.

3.3 Instrumental variables

Whilst estimation of equations (1) and (2) as well as our use of matching shows the association between domestic violence and mortality controlling for observed characteristics, this relationship may also be driven by additional unobserved variables. To investigate the causal effect of domestic violence on mortality, we use an instrumental variables strategy in which identification comes from the use of indices of domestic violence and rape (including marital rape) laws which vary over countries and/or across time.

In order to measure laws against domestic violence we use data from the 2012 and 2014 edition of the OECD Development Centre's Social Institutions and Gender Index (SIGI).[10] We match the 2012 and 2014 indices by country and survey to nearest year of survey.[11] This index provides a measure of discrimination against women in social institutions across 160 countries and covers all but one of the countries in our sample (Sao Tome and Principe). While the index covers five different dimensions of discriminatory social institutions we focus on the dimension of restricted physical integrity which includes indices capturing whether the legal framework in a country offers women legal protection from domestic violence, and rape.[12]

The SIGI index of laws on domestic violence takes five equidistant values between zero and one. The index assigns the value zero to a country in which there is legislation in place to address domestic violence in the country and additionally where there are no reported problems with implementation of these laws. The value one indicates that there is no legislation in place within the country that addresses domestic violence. Values in between zero and one are assigned to countries where laws exist but there are problems with implementation of those laws (see Table A10 for more information). For ease of interpretation, we invert the indices so that zero is equivalent to no legislation, and one indicates legislation with no

[10] The index data are available at https://stats.oecd.org/, and related information are available at www.genderindex.org.

[11] If a survey is observed in 2013, we use the 2014 value., since this pertains to the country in 2013, whereas the 2012 value pre-dates 2013 and may not reflect any changes that were implemented in 2012 or 2013.

[12] The restricted physical integrity index also contains indices for sexual harassment laws, incidence of female genital mutilation (FGM), and an index of reproductive autonomy. We do not use the index for sexual harassment laws since these do not pertain to domestic violence, specifically, and we do not use information on FGM since again, it does not capture domestic violence in the last 12 months. Finally, we do not use the index for reproductive autonomy since this is itself based in part on the DHS data.

problems in implementation i.e. higher values of this index indicate better legal protection against domestic violence.

The SIGI index of rape laws also takes five equidistant values between zero and one. The index assigns the value of zero to a country in which there is specific legislation in place to address rape; marital rape is included, perpetrators cannot escape prosecution if they marry the victim, and implementation is effectively enforced. The value one is assigned to countries where there is no legislation to address rape, and intermediate values are assigned to countries in which the law does not include marital rape, perpetrators can escape prosecution through marriage, and/or implementation is not effectively enforced (see Table A10 for detailed information). Once again, we invert the indices so that higher values of this index indicate better legal protection against rape (including marital rape).

For some survey rounds in our sample, the SIGI indices pertains to laws passed in a particular country *after* the survey data was collected. For these women, we set the value of the index to 0 i.e. no law in place. Of the 29 countries for which we have data on both laws and violence in the last 12 months, in 21 we observe women only in these countries either before or after a law has been implemented, so that the indices do not vary at the country level. In the remaining 8 countries we have data from surveys carried out before and after the implementation of laws;[13] women in these countries make up approximately half of our total sample. Thus we have variation in laws both across countries and within (some) countries.

Our first stage is given by

$$VR_{ijt}^{l} = \pi_0^{neo,l} + \pi_1^{neo,l} DVIndex_{jt} + \pi_2^{neo,l} RapeIndex_{jt} + X_{ijt}^{'}\pi_3^{neo,l} + \rho_j + \tau_t + \sigma_j t + \nu_{ijt}^{neo,l} \tag{3a}$$

where $DVIndex_{jt}$ and $RapeIndex_{jt}$ are the values for the domestic violence and rape indices, respectively. We use predicted values of VR_{ijt}^{l} from (3a) to estimate

$$C_{ijt}^{neo} = \gamma_0^{neo,l} + \gamma_1^{neo,l} \widehat{VR_{ijt}^{l}} + X_{ijt}^{'}\gamma_3^{neo,l} + \rho_j + \tau_t + \sigma_j t + \epsilon_{ijt}^{neo,l} \tag{3b}$$

The coefficient $\gamma_1^{neo,l}$ gives a causal effect of domestic violence experienced by mothers in the last twelve months on neonatal mortality of their children.

Our identification strategy is similar to Aizer (2011) who uses arrest rates in different counties across California over time to instrument for the incidence of domestic violence. This strategy is used to identify the effect of domestic violence on birth weight of children

[13] Thus, the index = 0 for women observed in these countries before the law came into force and > 0 for women observed in these countries after the law was implemented

born to victims. Like Aizer (2011) we also make the exclusion restriction assumption that there is no direct effect of legal sanctions against domestic violence on child health except through the effect on incidence of domestic violence.[14]

We include the same control variables as in equation 2, and again we use robust standard errors which adjust for clustering at the country level.

4 Results

Estimates of the impact of domestic violence, domestic physical violence only and domestic sexual violence only are summarized in Table 3 from estimation of equation (1) and Table 4 from estimation of equation (2). These estimates provide evidence of a consistent positive association between domestic violence faced by the mother and child mortality.[15]

4.1 OLS Estimates

4.1.1 Violence ever experienced

Children born to mothers who are victims of *any* type of domestic violence 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 (panel A, Column (IV), Table 3). This effect is driven primarily by physical violence; children born to mothers who are victims of physical violence are 0.4 percentage points more likely to die within the first month of being born, versus 0.2 percentage points more likely to die within the first month of being born when we consider sexual violence only.

We find similar results when considering infant (under-5) mortality, with children born to mothers who are victims of any type of domestic violence being 0.7 (1.1) percentage points more likely to die within the first year (five years) of being born compared to similar children born to mothers who are not victims (panels B and C, Column (IV), Table 3). For all our measures, effects are larger for physical versus sexual violence, and of a higher level of statistical significance, although the latter is still substantively large and statistically significant.

The magnitude of the effects we find are sizeable given that the incidence of neonatal mortality is just 3.1%, infant mortality 6.4% and under five mortality 9.5% for all children

[14]This assumes, for example, that legal sanctions on domestic violence were not introduced in response to high rates of neonatal mortality, which is our outcome of interest. There is no evidence to suggest that such legal changes are related to mortality in this way.

[15]While we use linear probability models, just $3.45 - 4.99\%$ of predictions when estimating equation (1) are outside of the $[0, 1]$ range and $1.88 - 2.67\%$ of predictions when estimating equation (2) are outside of the $[0, 1]$ range.

in our estimation sample.

There are several mechanisms which could be driving the relationship we find between domestic violence and child mortality. If the violence occurs while the mother is pregnant then the following mechanisms could be at work: an unborn child's health could be directly affected if the mother suffers physical domestic violence due to blunt physical trauma to the foetus (Nasir and Hyder, 2003). Indirect (and negative) effects could also arise due to victims of domestic violence having inadequate access to pre-natal health care, victims having inadequate nutrition and engaging in risky behaviors as well as experiencing high levels of psychological stress which are associated with low birth weight and pre-term delivery, in turn risk factors for increased child mortality (Newberger et al., 1992). Evidence also suggests that women suffering intimate partner violence are less likely to seek preventative health counselling during prenatal care (Petersen et al., 2001). The associations we find between domestic violence and neonatal mortality will include all of these mechanisms.

The larger effects associated with physical violence in comparison with sexual violence indicate that the direct effect plays an important role in increasing child mortality compared with the indirect effects, as we might expect sexual violence to increase child mortality primarily through the indirect mechanisms. We also find that the association between domestic violence and child mortality magnifies over time as we compare neonatal mortality with infant and under five mortality. This is likely due to additional pathways through which domestic violence adversely impacts child health which are associated with children growing up in an abusive environment. Victims of domestic violence may only be able to provide child care with restricted access to post-natal health care and inadequate nutrition (Hasselmann and Reichenheim, 2006; Yount et al., 2011). We cannot rule out, when examining the effect of domestic violence on infant or under five mortality, that the children themselves are directly subject to violence; therefore the relationship under consideration in this case should be considered as growing up in a family where the mother was ever subjected to violence in comparison with one in which the mother was not, where such a family environment adversely impacts survival in myriad ways.

4.1.2 Violence experienced in the last 12 months

Table 4 provides estimates for the relationship between domestic violence experienced in the last twelve months by the mother and neonatal mortality. We are now restricted to studying neonatal mortality since this is the only mortality measure that children have been fully exposed to in the last twelve months. Sample sizes are considerably reduced in comparison to our ever experienced violence regressions; for example, in the physical violence regressions the sample falls to around 35,000 upon inclusion of a full set of controls.

Exposure to physical violence in the last twelve months increases the probability of neona-

tal mortality for children born in the last twelve months by 0.5 percentage points (Column (IV), Table 4), although this coefficient is only statistically significant at the 10% level once we include our full set of controls. The corresponding effect sizes for any (sexual) violence are 0.4 (0.3) percentage points, but the coefficients are no longer statistically significant when we condition on our full set of controls.

4.2 Matching Estimates

Tables 5 and 6 show results when we employ the matching methodology described in section 3.2. Our matching estimates continue to suggest a positive relationship between violence ever experienced by women and the mortality of their offspring. Our results are particularly robust when we consider any- and physical- violence, for which we find similar effect sizes and statistical significance as in our OLS estimations of equation 3. For sexual violence ever experienced, coefficients are approximately zero and we lose statistical significance in our neonatal and infant mortality regressions (Columns (I) and (II), table 5).

Turning to violence in the last 12 months, our matching results suggest similar sized effects to OLS. However, statistical significance is now stronger (recall the effect was only statistically significant at the 10% level in the OLS specification). Our matching estimate suggests that exposure to physical violence in the last 12 months increases the probability of neonatal mortality by 0.8 percentage points. This effect is sizeable given that the incidence of neonatal mortality in this sample is 2.4%.

4.3 Instrumental variables

Our IV estimates are given in Tables 8 - 9.[16] Consistent with a negative deterrent and incapacitation effect of sanctions on crime, results for equation (3a) suggest that a stronger legal framework supporting women against domestic violence and rape leads to reduced incidence of domestic violence (i.e. π_1 and π_2 are both negative). The effect of domestic violence laws is statistically significant in all specifications, and laws on rape are statistically significant in our physical violence specification. In other words, the more effective these laws are, the lower the probability of experiencing violence, and violence is higher in countries when laws against domestic violence or rape have not yet been implemented.

Our estimates continue to suggest that children born to victims of physical violence by intimate partners are more likely to die within thirty days of being born compared to children born to non-victims. Our estimates including all controls suggest that children born to

[16]Note that the sample sizes are smaller than in table 4 since the law indices are missing for Sao Tome and Principe; we did also repeat the OLS estimates on this (marginally) smaller sample for which the laws are available and found very similar effect sizes as in Table 4. Results available on request.

victims of any type of violence by intimate partners are 3.7 percentage points more likely to die within thirty days of being born compared to children born to non-victims (Column (IV), Table 7). The F-stat is just under 10 and the Hansen-J overidentification test is comfortably passed. Similarly, when considering physical violence, our estimates suggest a 4.4 percentage point increase in neonatal mortality (Column (IV), Table 8). The F-stat is larger, at 42.03, suggesting that our instruments are better able to predict physical violence vs. sexual violence. This is borne out when we consider sexual violence only as our explanatory variable. In this specification (Table 9), whilst the coefficient estimate is much larger, our instrument is weaker, with an F-stat of 6.17.

5 Robustness

In this section, we investigate i) robustness of the results to the inclusion of additional controls which are not available for all surveys, ii) use of indices of domestic violence, iii) a more restrictive sample of women in our control group and iv) a just identified IV strategy.

5.1 Inclusion of additional control variables

We investigate two restricted specifications with additional control variables.[17] We first include measures of the height of the mother. Mother's height is a measure of the mother's overall stock of health. We have used mother's height since it is considered a permanent measure of health (Strauss and Thomas, 2008).[18] Height is therefore preferable to more transitory measures of mother's health such as BMI and in previous studies it has been shown to be related to child mortality (Monden and Smits, 2009; Bhalotra and Rawlings, 2011, 2013).[19] This leads to a smaller sample since in seventeen of the fifty four surveys that make up our sample, information on height of mothers was not collected (see Tables A1 and A2).

Estimated effects of violence ever experienced on mortality are broadly similar (although attenuated in some cases) in the restricted sample for which we have information on maternal height (Columns (I- III), Table A11), and are still statistically significant. When considering violence experienced in the last twelve months, our OLS estimates are of a similar magnitude and statistical significance (Column (IV), Table A11). For our IV estimates, we continue to find statistically significant effects even after controlling for maternal height (Column (V),

[17] Means of additional control variables across victims and non-victims are given in Tables 1-A7, and Appendix Tables A3-A9.

[18] This matters particularly for our estimates of the impact of violence *ever experienced* since in these estimations we are considering births that may have occurred many years previously.

[19] Results are unchanged if we instead use mother's BMI instead of height (results available on request).

A11). These estimates are much larger than those in Tables 8-9, but note that, due to the reduction in sample size and countries included in the analysis, there is now no longer enough variation within country to use the index for rape laws as an instrument, since it is collinear with the country FE. The coefficients are therefore best compared to our just identified strategy, reported in Table A19 and discussed in section 5.4 below. The estimated effect sizes are very similar to the just identified specification without controls for maternal height.

Next, we include religion dummies in our estimates of equations (1) and (2); information on religion is not collected in 12 out of 54 surveys (see Tables A1 and A2). We include dummies for Christian, Muslim, and other religion (the omitted category is "no religion"). Our results are robust to the inclusion of religion dummies (Table A12), particularly for any and physical violence ever experienced. When we consider violence in the last 12 months, our OLS results are robust to inclusion of religion (Column (IV), Table A12), whilst our 2SLS estimates continue to show a positive effect, although the instruments appear to be weaker in our *any* and sexual violence regressions (Column (V), Table A12).

5.2 Using indices of domestic violence

Thus far, we have specified exposure to domestic violence as dummy variables which take the value one if the woman experienced physical, sexual or any form of violence from her partner ever (equation 1) or in the last 12 months (equations 2 and 3a). As an alternative, we create indices of domestic violence, using the underlying questions on specific acts of violence. Although interpretation is less straightforward, aggregation of these underlying variables has the advantage that it can improve statistical power to detect effects that go in the same direction within a domain (Kling et al., 2007). We first convert answers to individual physical violence and sexual violence questions to z-scores by subtracting the country-specific mean and dividing by the country-specific standard deviation. We then average over these z-scores to create an index for i) physical violence, ii) sexual violence and iii) any violence.[20]

Our results for ever experienced violence are robust to instead using indices of violence (Table A13), and we continue to find a positive and statistically significant impact of any violence on mortality; these effects again appear to be driven by physical violence. The coefficients for sexual violence are very small and statistically insignificant. For recent violence, we again tend to find only statistically significant effects for physical violence (Table A14), and whilst our IV coefficients suggest a positive effect of violence on neonatal mortality, this is only statistically significant for any type of violence. All of the F-statistics for the first stage are reduced and are smaller than 6 (Panel A, Table A15).

[20] We follow the procedure first described by Kling et al. (2007) and later implemented by Erten and Keskin (2018) in the context of domestic violence using DHS data.

5.3 Restricted sample of women for violence in the last 12 months

In our main analysis, Equations 2 and 3b are estimated on the sample of *all* births in the last 12 months. The treatment group in these specifications are those women who gave birth in the last 12 months and who experienced domestic violence in the last 12 months. The control group consists of two groups of women who gave birth in the last 12 months: 1) women who previously experienced violence, but not in the last 12 months, and 2) women who never experienced violence.

In what follows, we estimate a more restrictive specification, wherein we drop women who never experienced violence from the sample, so that our empirical strategy rests on comparing mortality of children born to women who experienced violence in the last 12 months versus women who previously experienced violence, but not in the last 12 months. Thus we compare outcomes in what we term "violent households", and we assume that violence affects neonatal mortality only through the timing of violence.[21] Thus, we compare mortality of children born in the last 12 months to women who recently experienced violence to that of children whose mothers had previously experienced violence, but not recently.

Appendix Tables A7 - A9 show that, even in this restricted control group, these women differ on a number of observable characteristics. We cast this as a robustness check rather than focusing on these results as the main analysis since unfortunately, we lose a large proportion of our sample (72.0 - 91.2%, depending on violence measure) through this restriction.

Considering the restricted sample of "violent households" only (Table A16), we see that our coefficient for physical violence is very similar, suggesting that exposure to physical violence in the last twelve months increases the probability of neonatal mortality to children born in the last twelve months by 0.6 percentage points. Our coefficient for any violence is similar in magnitude, but as in our baseline specification, is not statistically significant. For sexual violence, restricting our control group only to those women who ever experienced sexual violence leads to a loss of 91% of the sample and our coefficient estimates are no longer stable.

The story is similar when we consider matching estimates; our estimates for any and physical violence are of the same size as in the restricted sample, but standard errors are larger and this leads to a loss in statistical significance (Columns (IV) and (V), Table A17). Our estimates for sexual violence in the last 12 months are not robust to using the restricted sample, but this is likely due to the large loss in observations (91% of the sample) from the restriction that only women who ever experienced sexual violence be included in the sample.

Our IV estimates using the restricted sample of "violent households" are much larger than in the full sample, and, for any and sexual violence, are not statistically significant (Table

[21] A similar strategy is employed by Currie et al. (2018).

A18). Overall, all of the analysis using the restricted sample of "violent households" suggests that our physical violence regressions are robust to this restriction, whilst our any and sexual violence regressions are not. This is in line with our overall finding throughout this paper that the associations we observe between domestic violence and child mortality are driven by physical violence rather than sexual violence.

5.4 Just identified instrumental variables strategy

Our main instrumental variables strategy uses two indices of laws: domestic violence laws, and rape laws. In the time period under study in this paper, we observe more variation in the index of domestic violence laws within countries (11 countries) versus the index of rape laws (2 countries). As a robustness check, we estimate a just identified IV strategy in which we use only the index of domestic violence laws.

Appendix Table A19 shows results when we employ a just identified strategy using only the index of domestic violence laws. We continue to find a positive and statistically significant effect of violence on neonatal mortality ($\gamma_1 > 0$), and a deterrent/incapacitation effect of laws ($\pi_1 < 0$). However, our instruments are weaker in all cases, and our coefficient estimates are larger and more imprecisely estimated.

6 Discussion and Conclusion

This paper provides evidence of a strong positive association between domestic violence experienced by mothers on the subsequent mortality of their children in a large sample of developing countries, where high fractions of poor women are victims of domestic violence. We are able to utilize comparable data on children born between 1975 and 2014 from thirty two different developing countries to examine this relationship.

We find statistically significant and sizeable correlations between domestic violence on child health. Children born to mothers who were ever victims of either physical or sexual domestic violence are 0.4 percentage points more likely to die within thirty days, 0.7 percentage points more likely to die within a year and 1.1 percentage points more likely to die within the first five years of being born compared to similar children born to mothers who were never victims. Our results are similar when we use matching methods. We find similar associations between violence experienced in the last 12 months and neonatal mortality. Isolating the causal impact of recent violence on neonatal mortality within an instrumental variables framework, we find that children born in the last twelve months to mothers who experience any type of violence over the same period are 3.7 percentage points more likely to die within thirty days of birth.

Our work provides a first, systematic analysis quantifying the relationship between domestic violence and child mortality in a cross-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.

Additionally, an important result from our instrumental variables estimation is the strong deterrent and incapacitation effect of legal sanctions on the incidence of domestic violence. This is an encouraging result, indicating that provision of a legal framework that provides safeguards to women against domestic violence in the developing world is an important way forward, not just to improve the lives of the women themselves but also those of their children.

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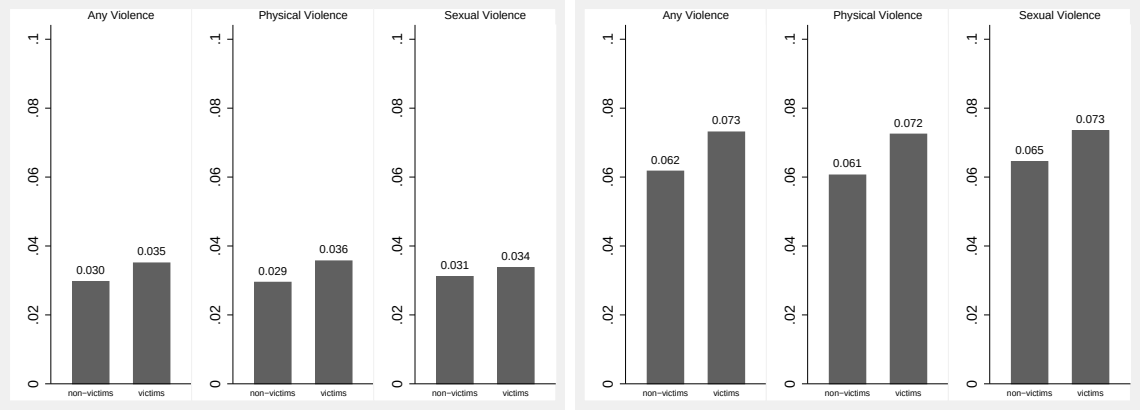
Figures and Tables

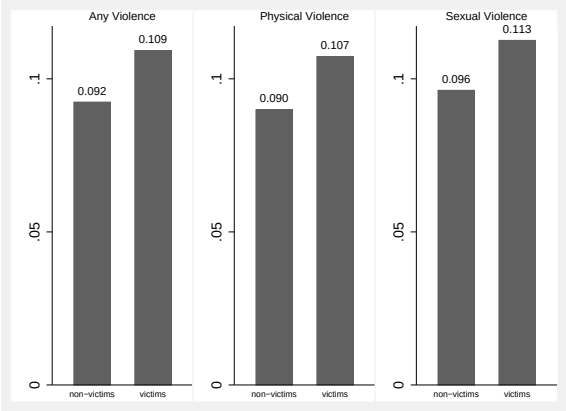
Figure 1

Child mortality across victims (non-victims) of ever experienced domestic violence

(a) Neonatal Mortality **(b)** Infant Mortality



(c) Under-5 Mortality

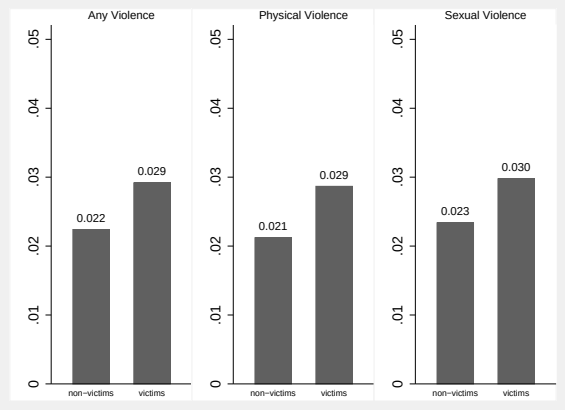


Notes: Neonatal, infant, and under-5 mortality measured as the fraction of children dying within one month, one year, and five years of being born, respectively. Inclusion in the neonatal, infant, and under-5 mortality sample is conditional upon children being born at least one month, one year, and five years ago, respectively.

Source: Data from the Demographic and Health Surveys.

Figure 2

Neonatal mortality across victims (non-victims) of domestic violence in the last 12 months



Notes: Neonatal mortality measured as the fraction of children dying within one month. Inclusion in the sample is conditional upon children being born in the last 12 months, and at least one month ago, relative to date of interview.

Source: Data from the Demographic and Health Surveys.

TABLE 1

Summary statistics by whether or not the respondent was ever a victim of physical violence

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.029	0.036	-0.006***	0.000	792946
Infant Mortality	0.061	0.072	-0.012***	0.000	753402
Under-5 Mortality	0.090	0.107	-0.017***	0.000	582731
Child male	0.523	0.520	0.002	0.058	792946
Mother age at birth	24.827	24.397	0.431***	0.000	792946
Multiple birth	0.021	0.021	0.000	0.615	792946
Birth order	2.769	2.911	-0.142***	0.000	792946
Urban	0.381	0.372	0.009***	0.000	792946
Years education (mother)	5.628	4.837	0.792***	0.000	792726
Years education (father)	6.685	6.252	0.433***	0.000	790628
Spouse age	41.203	40.577	0.626***	0.000	792946
Wealth quintile	2.827	2.631	0.196***	0.000	792946
Mother height (cm)	155.336	154.465	0.871***	0.000	644407
Christian	0.503	0.517	-0.014***	0.000	527137
Muslim	0.227	0.172	0.055***	0.000	527137
Other religion	0.253	0.293	-0.041***	0.000	527137
No religion	0.018	0.018	0.000	0.743	527137

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating physical violence ever experienced (Equation 1) with full set of controls. For means of control variables, we use the neonatal mortality sample i.e. including all children who were born at least one month ago. The mother height (religion) samples exclude the seventeen (twelve) surveys in which information on womens' height (religion) is not collected (see Table A1).

TABLE 2

Summary statistics by whether or not the respondent was a victim of physical violence in the last 12 months

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.021	0.029	-0.007***	0.000	34521
Child male	0.511	0.504	0.007	0.300	34521
Mother age at birth	26.917	26.227	0.689***	0.000	34521
Multiple birth	0.025	0.024	0.001	0.694	34521
Birth order	3.091	3.395	-0.304***	0.000	34521
Urban	0.394	0.358	0.036***	0.000	34521
Years education (mother)	6.672	5.306	1.367***	0.000	34513
Years education (father)	7.434	6.658	0.776***	0.000	34416
Spouse age	32.857	32.169	0.688***	0.000	34521
Wealth quintile	2.757	2.532	0.225***	0.000	34521
Mother height (cm)	155.076	154.905	0.172	0.101	27004
Christian	0.550	0.605	-0.055***	0.000	22832
Muslim	0.193	0.146	0.047***	0.000	22832
Other religion	0.234	0.225	0.009	0.183	22832
No religion	0.023	0.024	-0.001	0.630	22832

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating physical violence experienced in the last 12 months (Equation 2) with full set of controls. The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE 3

Associations of child mortality with domestic violence ever experienced by the mother

	(I)	(II)	(III)	(IV)
A: Neonatal mortality				
Any Violence	0.005	0.004***	0.004**	0.004**
	(0.003)	(0.001)	(0.001)	(0.001)
Observations	863526	733697	733697	733697
Physical Violence	0.005*	0.005***	0.004***	0.004***
	(0.003)	(0.001)	(0.001)	(0.001)
Observations	925905	792946	792946	792946
Sexual Violence	0.002*	0.002**	0.001*	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	864020	734123	734123	734123
B: Infant mortality				
Any Violence	0.010**	0.009***	0.007***	0.007***
	(0.005)	(0.002)	(0.002)	(0.002)
Observations	818813	696689	696689	696689
Physical Violence	0.011**	0.008***	0.007***	0.007***
	(0.005)	(0.002)	(0.002)	(0.002)
Observations	878455	753402	753402	753402
Sexual Violence	0.009**	0.007***	0.003*	0.004**
	(0.003)	(0.002)	(0.002)	(0.002)
Observations	819274	697087	697087	697087
C: Under-5 mortality				
Any Violence	0.015*	0.013***	0.011***	0.011***
	(0.008)	(0.003)	(0.003)	(0.003)
Observations	630365	537528	537528	537528
Physical Violence	0.016**	0.012***	0.011***	0.011***
	(0.008)	(0.003)	(0.003)	(0.003)
Observations	677690	582731	582731	582731
Sexual Violence	0.016**	0.013***	0.007***	0.008***
	(0.006)	(0.003)	(0.002)	(0.002)
Observations	630709	537834	537834	537834
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Each cell provides estimates from a separate regression. All regressions use the specification given in equation (1) as described in section 3. Standard errors are clustered at the country level. *** p-value < 1%, ** p-value < 5%, * p-value < 10%.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made.

TABLE 4

Associations of neonatal mortality with domestic violence experienced by the mother in the last 12 months

	(I)	(II)	(III)	(IV)
Any Violence (last 12 months)	0.006**	0.006**	0.004	0.004
	(0.003)	(0.002)	(0.003)	(0.003)
Observations	31969	28263	28263	28263
Physical Violence (last 12 months)	0.007***	0.007***	0.005*	0.005*
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	40020	34521	34521	34521
Sexual Violence (last 12 months)	0.006	0.005	0.003	0.003
	(0.004)	(0.004)	(0.005)	(0.005)
Observations	32074	28353	28353	28353
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Each cell provides estimates from a separate regression. All regressions use the specification given in equation (2) as described in section 3. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE 5

Associations of child mortality with domestic violence ever experienced by the mother using matching

	(I) Neonatal Mortality	(II) Infant Mortality	(III) Under-5 Mortality
Any Violence (ever)	0.004***	0.007***	0.010***
	(0.001)	(0.001)	(0.001)
Observations	733697	696689	537528
Physical Violence (ever)	0.003***	0.007***	0.010***
	(0.001)	(0.001)	(0.001)
Observations	792946	753402	582731
Sexual Violence (ever)	–0.000	0.002	0.006***
	(0.001)	(0.002)	(0.002)
Observations	734123	697079	537830

Notes: Each cell provides estimates from a separate matching estimation. Estimates are obtained through propensity score estimation using nearest neighbour matching. The propensity score is determined by a logit regression of violence on mother education, partner's education, urban status, gender of the child, mother age at birth, birth order, spousal age, wealth indices, and fixed effects for country and child year of birth. Robust standard errors are reported. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made.

TABLE 6

Associations of neonatal mortality with domestic violence experienced by the mother in the last 12 months using matching

	(I)
Any Violence (last 12 months)	0.004
	(0.003)
Observations	28263
Physical Violence (last 12 months)	0.008***
	(0.003)
Observations	34521
Sexual Violence (last 12 months)	0.008
	(0.005)
Observations	28353

Notes: Each cell provides estimates from a separate matching estimation; the dependent variable is neonatal mortality. Estimates are obtained through propensity score estimation using nearest neighbour matching. The propensity score is determined by a logit regression of violence on mother education, partner's education, urban status, gender of the child, mother age at birth, birth order, spousal age, wealth indices, country indicator, and child year of birth trend. Robust standard errors are reported. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE 7

The effect of any violence experienced by the mother in the last 12 months on neonatal mortality, 2SLS estimates

	(I)	(II)	(III)	(IV)
Any violence (last 12 months)	0.076	0.054	0.019	0.037*
	(0.051)	(0.044)	(0.022)	(0.020)
Observations	31798	28120	28120	28120
First stage				
index DV laws	–0.100	–0.092*	–0.077	–0.129***
	(0.064)	(0.055)	(0.057)	(0.042)
index rape laws	–0.021	–0.011	–0.333***	–0.403
	(0.124)	(0.113)	(0.093)	(0.309)
F-stat first stage	1.251	1.410	6.403	9.541
p-value Hansen-J Statistic	0.573	0.460	0.654	0.213
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a) as described in sub-section 3.3. Table A10 gives a description of the law indices used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE 8

The effect of physical violence experienced by the mother in the last 12 months on neonatal mortality, 2SLS estimates

	(I)	(II)	(III)	(IV)
Physical Violence (last 12 months)	0.100*	0.053	–0.050	0.044**
	(0.053)	(0.040)	(0.085)	(0.021)
Observations	39849	34378	34378	34378
First stage				
index DV laws	–0.092**	–0.082**	–0.035	–0.117**
	(0.039)	(0.040)	(0.062)	(0.047)
index rape laws	0.018	0.022	–0.212***	–0.708***
	(0.106)	(0.098)	(0.081)	(0.184)
F-stat first stage	2.801	2.248	3.518	42.035
p-value Hansen-J Statistic	0.600	0.769	0.523	0.204
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a) as described in sub-section 3.3. Table A10 gives a description of the law indices used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE 9

The effect of sexual violence experienced by the mother in the last 12 months on neonatal mortality, 2SLS estimates

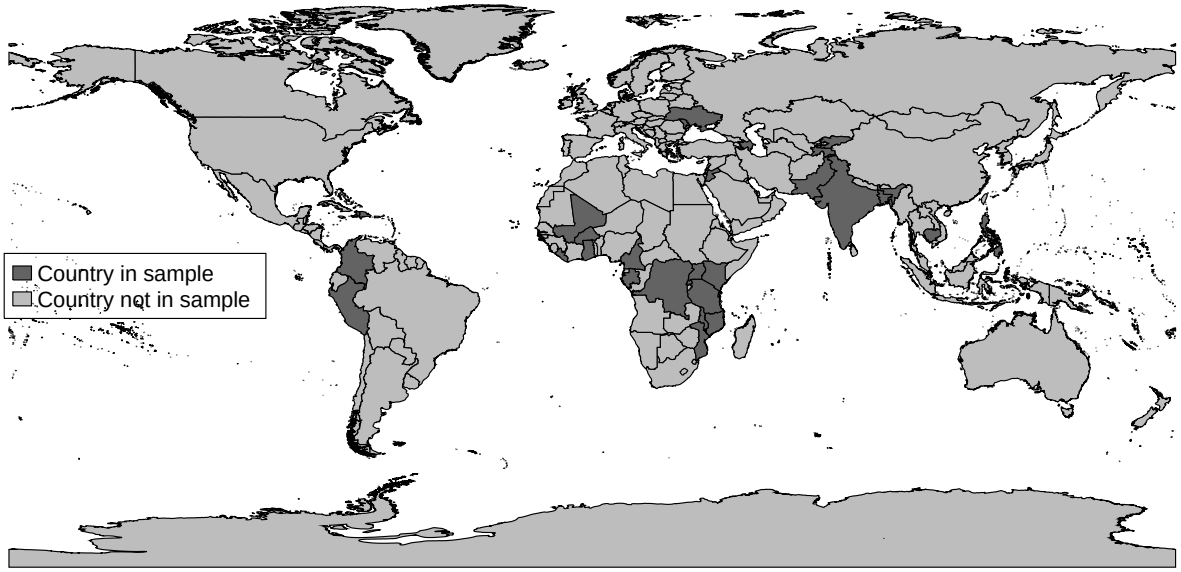
	(I)	(II)	(III)	(IV)
Sexual Violence (last 12 months)	0.111	0.072	0.043	0.156**
	(0.089)	(0.082)	(0.044)	(0.078)
Observations	31903	28210	28210	28210
First stage				
index DV laws	–0.032	–0.027	–0.037***	–0.034***
	(0.038)	(0.031)	(0.009)	(0.011)
index rape laws	–0.090	–0.078	–0.201***	–0.188
	(0.072)	(0.057)	(0.031)	(0.331)
F-stat first stage	1.424	1.295	21.098	6.169
p-value Hansen-J Statistic	0.137	0.124	0.588	0.188
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a) as described in sub-section 3.3. Table A10 gives a description of the law indices used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

Appendix Figures and Tables

Figure A1
Map of countries included in estimation sample

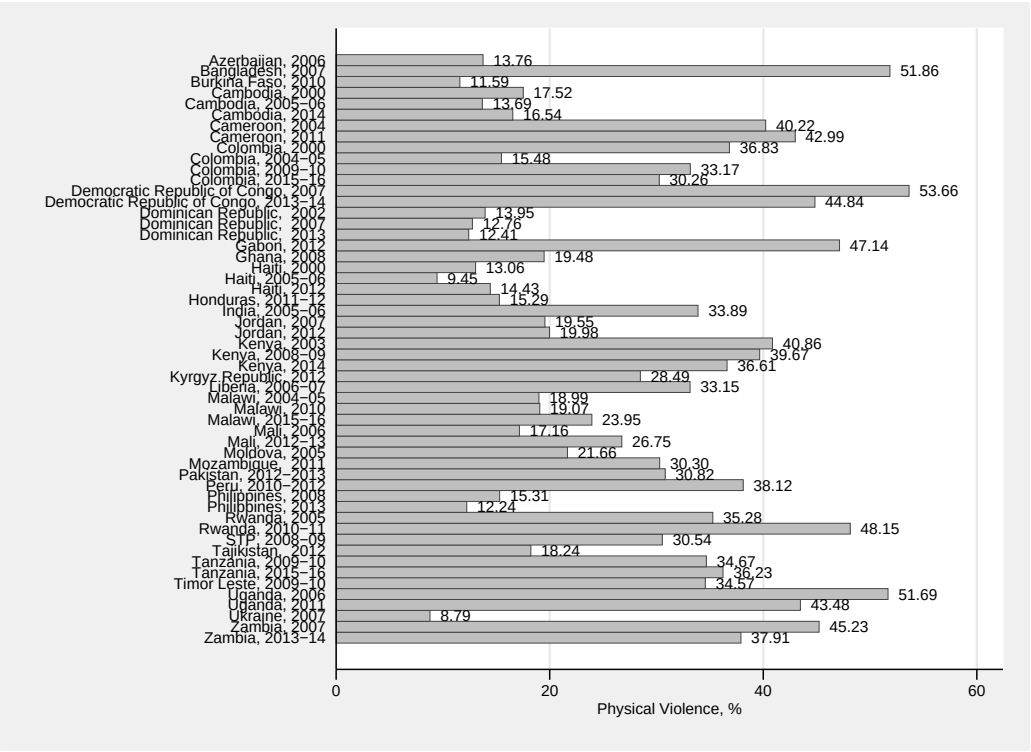


Source: Data from the Demographic and Health Surveys.

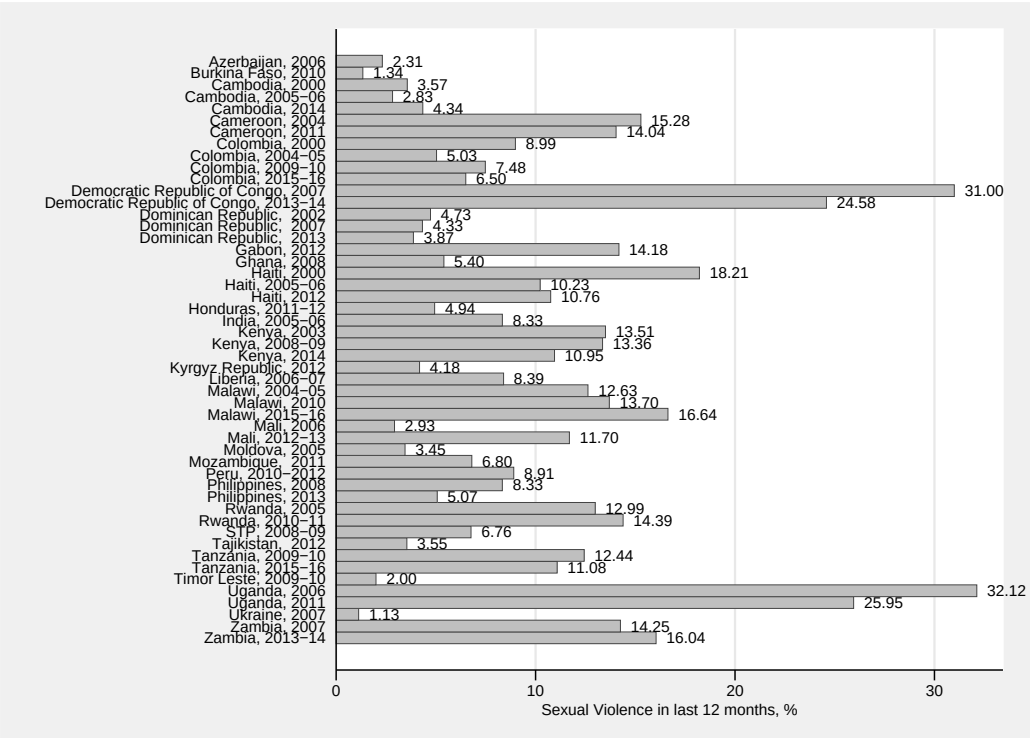
Figure A2

Domestic violence measures by DHS survey

(a) Spouse violence ever experienced



(b) Spouse sexual violence ever experienced

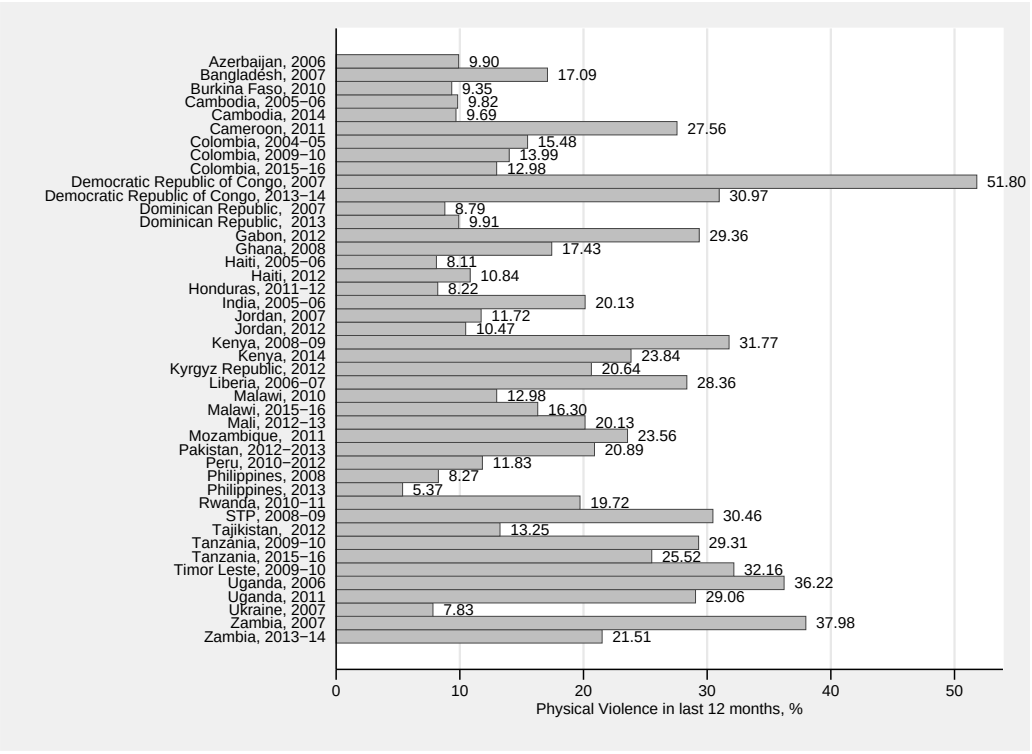


Source: Data from the Demographic and Health Surveys. Sample used is that from our baseline regressions investigating violence ever experienced (Equation 1) with full set of controls.

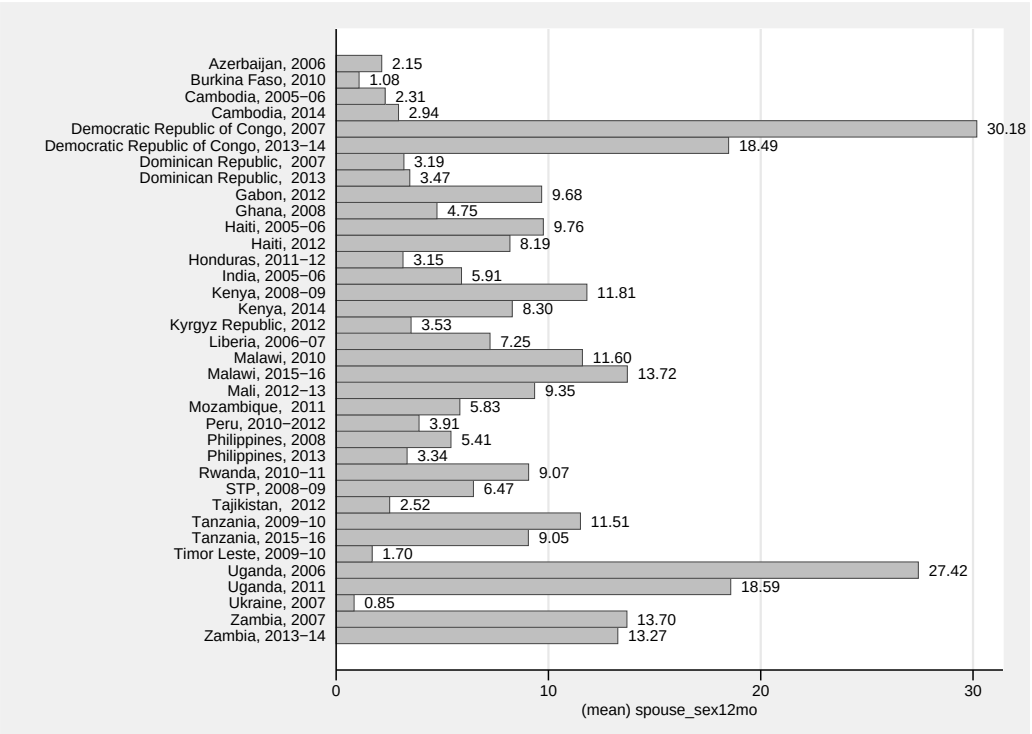
Figure A3

Domestic violence measures by DHS survey

(a) Spouse violence in last 12 months



(b) Spouse sexual violence in last 12 months

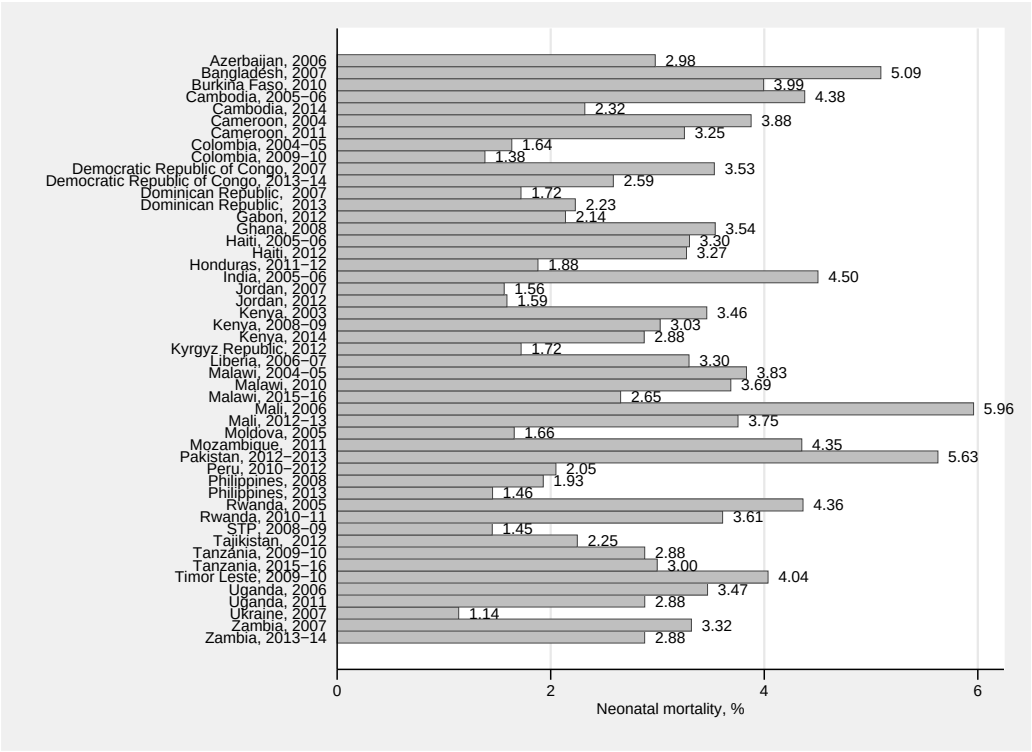


Source: Data from the Demographic and Health Surveys. Sample used is that from our baseline regression investigating violence experienced in the last 12 months (Equation 2) with full set of controls.

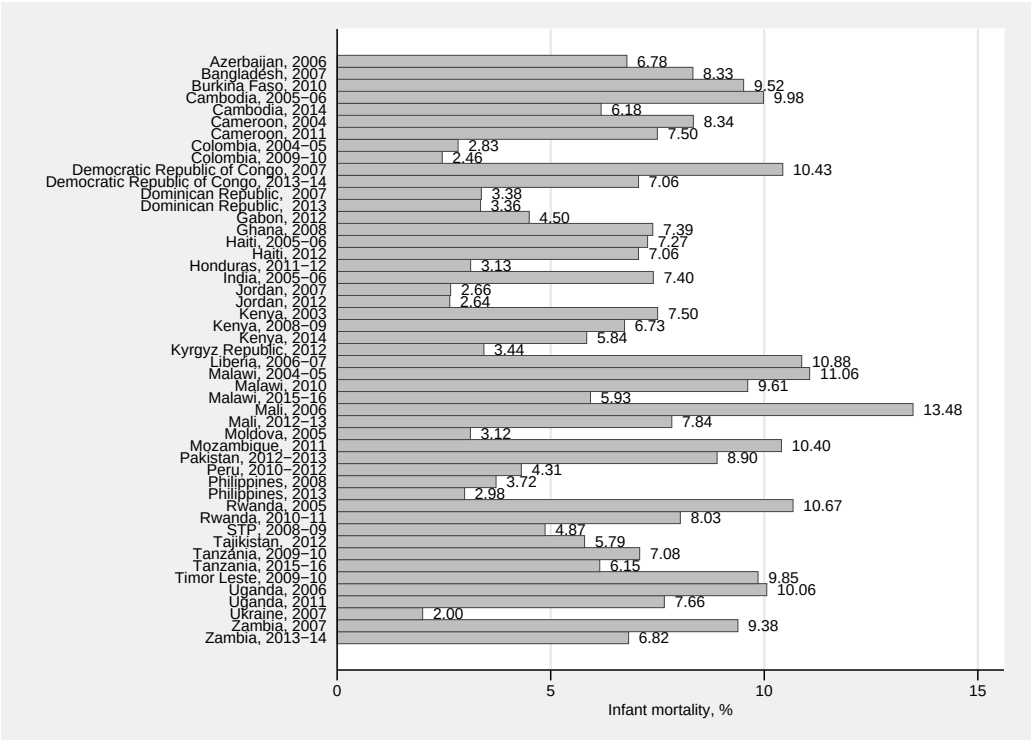
Figure A4

Child mortality by DHS survey

(a) Neonatal Mortality

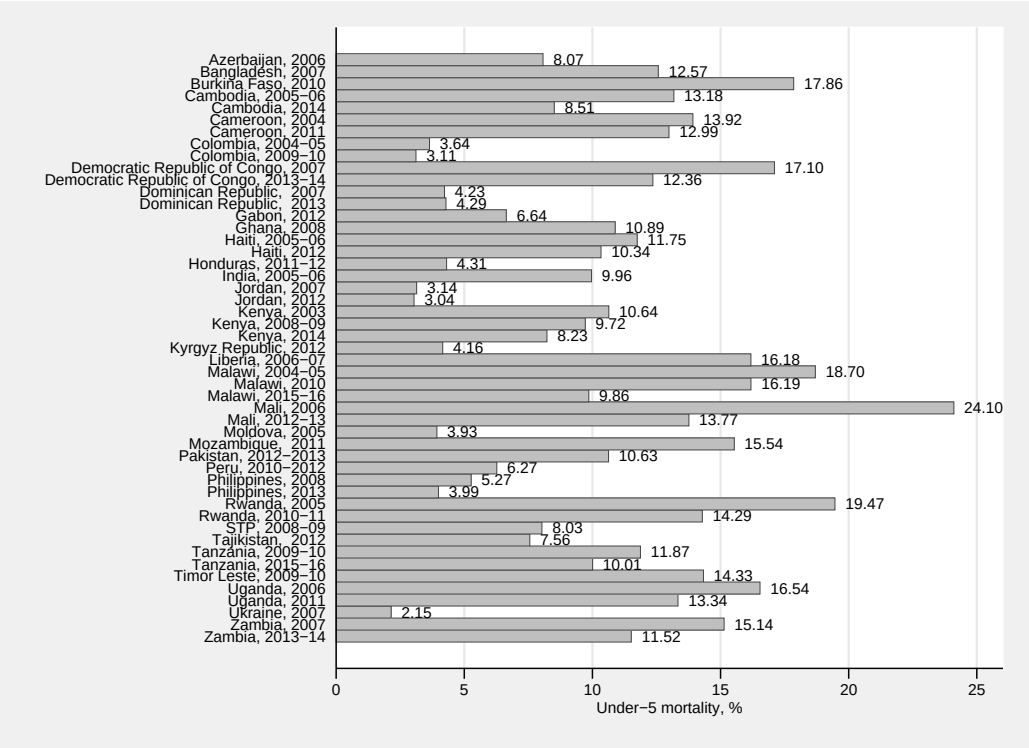


(b) Infant Mortality



Source: Data from the Demographic and Health Surveys. Sample used is that from our baseline regression investigating physical violence ever experienced (Equation 1) with full set of controls.

Figure A4
Child mortality by DHS survey
(c) Under-5 Mortality



Source: Data from the Demographic and Health Surveys. Sample used is that from our baseline regression investigating physical violence experienced in the last 12 months (Equation 2) with full set of controls.

TABLE A1

DHS countries and survey years in estimations for (ever) victims/non-victims of domestic violence

Country and DHS Survey Years for Physical Violence	Country and DHS Survey Years for Sexual violence
Azerbaijan 2006	Azerbaijan 2006
Bangladesh 2007	
Burkina Faso 2010	Burkina Faso 2010
Cambodia 2000*†, 2005-06*, 2014*	Cambodia 2000*, 2005-06*, 2014*
Cameroon 2004*, 2011	Cameroon 2004*, 2011
Colombia 2000*, 2004-05, 2009-10, 2015-16*	Colombia 2000*, 2004-05, 2009-10, 2015-16*
Democratic Republic of Congo (DRC) 2007*, 2013-14*	Democratic Republic of Congo (DRC) 2007*, 2013-14*
Dominican Republic 2002*†, 2007*†, 2013	Dominican Republic 2002*†, 2007*†, 2013
Gabon 2012	Gabon 2012
Ghana 2008	Ghana 2008
Haiti 2000*†, 2005-06, 2012	Haiti 2000*†, 2005-06, 2012
Honduras, 2011-12	Honduras, 2011-12
India 2005-06	India 2005-06
Jordan 2007*†, 2012†	Jordan 2007*†, 2012†
Kenya 2003, 2008-09, 2014	Kenya 2003, 2008-09, 2014
Kyrgyz Republic 2012†	Kyrgyz Republic 2012†
Liberia 2006-07	Liberia 2006-07
Malawi 2004-05, 2010, 2015-16	Malawi 2004-05, 2010, 2015-16
Mali 2006, 2012-13	Mali 2006, 2012-13
Moldova 2005	Moldova 2005
Mozambique 2011	Mozambique 2011
Pakistan 2012-2013†	
Peru 2010-2012†	Peru 2010-2012†
Philippines 2008*, 2013*	Philippines 2008*, 2013*
Rwanda 2005, 2010-11	Rwanda 2005, 2010-11
Sao Tome and Principe (STP) 2008-09	Sao Tome and Principe (STP) 2008-09
Tajikistan 2012†	Tajikistan 2012†
Tanzania 2009-10†, 2015-16†	Tanzania 2009-10†, 2015-16†
Timor Leste 2009-10	Timor Leste 2009-10
Uganda 2006*, 2011*	Uganda 2006*, 2011*
Ukraine 2007*	Ukraine 2007*
Zambia 2007, 2013-14	Zambia 2007,2013-14

Notes:

∗ Survey does not collect information on respondent's heights.

† Survey does not collect information on religion of respondents.

TABLE A2

DHS countries and survey years used in estimations for victim/non-victims of domestic violence in the last 12 months

Country and DHS Survey Years for Physical Violence	Country and DHS Survey Years for Sexual violence
Azerbaijan 2006	Azerbaijan 2006
Bangladesh 2007	
Burkina Faso 2010	Burkina Faso 2010
Cambodia 2005-06*, 2014*	Cambodia 2005-06*, 2014*
Cameroon 2011	
Colombia 2004-05†, 2009-10†, 2015-16*†	
Democratic Republic of Congo (DRC) 2007*, 2013-14*	Democratic Republic of Congo (DRC) 2007*, 2013-14*
Dominican Republic 2007*†, 2013	Dominican Republic 2007*†, 2013
Gabon 2012	Gabon 2012
Ghana 2008	Ghana 2008
Haiti 2005-06, 2012	Haiti 2005-06, 2012
Honduras, 2011-12	Honduras, 2011-12
India 2005-06	India 2005-06
Jordan 2007†, 2012†	
Kenya 2008-09, 2014	Kenya 2008-09, 2014
Kyrgyz Republic 2012†	Kyrgyz Republic 2012†
Liberia 2006-07	Liberia 2006-07
Malawi 2010, 2015-16	Malawi 2010, 2015-16
Mali, 2012-13	Mali, 2012-13
Mozambique 2011	Mozambique 2011
Pakistan 2012-2013†	
Peru 2010-2012†	Peru 2010-2012†
Philippines 2008*, 2013*	Philippines 2008*, 2013*
Rwanda 2010-11	
Sao Tome and Principe (STP) 2008-09	Sao Tome and Principe (STP) 2008-09
Tajikistan 2012†	Tajikistan 2012†
Tanzania 2009-10†, 2015-16†	Tanzania 2009-10†, 2015-16†
Timor Leste 2009-10	Timor Leste 2009-10
Uganda 2006*, 2011*	Uganda 2006*, 2011*
Ukraine 2007*	Ukraine 2007*
Zambia 2007, 2013-14	Zambia 2007, 2013-14

Notes:

∗ Survey does not collect information on respondent's heights.

† Survey does not collect information on religion of respondents.

TABLE A3

Summary statistics by whether or not the respondent was ever a victim of any type of violence

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.030	0.035	-0.005***	0.000	733697
Infant Mortality	0.062	0.073	-0.011***	0.000	696689
Under-5 Mortality	0.092	0.109	-0.017***	0.000	537528
Child male	0.523	0.520	0.003**	0.010	733697
Mother age at birth	24.720	24.368	0.352***	0.000	733697
Multiple birth	0.020	0.021	-0.001***	0.007	733697
Birth order	2.730	2.891	-0.162***	0.000	733697
Urban	0.365	0.355	0.010***	0.000	733697
Years education (mother)	5.425	4.800	0.625***	0.000	733513
Years education (father)	6.498	6.247	0.250***	0.000	731403
Spouse age	41.076	40.365	0.711***	0.000	733697
Wealth quintile	2.830	2.644	0.186***	0.000	733697
Mother height (cm)	155.300	154.591	0.709***	0.000	598987
Christian	0.503	0.549	-0.046***	0.000	516887
Muslim	0.221	0.143	0.078***	0.000	516887
Other religion	0.258	0.290	-0.032***	0.000	516887
No religion	0.019	0.019	0.000	0.800	516887

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating any violence ever experienced (Equation 1) with full set of controls. For means of control variables, we use the neonatal mortality sample i.e. including all children who were born at least one month ago. The mother height (religion) samples exclude the seventeen (twelve) surveys in which information on womens' height (religion) is not collected (see Table A1).

TABLE A4

Summary statistics by whether or not the respondent was ever a victim of sexual violence

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.031	0.034	-0.003***	0.000	734123
Infant Mortality	0.065	0.073	-0.009***	0.000	697087
Under-5 Mortality	0.096	0.113	-0.016***	0.000	537834
Child male	0.523	0.519	0.004*	0.082	734123
Mother age at birth	24.629	24.426	0.203***	0.000	734123
Multiple birth	0.021	0.023	-0.003***	0.000	734123
Birth order	2.760	2.990	-0.230***	0.000	734123
Urban	0.366	0.317	0.049***	0.000	734123
Years education (mother)	5.281	4.701	0.579***	0.000	733937
Years education (father)	6.442	6.185	0.257***	0.000	731829
Spouse age	40.902	40.368	0.534***	0.000	734123
Wealth quintile	2.788	2.605	0.183***	0.000	734123
Mother height (cm)	155.092	154.882	0.210***	0.000	599310
Christian	0.503	0.651	-0.148***	0.000	517274
Muslim	0.205	0.116	0.089***	0.000	517274
Other religion	0.273	0.217	0.056***	0.000	517274
No religion	0.019	0.016	0.003***	0.000	517274

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating sexual violence ever experienced (Equation 1) with full set of controls. For means of control variables, we use the neonatal mortality sample i.e. including all children who were born at least one month ago. The mother height (religion) samples exclude the seventeen (twelve) surveys in which information on womens' height (religion) is not collected (see Table A1).

TABLE A5

Summary statistics by whether or not the respondent was a victim of any type of violence in the last 12 months

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.022	0.029	-0.007***	0.002	28263
Child male	0.513	0.503	0.009	0.199	28263
Mother age at birth	26.859	26.407	0.452***	0.000	28263
Multiple birth	0.024	0.026	-0.002	0.486	28263
Birth order	3.129	3.486	-0.358***	0.000	28263
Urban	0.348	0.314	0.034***	0.000	28263
Years education (mother)	6.220	5.005	1.215***	0.000	28258
Years education (father)	7.042	6.450	0.592***	0.000	28186
Spouse age	32.814	32.362	0.452***	0.000	28263
Wealth quintile	2.807	2.601	0.206***	0.000	28263
Mother height (cm)	154.862	154.843	0.019	0.865	21595
Christian	0.552	0.618	-0.066***	0.000	21892
Muslim	0.181	0.130	0.051***	0.000	21892
Other religion	0.243	0.227	0.016**	0.025	21892
No religion	0.024	0.025	-0.001	0.758	21892

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating any violence experienced in the last 12 months (Equation 2) with full set of controls. The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE A6

Summary statistics by whether or not the respondent was a victim of sexual violence in the last 12 months

	Non-victims	Victims	Difference	P-value	Observations
Neonatal Mortality	0.023	0.030	-0.006*	0.066	28353
Child male	0.511	0.505	0.006	0.604	28353
Mother age at birth	26.815	26.167	0.648***	0.000	28353
Multiple birth	0.024	0.032	-0.008**	0.033	28353
Birth order	3.179	3.581	-0.401***	0.000	28353
Urban	0.346	0.270	0.076***	0.000	28353
Years education (mother)	6.037	4.955	1.082***	0.000	28348
Years education (father)	6.939	6.598	0.341***	0.001	28275
Spouse age	32.769	32.090	0.679***	0.000	28353
Wealth quintile	2.778	2.580	0.198***	0.000	28353
Mother height (cm)	154.852	154.986	-0.134	0.469	21656
Christian	0.558	0.679	-0.121***	0.000	21975
Muslim	0.175	0.112	0.063***	0.000	21975
Other religion	0.243	0.191	0.052***	0.000	21975
No religion	0.024	0.018	0.006	0.101	21975

Notes: *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating sexual violence experienced in the last 12 months (Equation 2) with full set of controls.The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE A7

Summary statistics by physical violence victim status: never, ever experienced, experienced last 12 months

	Non-victims	Victims (ever)	Victims (last 12 months)	Observations
Neonatal Mortality	0.021	0.021	0.029	34521
Child male	0.512	0.508	0.504	34521
Mother age at birth	26.763	28.565	26.227	34521
Multiple birth	0.025	0.028	0.024	34521
Birth order	3.015	3.908	3.395	34521
Urban	0.394	0.403	0.358	34521
Years education (mother)	6.730	6.051	5.306	34513
Years education (father)	7.455	7.212	6.658	34416
Spouse age	32.722	34.306	32.169	34521
Wealth quintile	2.775	2.568	2.532	34521
Mother height (cm)	155.172	154.113	154.905	27004
Christian	0.551	0.538	0.605	22832
Muslim	0.194	0.184	0.146	22832
Other religion	0.232	0.259	0.225	22832
No religion	0.024	0.019	0.024	22832

Notes: "Non-victims" are those women who never experienced violence. "Victims (ever)" are those women who previously had experienced violence, but not in the last 12 months. "Victims (last 12 months)" are those women who experienced violence in the last 12 months.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating physical violence experienced in the last 12 months (Equation 2) with full set of controls. The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE A8

Summary statistics by any violence victim status: never, ever experienced, experienced last 12 months

	Non-victims	Victims (ever)	Victims (last 12 months)	Observations
Neonatal Mortality	0.022	0.022	0.029	28263
Child male	0.513	0.510	0.503	28263
Mother age at birth	26.700	28.575	26.407	28263
Multiple birth	0.024	0.030	0.026	28263
Birth order	3.057	3.909	3.486	28263
Urban	0.346	0.364	0.314	28263
Years education (mother)	6.253	5.854	5.005	28258
Years education (father)	7.038	7.085	6.450	28186
Spouse age	32.702	34.020	32.362	28263
Wealth quintile	2.831	2.553	2.601	28263
Mother height (cm)	154.977	153.693	154.843	21595
Christian	0.552	0.553	0.618	21892
Muslim	0.186	0.125	0.130	21892
Other religion	0.238	0.303	0.227	21892
No religion	0.024	0.020	0.025	21892

Notes: "Non-victims" are those women who never experienced violence. "Victims (ever)" are those women who previously had experienced violence, but not in the last 12 months. "Victims (last 12 months)" are those women who experienced violence in the last 12 months.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating any violence experienced in the last 12 months (Equation 2) with full set of controls. The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE A9

Summary statistics by sexual violence victim status: never, ever experienced, experienced last 12 monthss

	Non-victims	Victims (ever)	Victims (last 12 months)	Observations
Neonatal Mortality	0.023	0.032	0.030	28353
Child male	0.511	0.537	0.505	28353
Mother age at birth	26.789	28.443	26.167	28353
Multiple birth	0.024	0.035	0.032	28353
Birth order	3.167	3.980	3.581	28353
Urban	0.347	0.269	0.270	28353
Years education (mother)	6.058	4.704	4.955	28348
Years education (father)	6.948	6.377	6.598	28275
Spouse age	32.754	33.978	32.090	28353
Wealth quintile	2.783	2.400	2.580	28353
Mother height (cm)	154.868	153.607	154.986	21656
Christian	0.558	0.559	0.679	21975
Muslim	0.175	0.152	0.112	21975
Other religion	0.243	0.274	0.191	21975
No religion	0.025	0.015	0.018	21975

Notes: "Non-victims" are those women who never experienced violence. "Victims (ever)" are those women who previously had experienced violence, but not in the last 12 months. "Victims (last 12 months)" are those women who experienced violence in the last 12 months.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made. Sample used is that from our baseline regression investigating sexual violence experienced in the last 12 months (Equation 2) with full set of controls. The samples for means of mother height (religion) exclude the eleven (eleven) surveys in which information on womens' height (religion) are not collected (see Table A2).

TABLE A10

Explanation of SIGI index values, alongside inverted values used in regression

SIGI Index Value	Explanation of value	Inverted value used in analysis
Panel A: Whether the legal framework offers women legal protection from domestic violence		
0	There is specific legislation in place to address domestic violence; the law is adequate overall, and there are no reported problems of implementation.	1
0.25	There is specific legislation in place to address domestic violence; the law is adequate overall, but there are reported problems of implementation.	0.75
0.5	There is specific legislation in place to address domestic violence, but the law is inadequate.	0.5
0.75	There is no specific legislation in place to address domestic violence, but there is evidence of legislation being planned or drafted.	0.25
1	There is no legislation in place to address domestic violence.	0
Panel B: Whether the legal framework offers women legal protection from rape		
0	There is specific legislation in place to address rape, marital rape is included, perpetrators cannot escape prosecution if they marry the victim and implementation is effectively enforced.	1
0.25	There is specific legislation in place to address rape, marital rape is included and perpetrators cannot escape prosecution if they marry the victim, although implementation is not effectively enforced.	0.75
0.5	There is specific legislation in place to address rape, marital rape is not included and perpetrators cannot escape prosecution if they marry the victim.	0.5
0.75	There is specific legislation in place to address rape, marital rape is not included and perpetrators can escape prosecution if they marry the victim. However, legislation is being planned or drafted.	0.25
1	There is no legislation in place to address rape.	0

Source: Social Institutions and Gender Index, available from https://stats.oecd.org/

TABLE A11

Robustness check: the effect of domestic violence on child mortality while controlling for maternal height

	A: Violence Ever Experienced			B: Violence in last 12 months	
	Neonatal Mortality **OLS**	Infant Mortality **OLS**	Under-5 mortality **OLS**	Neonatal Mortality **OLS**	Neonatal Mortality **2SLS**
	(I)	(II)	(III)	(IV)	(V)
Physical Violence (ever)	0.003**	0.007***	0.011***		
	(0.001)	(0.002)	(0.003)		
Physical Violence (recent)				0.005*	0.199***
				(0.003)	(0.059)
Observations	644407	612785	474838	27004	26867
F-stat first stage					27.668
Sexual Violence (ever)	0.002**	0.004**	0.008***		
	(0.001)	(0.002)	(0.003)		
Sexual Violence (recent)				0.005	0.318**
				(0.006)	(0.141)
Observations	598987	569234	440167	21595	21458
F-stat first stage					233.922
Any violence (ever)	0.003**	0.007***	0.011***		
	(0.001)	(0.002)	(0.003)		
Any violence (recent)				0.005	0.186***
				(0.003)	(0.053)
Observations	599310	569538	440399	21656	21519
F-stat first stage					29.238
X Controls	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Country Trends	Y	Y	Y	Y	Y

Notes: Columns (I) - (III) provide estimates of equation 1, Column (IV) provides estimates of equation 2, and column (V) provides estimates of equation 3b, additionally controlling for maternal height. Table A10 provides a description of the law indices used in the first stage of 2SLS reported in column (V). F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used when using domestic violence (ever) and Table A2 for the surveys used when using domestic violence (recent). Section 2 describes the sample restrictions made.

TABLE A12

Robustness check: the effect of domestic violence on child mortality while controlling for religion

	A: Violence Ever Experienced			B: Violence in last 12 months	
	Neonatal Mortality **OLS**	Infant Mortality **OLS**	Under-5 mortality **OLS**	Neonatal Mortality **OLS**	Neonatal Mortality **2SLS**
	(I)	(II)	(III)	(IV)	(V)
Any Violence (ever)	0.005***	0.009***	0.013***		
	(0.001)	(0.002)	(0.003)		
Any Violence (recent)				0.006*	0.348*
				(0.003)	(0.190)
Observations	516843	489378	372688	21889	21746
F-stat first stage					2.699
p-value Hansen-J Statistic					0.531
Physical Violence (ever)	0.005***	0.009***	0.013***		
	(0.001)	(0.002)	(0.003)		
Physical Violence (recent)				0.008***	0.219***
				(0.003)	(0.059)
Observations	527093	499243	380732	22829	22686
F-stat first stage					11.813
p-value Hansen-J Statistic					0.555
Sexual Violence (ever)	0.002***	0.004**	0.009***		
	(0.001)	(0.002)	(0.002)		
Sexual Violence (recent)				0.006	0.841*
				(0.005)	(0.437)
Observations	517230	489739	372965	21972	21829
F-stat first stage					2.699
p-value Hansen-J Statistic					0.662
X Controls	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Country Trends	Y	Y	Y	Y	Y

Notes: Columns (I) - (III) provide estimates of equation 1, Column (IV) provides estimates of equation 2, and column (V) provides estimates of equation 3b, additionally controlling for religion. Table A10 provides a description of the law indices used in the first stage of 2SLS reported in column (V). F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used when using domestic violence (ever) and Table A2 for the surveys used when using domestic violence (recent). Section 2 describes the sample restrictions made.

TABLE A13

Robustness check: associations of child mortality with indices of domestic violence ever experienced by the mother

	(I)	(II)	(III)	(IV)
A: Neonatal mortality				
Index Any Violence (ever)	0.002*	0.002**	0.001**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	863517	733688	733688	733688
Index Physical Violence (ever)	0.003**	0.002***	0.002**	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	925905	792946	792946	792946
Index Sexual Violence (ever)	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	864011	734114	734114	734114
B: Infant mortality				
Index Any Violence (ever)	0.004**	0.003***	0.003***	0.003***
	(0.002)	(0.001)	(0.001)	(0.001)
Observations	818805	696681	696681	696681
Index Physical Violence (ever)	0.006***	0.004***	0.004***	0.004***
	(0.002)	(0.001)	(0.001)	(0.001)
Observations	878455	753402	753402	753402
Index Sexual Violence (ever)	0.001	0.000	0.000	0.001
	(0.001)	(0.000)	(0.000)	(0.000)
Observations	819266	697079	697079	697079
C: Under-5 mortality				
Index Any Violence (ever)	0.006*	0.004**	0.005***	0.005***
	(0.003)	(0.002)	(0.001)	(0.001)
Observations	630358	537521	537521	537521
Index Physical Violence (ever)	0.009**	0.005***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
Observations	677690	582731	582731	582731
Index Sexual Violence (ever)	0.001	0.001	0.001	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	630702	537827	537827	537827
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Each cell provides estimates from a separate regression. All regressions estimate equation (1), replacing dummy variables for violence with indices of violence. Indices are calculated in the following way: we calculate z-scores for each woman for each question concerning physical or sexual violence. We then average over these z-scores for the index of physical and sexual violence, respectively. For the index of any type of violence, we average over the indices for physical and sexual violence. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A1 for the surveys used and section 2 for the sample restrictions made.

TABLE A14

Robustness check: associations of neonatal mortality with indices of domestic violence experienced by the mother in the last 12 months

	(I)	(II)	(III)	(IV)
Index Any Violence (last 12 months)	0.004	0.003	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Observations	31969	28263	28263	28263
Index Physical Violence (last 12 months)	0.004**	0.003**	0.003*	0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	40020	34521	34521	34521
Index Sexual Violence (last 12 months)	0.002	0.001	0.001	0.001
	(0.002)	(0.001)	(0.002)	(0.002)
Observations	32074	28353	28353	28353
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Each cell provides estimates from a separate regression. All regressions estimate equation (2), replacing dummy variables for violence with indices of violence. Indices are calculated in the following way: we calculate z-scores for each woman for each question concerning physical or sexual violence. We then average over these z-scores for the index of physical and sexual violence, respectively. For the index of any type of violence, we average over the indices for physical and sexual violence. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE A15

Robustness check: the effect of indices of domestic violence experienced by the mother in the last 12 months on neonatal mortality; instrumental variables estimates

	(I)	(II)	(III)	(IV)
Index Any Violence (last 12 months)	0.250*	0.196	–0.000	0.221*
	(0.132)	(0.159)	(0.031)	(0.114)
Observations	31798	28120	28120	28120
F-stat first stage	1.991	0.831	14.104	1.146
p-value Hansen-J Statistic	0.566	0.249	0.655	0.377
Index Physical Violence (last 12 months)	0.222**	0.049	–0.097	0.233**
	(0.105)	(0.168)	(0.114)	(0.103)
Observations	39849	34378	34378	34378
F-stat first stage	4.868	0.281	1.926	3.817
p-value Hansen-J Statistic	0.262	0.017	0.409	0.395
Index Sexual Violence (last 12 months)	0.201*	0.163*	0.000	0.189
	(0.113)	(0.097)	(0.018)	(0.173)
Observations	31903	28210	28210	28210
F-stat first stage	1.681	1.767	30.241	0.243
p-value Hansen-J Statistic	0.698	0.434	0.638	0.307
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a), replacing dummy variables for violence with indices of violence.. Indices are calculated in the following way: we calculate z-scores for each woman for each question concerning physical or sexual violence. We then average over these z-scores for the index of physical and sexual violence, respectively. For the index of any type of violence, we average over the indices for physical and sexual violence. Table A10 gives a description of the law indices used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE A16

Robustness check: associations of neonatal mortality with domestic violence experienced by the mother in the last 12 months, restricted sample of women

	(I)	(II)	(III)	(IV)
Any Violence (last 12 months)	0.007*	0.005*	0.004	0.004
	(0.003)	(0.003)	(0.002)	(0.002)
Observations	8914	7916	7916	7916
Physical Violence (last 12 months)	0.008***	0.007***	0.006***	0.006***
	(0.003)	(0.002)	(0.002)	(0.002)
Observations	10033	8734	8734	8734
Sexual Violence (last 12 months)	–0.001	–0.001	–0.004	–0.005
	(0.006)	(0.006)	(0.006)	(0.007)
Observations	2819	2485	2485	2485
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Each cell provides estimates from a separate regression. All regressions use the specification given in equation (2) as described in section 3. "Restricted sample" excludes from the control group those women who never experienced violence; in this sample we compare neonatal mortality of children born in the last 12 months to individuals who experienced violence in the last 12 months vs. those who experienced violence, but not in the last 12 months. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE A17

Robustness check: associations of neonatal mortality with domestic violence experienced by the mother in the last 12 months; matching estimates, restricted sample of women

	(I)
Any Violence (last 12 months)	0.004
	(0.003)
Observations	7916
Physical Violence (last 12 months)	0.007
	(0.005)
Observations	8734
Sexual Violence (last 12 months)	–0.002
	(0.010)
Observations	2485

Notes: Each cell provides estimates from a separate matching estimation; the dependent variable is neonatal mortality. Estimates are obtained through propensity score estimation using nearest neighbour matching. The propensity score is determined by a logit regression of violence on mother education, partner's education, urban status, gender of the child, mother age at birth, birth order, spousal age, wealth indices, country indicator, and child year of birth trend. "Restricted sample" excludes from the control group those women who never experienced violence; in this sample we compare neonatal mortality of children born in the last 12 months to individuals who experienced violence in the last 12 months vs. those who experienced violence, but not in the last 12 months.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE A18

Robustness check: the effect of any domestic violence experienced by the mother in the last 12 months on neonatal mortality, 2SLS estimates, restricted sample of women

	(I)	(II)	(III)	(IV)
Any Violence (last 12 months)	0.007	0.023	0.050	0.127
	(0.035)	(0.019)	(0.131)	(0.110)
Observations	8868	7876	7876	7876
F-stat first stage	3.756	10.794	5.103	18.971
p-value Hansen-J Statistic	0.627	0.703	0.023	0.093
Physical Violence (last 12 months)	0.015	0.029*	0.070	0.187***
	(0.031)	(0.016)	(0.084)	(0.070)
Observations	9987	8694	8694	8694
F-stat first stage	3.831	7.175	25.542	11.571
p-value Hansen-J Statistic	0.693	0.427	0.272	0.916
Sexual Violence (last 12 months)	0.063	0.054	0.921**	0.837
	(0.066)	(0.046)	(0.460)	(0.819)
Observations	2813	2479	2479	2479
F-stat first stage	6.441	12.826	2.775	0.405
p-value Hansen-J Statistic	0.508	0.483	0.361	0.510
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a) as described in sub-section 3.3. Table A10 gives a description of the law indices used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. The test of overidentifying restrictions is reported by the p-value of the Hansen-J statistic; the null hypothesis is that the instruments are valid. "Restricted sample" excludes from the control group those women who never experienced violence; in this sample we compare neonatal mortality of children born in the last 12 months to individuals who experienced violence in the last 12 months vs. those who experienced violence, but not in the last 12 months. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.

TABLE A19

Robustness check: the effect of domestic violence experienced by the mother in the last 12 months on neonatal mortality, 2SLS estimates, just identified estimates

	(I)	(II)	(III)	(IV)
Any Violence (last 12 months)	0.077	0.075*	0.029	0.381
	(0.051)	(0.045)	(0.070)	(0.314)
Observations	31798	28120	28120	28120
F-stat first stage	2.209	3.056	3.161	0.926
Physical Violence (last 12 months)	0.102*	0.090	–0.625	0.187***
	(0.055)	(0.058)	(3.108)	(0.055)
Observations	39849	34378	34378	34378
F-stat first stage	3.555	2.755	0.052	6.471
Sexual Violence (last 12 months)	0.148	0.130*	0.033	0.638**
	(0.111)	(0.068)	(0.080)	(0.287)
Observations	31903	28210	28210	28210
F-stat first stage	1.968	3.930	10.534	3.465
X Controls		Y	Y	Y
Country FE			Y	Y
Year FE			Y	Y
Country Trends				Y

Notes: Estimated violence coefficients reported from estimating equation (3b) and first stage results refer to equation (3a) as described in sub-section 3.3. Panel A of Table A10 gives a description of the law index used in the first stage. F-stat reported is the Kleibergen-Paap rk weak identification statistic. Standard errors are clustered at the country level. *** p-value $< 1\%$, ** p-value $< 5\%$, * p-value $< 10\%$.

Source: Data from the Demographic and Health Surveys. See Table A2 for the surveys used and section 2 for the sample restrictions made.