Exploring the relationship between domestic violence against mothers and their children's health outcomes

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Abstract

India-wide surveys show consistently increasing incidences of spousal violence. Research shows a strong association between domestic violence and women's health outcomes. The likelihood of a child having worse health outcomes is also higher amongst children whose mothers are victims of domestic violence. This paper explores the impact of domestic violence against mothers on the health outcomes of their first born child. We leverage NFHS-4 and use the implementation of the Protection of Women from Domestic Violence Act, 2005 as an instrumental variable in our regression analysis to remove endogeneity in the main relationship. We find a negative correlation between incidence of domestic violence and children's health outcomes. The results of this paper also imply that the Protection of Women from Domestic Violence Act, 2005 seems to be increasing the reporting of domestic violence.

Introduction

Domestic violence is a pattern of behaviour in any relationship used to gain or maintain power and control over an intimate partner. The abuse can be physical, emotional, sexual, psychological, economic or threats that can influence another person (United Nations, "What is domestic abuse?"). While there is no gender-specific disposition of domestic violence victims, victims generally tend to be women (Das and Lakshmana 2020, 1). Domestic violence represents an extreme form of control that husbands may use to hold their wives to preconceived gender roles (Stephenson et al. 2006, 75).

In India, domestic violence is seen as a major threat to women's lives - historically being driven by the dowry system. Country-wide surveys show consistently increasing incidences of spousal violence - this trend is particularly seen in some regions. According to NFHS-5, states with the highest incidence of spousal violence are Karnataka, Bihar and Manipur (Suri et al. 2022).

Studies across the world, in countries such as Nicaragua, US, India and Bangladesh, show a higher incidence of low birth weight in newborn babies and deaths amongst pregnant women who are victims of domestic violence. A 2005 WHO study also showed a strong association between domestic violence and women's health. Further, studies found that the likelihood of a child being underweight, wasted, stunted or any combination of the three is higher among children whose mothers are domestic violence victims (Suri et al. 2022).

This paper aims to explore the impact of domestic violence against mothers on the health outcomes of their first born child. We do not include the other children as they might have worse health outcomes by virtue of being of a higher birth order or being born after a first-born son, biassing the main relationship. To assess this relationship, we leverage NFHS-4 and use the implementation of the Protection of Women from Domestic Violence Act, 2005 (referred to as 'The Act' henceforth) as an instrument to remove any endogeneity that may plague the main relationship. Accounting for relevant covariates also allows us to assess how these factors impact children's health outcomes in conjunction with domestic violence. Our preliminary hypothesis is that domestic violence against mothers plausibly causes worse health outcomes for children.

Upon employing a simple regression framework we find a statistically significant negative relationship between domestic violence and two indicators of child's health outcomes - height for age and birth weight. The negative impact is more pronounced for height for age as compared to birth weight. On employing a multiple regression framework with household and individual level controls, this negative correlation reduces, indicating that there are several factors correlated with incidence of domestic violence that impact a child's health outcomes. The results from the instrumental variable framework show a higher negative impact of domestic violence as compared to the OLS multiple regression framework in terms of magnitude. However, this impact is statistically insignificant.

Literature Review

Research shows that child abuse is often found in cases of partner abuse and may occur during, before or after a pregnancy. A positive association between abuse during pregnancy and adverse pregnancy outcomes has also been found (Morewitz 2004, 3). Domestic violence has a negative association with a couple's likelihood of adopting a modern method of contraception, and can be an important explanatory factor for unintended pregnancy (Stephenson et al. 2006, 82)**.** Unintended pregnancies can lead to worse children's health outcomes, as a woman's body may not be prepared for pregnancy and prospective parents may not be capable of raising a child. A study done on NFHS-4 shows that incidence of any kind of domestic violence (verbal, mental, physical, economic and sexual) has significant effects on indicators of women's and children's health, care and nutrition (Suri et al. 2022). Most studies assessing children of abused women

report serious problems including increased anxiety and aggression. A cross sectional study conducted in Bihar found that those who experience physical and/or sexual domestic violence are significantly more likely to report miscarriage, stillbirth, and abortion as well as maternal health complications compared to women who had not faced such violence (Dhar et al. 2018, 8)

A study conducted in California most closely mimics the empirical strategy of this paper. The study employs an OLS regression model to test the effect of hospitalisation while pregnant on newborn health outcomes and then employs an instrumental variable (ratio of arrests for domestic violence to number of 911 calls reporting domestic violence in the previous year) to account for endogeneity. The paper found a negative relationship between violence during pregnancy and newborn health. It also finds that an increase in the probability of arrest for domestic violence reduces the number of pregnant women hospitalised because of an assault (Aizer 2011, 535).

Our paper adds to this field by studying not just the relationship between domestic violence and children's health outcomes but doing so in context of The Act. The question is policy relevant as the results can be used to inform laws regarding the safety of women and children and also ensure that there are safe, accessible avenues for victims to report violence. It could also provide insight into indirect factors affecting children's health outcomes as well as domestic violence, such as household income levels, and push for the implementation of more policies that target the improvement of such factors.

Protection of Women from Domestic Violence Act, 2005

The Act was passed in 2005 and came into effect in October 2006. The law for the first time recognized women's right to a violence free home. It is a civil law aimed at providing immediate support to women facing physical, sexual, verbal, emotional or economic domestic violence. No arrests can be made based on complaints filed under this law. The Act provides for the appointment of Protection Officers (POs) - who are the key implementing agencies of the Act. They are appointed to receive complaints from the victim/survivors and record reports apart from also providing information on legal rights, remedies and facilitating access to justice and support services. POs can pass protection orders in favour of the aggrieved, prohibiting the accused from inflicting any further violence on the aggrieved, freezing any assets, going to their

workplace or attempting communication, amongst others. Breach of a protection order could result in imprisonment or fine ("The Protection of Women from Domestic Violence Act, 2005.").

Overall, implementation of the Act has been slow and uneven across states (Maharashtra had appointed over 3000 Protection Officers by 2012, West Bengal only had 20) .

Data

The data used in this paper is sourced from the Individual Recode dataset from the National Family Health Survey (NFHS-4) conducted over the years 2015-16. The NFHS is a multi-round survey conducted in a representative sample of households throughout India and provides information on population, health and nutrition for India and each state and union territory. The dataset collected information from 601,509 households, 699,686 women and 103,525 men. The Individual Recode dataset has one record for every eligible woman and accounts for variables such as marriage and sexual activity, fertility preferences, family planning, women empowerment, domestic violence and anthropometry for children of interviewed women ("National Family Health Survey.").

The survey reports domestic violence of three types as dummy variables - less severe, severe and sexual. The primary independent variable used for this study is an index created as a summation of these three types of reported violence.

To measure children's health outcomes, we use height for age standard deviation as the first dependent variable. However, given that domestic violence during pregnancy is known to lead to adverse pregnancy outcomes due to the direct toll of abuse on the physical and mental health of the woman, we test whether domestic violence has a more pronounced impact on the child's neonatal health as compared to height for age. We hypothesise a greater impact because while height for age could be affected by other environmental factors, a woman's physical health and nutrition levels are the most crucial indicators of a child's neonatal well being. We test this impact by regressing a child's birth weight (an indicator of the child's neonatal health) on the domestic violence index. The covariates considered are expounded upon in the next section.

Empirical Strategy

To evaluate the impact that domestic violence may have on children's health outcomes, we begin by employing a simple regression model, with height for age and birth weight as the dependent variables and domestic violence index as the independent variable. This is delineated in equation (1):

$$y_{cihds} = \beta_0 + \beta_1 Domestic\ Violence\ Index_{ihds} + \epsilon_{cihds}$$

However, we theorise that there may be a myriad of other factors that significantly affect this relationship, apart from the domestic violence index, that might impact children's health outcomes. These include age at marriage, age at first birth, household size, number of living children, woman's weight, wealth index, place of residence (rural or urban), whether the woman is currently working, has completed secondary education, whether her partner is currently working as well as her level of financial independence (whether the woman is involved in financial decision making in the household), and whether the child is a female. Not accounting for these factors might bias the β_1 coefficient in Equation (1). Thus, we build a Multiple Regression Model, characterised in Equation (2):

$$y_{cihds} = \beta_0 + \beta_1 Domestic\ Violence\ Index_{ihds} + \beta_2 Age\ at\ Marriage_{ihds} +$$
$$\beta_3 Age\ at\ First\ Birth_{ihds} + \beta_4 Household\ Size_{hds} + \beta_5 Number\ of\ Living\ Children_{ihds} +$$
$$\beta_6 Woman's\ Weight_{ihds} + \beta_7 Wealth\ Index_{hds} + \beta_8 Urban_{ds} +$$
$$\beta_9 Woman\ Currently\ Working_{ihds} + \beta_{10} Woman\ Completed\ Secondary\ Education_{ihds}$$
$$+ \beta_{11} Partner\ Completed\ Secondary\ Education_{ihds} + \beta_{12} Financial\ Independence_{ihds} +$$
$$\beta_{13} Child\ is\ Female_{cihds} + \epsilon_{cihds}$$

We expound on our empirical strategy by explaining the expected directionality of some of the relationships between the covariates and independent and dependent variables considered.

A priori, we hypothesise a negative relationship between the **wealth index and domestic violence index**, i.e., being from a low income household will increase chances of being a victim

of domestic violence. Gender norms, gender pay gap and unequal access to public services contribute to a woman's disadvantaged position in the economy (Reis, "Domestic Abuse Is an Economic Issue – for Its Victims and for Society."). These factors are exacerbated when women are from low income households - women are less likely to be educated and are dependent on their husband, with lesser options outside of their marriage as compared to women from high income households. This creates a power imbalance and increases the propensity for women to experience domestic violence. We hypothesise a positive relationship between children's health outcomes and wealth index. Richer households will be able to better provide for their children's health needs, by virtue of having better access to care and nutrition and probably also being more educated about children's health compared to poorer households.

The relationship between **financial independence and domestic violence** incidence is ambiguous. The relationship may be negative through the following channel: more independence could lead to lesser domestic violence incidence, as greater financial independence could mean that the woman has more economic options outside her marriage. Greater financial independence could lead to greater autonomy and bargaining power within the household, help reduce or reverse the power imbalance between the husband and wife and provide the woman with more control over her household, reducing domestic violence incidence. One could also argue a positive relationship. Women with greater financial independence might face backlash from husbands who feel inadequate that they are not the sole providers of the household, as conventionally dictated by society. Alternatively, women with greater financial independence may be more willing to answer surveys truthfully and report violence than those who are afraid of greater backlash. We estimate a positive relationship between children's health and their mother's financial independence. Research shows that mothers spend more on their children than their fathers do (Zelizer, "The Gender of Money"). In that vein, more financial independence for the mother should imply that they have a greater say in their children's health expenditure and will also be willing to spend more on their well being, leading to better health outcomes for them.

We hypothesise a negative relationship between domestic violence and level of education. Essentially, a woman being more educated should reduce the probability of domestic violence occurrence. Prior literature finds that in India, couples with higher educated wives are

less likely to experience less severe and severe violence compared to low educated couples. Further, equally highly educated couples revealed the lowest likelihood of experiencing any type of domestic violence, connoting that the partner's level of education also plays a role in this relationship (Rapp et al. 2012). However, it must be noted that this negative relationship might be underestimated - i.e. it is possible that less educated women are less likely to truthfully report domestic violence as compared to those with more education. The relationship between a mother's education and children's health outcomes is intuitively positive. Educated mothers might have more bargaining power within the household, enabling them to take better care of their child, consequently improving their health outcomes. Additionally, educated mothers will also have greater knowledge about how best to take care of their child compared to a less educated mother, thus ensuring that the child receives adequate care.

Our third specification includes fixed effects at the individual level such as relationship with household heads and religion which are unlikely to change in the short run. We include the relationship with the household head as a proxy for women's autonomy within the household. We hypothesise that women who are the wives of household heads might have a greater autonomy in decision making regarding their child's nutritional needs as compared to a daughter in law and might also face lower abuse considering their status within the household (Carlson, Kordas and Murray-Kolb 2015, 4). We include women's religion as previous literature shows it to be correlated with domestic violence and child's health outcomes. For instance, Muslim children are likely to have better health outcomes than those of Hindus (Geruso and Spears 2018, 1)

In our fourth specification, we conduct heterogeneity tests to see whether the impact of domestic violence on child's health outcomes has differential impacts across women's education and household income levels.

Summary Statistics

	mean	sd	min	max
Height for Age	-1.915845	.9666248	-4.18	1.29
Birth Weight	2.825551	.5692009	1.3	4.5
Domestic Violence Index	.4270674	.7516783	0	3
Age at Marriage	18.57754	3.952486	10	35
Age at First Birth	20.5546	3.800384	13	36
Household Size	5.791607	2.629463	2	25
Number of Living Children	1.746378	1.650001	0	9
Woman's Weight	50.78852	11.0627	30	85
Wealth Index	2.978762	1.386907	1	5
Woman Completed Secondary Education	.5928945	.4912952	0	1
Partner Completed Secondary Education	.6544212	.4755592	0	1
Woman Currently Working	.2340643	.4234143	0	1
Urban	.2926098	.4549611	0	1
Child is Female	.4166892	.493011	0	1
Observations	699686			

Summary Statistics of the dependent and independent variables used in the
research process using the Individual Recode of NFHS-4 data.

RESULTS

Using Height for Age as the Outcome Variable

Table 1: OLS Regression Results

	(1) Basic Specification	(2) With Controls	(3) Fixed Effects	(4) Heterogeneity Test
Domestic Violence Index	-0.112***	-0.0276***	-0.0286***	-0.0234
	(0.00508)	(0.00895)	(0.00898)	(0.0189)
Age at Marriage		-0.00112	-0.000349	-0.000402
		(0.00352)	(0.00347)	(0.00347)
Age at First Birth		0.00219	0.00208	0.00204
		(0.00355)	(0.00341)	(0.00341)
Household Size		0.0184***	0.0113**	0.0114**
		(0.00432)	(0.00526)	(0.00526)
Number of Living Children		-0.0216***	-0.0144**	-0.0144**
		(0.00667)	(0.00732)	(0.00732)
Woman's Weight		0.0374***	0.0372***	0.0372***
		(0.000850)	(0.000810)	(0.000810)
Wealth Index		0.0249***	0.0156**	0.0152*
		(0.00789)	(0.00788)	(0.00896)
Urban		-0.101***	-0.0949***	-0.0948***
		(0.0197)	(0.0195)	(0.0195)
Woman Currently Working		-0.0126	-0.00971	-0.00994
		(0.0178)	(0.0181)	(0.0181)
Woman Completed Secondary Education		0.00898	0.0191	0.0286
		(0.0195)	(0.0196)	(0.0230)
Partner Completed Secondary Education		0.0360**	0.0414**	0.0416**
		(0.0178)	(0.0178)	(0.0178)
Financial Independence		-0.0464**	-0.0386*	-0.0390*
		(0.0200)	(0.0200)	(0.0200)
Child is Female		-0.0135	-0.0123	-0.0128
		(0.0150)	(0.0149)	(0.0149)
Wealth Index * Domestic Violence Index				0.000169
				(0.00785)
Education * Violence				-0.0172
				(0.0215)
Observations	64894	13767	13767	13767
Fixed Effects	No	No	Yes	Yes
Adjusted R-squared	0.00754	0.184	0.189	0.189

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01
Testing the relationship between Domestic Violence Index and Height for Age using OLS regressions
where (1) is the basic specification without controls, (2) includes controls but not fixed effects
(3) includes fixed effects of religion and relationship with household head
(4) includes heterogeneity tests of domestic violence with income and education

(1) In the simple regression model, the main relationship is statistically significant and negative. An increase in the index of domestic violence by one decreases the child's height for age by 0.112 standard deviations. This makes sense intuitively - a woman who experiences a higher level of domestic violence is less likely to have the emotional and physical well being to take good care of her child. Moreover, a woman who experiences domestic violence and ill treatment within the household might be more likely to have inadequate autonomy to make decisions regarding the distribution of household resources towards food (Tenkorang 2018, 56)**.** Considering that mothers are usually the primary caregivers and have a higher knowledge of the nutritional benefits for their child, this lack of autonomy might contribute to lower health outcomes of her child (Mehrotra 2006, 913). Existing literature also tells us that domestic violence is more prevalent in households belonging to lower wealth quintiles and poor education backgrounds. These households are also less likely to be able to provide their children with adequate nutrition and healthcare, further contributing to the negative impact of domestic violence on child's health outcomes (Pearce et al. 2019, 3)

(2) In order to partial out the effects of other factors contributing to the main relationship, the second specification employs a multiple regression model including these factors as controls. As hypothesised, upon addition, the negative impact of domestic violence on height for age reduces. Omitting controls was causing an overestimate of the negative impact of domestic violence. On testing bilateral relationships between these variables, it is seen that a woman facing a higher level of domestic violence is also more likely to have a greater number of living children, lower weight reflecting worse health outcomes, is more likely to belong to a poorer background and be with a less educated partner. These factors contribute to the negative impact of domestic violence on child's health outcomes, which is consistent with existing literature. A family with more living children is likely to have worse health outcomes for each child due to less time and resources incurred on each child. Children belonging to richer families are more likely to have better access to nutrition and healthcare consequently exhibiting better health outcomes and children belonging to women with lower weight (nutritional status) are likely to have

worse health outcomes. On controlling for these factors, we see that the impact of facing domestic violence on the child's height for age is not as pronounced as in the basic specification. While the negative relationship between a woman's financial independence and height for age is not consistent with our *a priori* hypothesis, this could potentially be attributed to self-reported financial independence being an inaccurate measure of a woman's decision-making autonomy within the household. Moreover, even if the woman has greater financial independence, if the household income is primarily the man's, he might choose to spend less of it on the child as compared to what a woman would.

(3) On adding aforementioned **individual fixed effects**, the negative impact of domestic violence on child's height for age remains similar to specification (2), reflecting that these factors may not greatly contribute to the main relationship.

(4) The fourth specification employs **heterogeneity tests** to check whether there is a differential impact of domestic violence on a child's height for age across education levels and wealth classes. We see no statistically significant differential impact, contrary to expectations and previous literature. However, this result may be a function of the large number of missing observations within the dataset and its self-reported nature, which might skew results due to misreporting. For instance, poorer households might be underreporting domestic violence incidence due to greater inhibition of being alienated from their family as compared to richer women who might be more comfortable doing so. Thus, the results might not depict a significant differential impact (i.e. a higher negative impact for poorer households and those with lower education) despite there being one in reality.

Using Birth Weight as the Outcome Variable

Table 2: OLS Regression Results

	(1) Basic Specification	(2) With Controls	(3) Fixed Effects	(4) Heterogeneity Tests
Domestic Violence Index	-0.0193***	-0.00661	-0.00313	-0.0202
	(0.00579)	(0.0122)	(0.0120)	(0.0241)
Age at Marriage		0.0183***	0.0133***	0.0134***
		(0.00455)	(0.00463)	(0.00464)
Age at First Birth		-0.0141***	-0.0117***	-0.0116***
		(0.00432)	(0.00450)	(0.00450)
Household Size		0.00563	0.00398	0.00383
		(0.00487)	(0.00688)	(0.00688)
Number of Living Children		0.0130	0.00948	0.00985
		(0.00944)	(0.0102)	(0.0102)
Woman's Weight		0.00618***	0.00611***	0.00611***
		(0.00106)	(0.00102)	(0.00102)
Wealth Index		0.00949	0.0120	0.00615
		(0.0104)	(0.0103)	(0.0115)
Urban		0.0171	0.0130	0.0142
		(0.0261)	(0.0256)	(0.0256)
Woman Currently Working		-0.0820***	-0.0825***	-0.0816***
		(0.0224)	(0.0223)	(0.0223)
Woman Completed Secondary Education		0.0791***	0.0644**	0.0770***
		(0.0255)	(0.0251)	(0.0295)
Partner Completed Secondary Education		0.00122	-0.00104	-0.000467
		(0.0244)	(0.0241)	(0.0241)
Financial Independence		0.0474*	0.0385	0.0381
		(0.0250)	(0.0248)	(0.0248)
Child is Female		-0.0710***	-0.0749***	-0.0749***
		(0.0190)	(0.0189)	(0.0189)
Wealth Index * Domestic Violence Index				0.0123
				(0.0109)
Education * Violence				-0.0233
				(0.0274)
Observations	19750	3418	3418	3418
Fixed Effects	No	No	Yes	Yes
Adjusted R-squared	0.000604	0.0459	0.0640	0.0643

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Testing the relationship between Domestic Violence Index and Birthweight using OLS regressions

where (1) is the basic specification without controls, (2) includes controls but not fixed effects

(3) includes fixed effects of religion and relationship with household head

(4) includes heterogeneity tests of domestic violence with income and education

Contrary to our preliminary hypothesis we see that domestic violence against women has a lower negative impact on their child's birth weight as compared to their height for age. In fact, this impact becomes insignificant once individual household level controls are added to the specification. This might indicate that domestic violence has more of an emotional toll on women that affect their ability to take care of the nutritional needs of their children post birth, thus negatively affecting their postnatal health outcomes more than neonatal outcomes which is primarily impacted by the woman's physical health outcomes. However, the NFHS dataset has several missing values for birth weight thus reducing the sample size by a large margin. This could contribute to inaccurate results, underestimating the negative impact of domestic violence on birth weight.

<u>Endogeneity Problem</u> :

   Our OLS specifications suffer from endogeneity, impeding us from establishing a causal relationship between domestic violence and child's health outcomes, largely due to the self-reported nature of the dataset. Self-reported domestic violence could lead to a **misclassification bias** because women might not truthfully report their exposure to domestic violence to present the more socially desirable answer and paint their partner in good light. They may also underreport out of fear of being alienated from their family and further ill-treated in case their answers are publicised. Further, the specification also suffers from a **survivor bias** in the case of health outcomes of children. We only consider the health outcomes of children who survived the neonatal stage, not those who died at or prior to birth. Given that domestic violence has been linked to adverse pregnancy outcomes, these children, had they survived, might have had worse health outcomes. Further, they might have also belonged to mothers who faced higher levels of domestic violence thus leading to a severe underestimate of the negative impact of domestic violence on child's health outcomes.

   Endogeneity could also result from omitted factors such as household **history and perception of domestic violence**. For instance, women belonging to households with a greater history of domestic violence might be more emotionally tolerant and be able to take better care of their children despite abuse. These women might skew the results leading to an underestimation of the negative impact of domestic violence.

   Children's genetic health problems could cause a sample bias. The sample may consist of children who display worse health outcomes due to genetic or external factors, despite domestic violence incidence. Such observations could overestimate the negative impact of domestic violence.

   There is also a chance of a recall bias. Recall bias is a systematic error that occurs when respondents do not remember previous events or experiences accurately, or omit details. It has been found that 'undesirable habits' tend to be underreported and pre-existing beliefs might also impact recall of past events (Catalog of Bias, 2019). Given this, there is a high chance of this

bias in our data, due to the sensitivity of domestic violence.

Instrumental Variable

To account for endogeneity, we employ a control function approach wherein we exploit the Act to perform an instrumental variable specification. The instrumental variable used is the number of POs assigned to a state as a fraction of the state's population. This instrument is relevant because it is extremely likely that the introduction of POs in states has a causal impact on self-reported domestic violence incidence either by decreasing the incidence of domestic violence (negative impact) or by increasing the confidence of women to be able to report these cases (positive impact on self reporting). The instrument is unlikely to affect a child's health outcome through channels other than domestic violence, satisfying instrumental endogeneity. However, to ensure that program implementation was exogenous, we perform a robustness check, the results of which are shown in table 4.

Equations of Interest :

First Stage Regression:

$$DomesticViolenceIndex_{ihds} = \alpha_0 + \alpha_1 Proportion\ of\ Protection\ Officers_s + \alpha_2 Statewise\ PCI_s + \gamma X_{ihds} + v_{ihds}$$

Second Stage Regression:

$$y_{cihds} = \beta_0 + \beta_1 Domestic\ \widehat{Violence}\ Index_{ihds} + \eta X_{ihds} + \zeta Statewise\ PCI + u_{cihds}$$

Where X represents the controls from the OLS specification and state wise per capita income accounts for endogeneity in program implementation. This is to control for the possibility that more developed states received earlier and better implementation of the program,

Table 3: Instrumental Variable Regression Results (Height For Age)

	(1) Stage 1	(2) Stage 2
Propportion of Protection Officers	2456.5*** (863.9)	
Age at Marriage	0.00126 (0.00325)	-0.000340 (0.00359)
Age at First Birth	-0.0112*** (0.00322)	0.00130 (0.00523)
Household Size	0.000508 (0.00499)	0.0113** (0.00520)
Number of Living Children	0.0169** (0.00705)	-0.0131 (0.00886)
Woman's Weight	-0.00145* (0.000743)	0.0371*** (0.000977)
Wealth Index	-0.0775*** (0.00751)	0.0103 (0.0256)
Urban	0.0684*** (0.0182)	-0.0894*** (0.0292)
Woman Currently Working	0.00275 (0.0178)	-0.0105 (0.0179)
Woman Completed Secondary Education	-0.0827*** (0.0186)	0.0126 (0.0348)
Partner Completed Secondary Education	-0.0692*** (0.0176)	0.0369 (0.0304)
Financial Independence	-0.176*** (0.0213)	-0.0512 (0.0624)
Child is Female	0.0101 (0.0142)	-0.0117 (0.0154)
Statewise Per Capita Income	-0.000000304** (0.000000135)	-0.000000159 (0.000000172)
Domestic Violence Index		-0.0991 (0.332)
Observations	13767	13767
Adjusted R-squared		0.172

Standard errors in parentheses
* p<0.10, ** p<0.05, *** p<0.01
Instrumental Variable regressions with Proportion of Protection Officers as the instrument.
Controls include (1) religion and (2) relationship with household head fixed effects

(1) From the first stage of the 2SLS regression specification, it is observed that the proportion of POs has a positive impact on self-reported domestic violence index and this impact is statistically significant. This may be due to increased awareness and confidence among women to report abuse post the implementation of the Act as they have a system to protect them if they are ill-treated for exposing abusers.

However, while interpreting the results, it is important to keep in mind that the

instrument is weak (F statistic = 8.14). An increase in the proportion of protection officers by .0001 (2500% of the mean) increases the degree of self reported domestic violence only by 0.2 (50% of the mean). The low degree of correlation between the instrument and variable of interest implies that if the instrument does not satisfy the exogeneity condition, there is a possibility of observing largely biassed estimates. Although we hypothesise that the instrument does not suffer from endogeneity and employ robustness checks to ensure the same, it is difficult to accurately test for zero exogeneity.

In the second stage of the 2SLS regression with child's height for age as the outcome variable, we observe that the negative impact of domestic violence becomes insignificant. While this could be a result of the other controls correlated with domestic violence having a higher impact on a child's health outcome, it could also be a function of the instrument being weak - inflating the standard error or having an endogeneity bias which cannot be accurately tested for. Thus, the statistical significance of this impact should be interpreted with caution.

Table 4: Instrumental Variable Regression Results (Birth Weight)

	(1)	(2)
	Stage 1	Stage 2
Propportion of Protection Officers	3591.3*	
	(1987.4)	
Age at Marriage	0.00363	0.0138***
	(0.00629)	(0.00490)
Age at First Birth	-0.0212***	-0.0154
	(0.00616)	(0.00951)
Household Size	-0.0169*	0.000930
	(0.00950)	(0.00907)
Number of Living Children	0.0412***	0.0166
	(0.0157)	(0.0192)
Woman's Weight	-0.00172	0.00582***
	(0.00133)	(0.00129)
Wealth Index	-0.0795***	-0.00104
	(0.0144)	(0.0313)
Urban	0.0532	0.0219
	(0.0345)	(0.0333)
Woman Currently Working	-0.0316	-0.0886***
	(0.0341)	(0.0264)
Woman Completed Secondary Education	-0.0647*	0.0524
	(0.0373)	(0.0383)
Partner Completed Secondary Education	-0.0591	-0.0116
	(0.0374)	(0.0350)
Financial Independence	-0.202***	0.00250
	(0.0406)	(0.0845)
Statewise Per Capita Income	7.37e-09	-4.36e-08
	(0.000000257)	(0.000000189)
Domestic Violence Index		-0.177
		(0.392)
Observations	3418	3418
Adjusted R-squared		-0.0242

Standard errors in parentheses

* p<0.10, ** p<0.05, *** p<0.01

Instrumental Variable regressions with Proportion of Protection Officers as the instrument.

Controls include (1) religion and (2) relationship with household head fixed effects

We observe similar results on using the instrumental variable model to check the impact of domestic violence on a child's birth weight. While the effect of proportion of protection officers on domestic violence has a more pronounced but less significant positive impact on self reported domestic violence, the negative impact of domestic violence on birth weight is also statistically insignificant although greater in magnitude as that of height for age. However, the results of this specification suffer from the problem of restricted sample size to a greater extent than the previous specification, further inflating the standard error.

Robustness Check

Table 5: Robustness Check Results

	(1) Domestic Violence Index
Proportion of Protection Officers	-5751.0***
	(646.3)
Age at Marriage	-0.00954***
	(0.00332)
Age at First Birth	-0.00528*
	(0.00316)
Household Size	-0.00741
	(0.00461)
Number of Living Children	0.0242***
	(0.00610)
Woman's Weight	-0.00259***
	(0.000609)
Wealth Index	-0.0710***
	(0.00712)
Urban	0.132***
	(0.0160)
Woman Currently Working	-0.0190
	(0.0215)
Woman Completed Secondary Education	-0.122***
	(0.0186)
Partner Completed Secondary Education	-0.0585***
	(0.0164)
Financial Independence	-0.00888
	(0.0189)
Child is Female	0.000341
	(0.0131)
Statewise Per Capita Income	-0.00000113***
	(0.000000153)
Observations	16804
Adjusted R-squared	0.0833

Standard errors in parentheses
* $p<0.10$, ** $p<0.05$, *** $p<0.01$
Robustness Check to see whether there is a positive correlation between
Domestic Violence Index and Proportion of Protection Officers.
Proportion of Protection Officers is calculated as the
Number of Protection Officers in a State divided by its population as of 2011.

Although the proportion of POs might seem like a relevant instrument that satisfies instrumental exogeneity, there is a possibility that the implementation of the Act was not entirely exogenous, affecting the exogeneity of the instrument. It is possible that the program, which was implemented in a staggered manner (Das and Lakshmana 2020, 9), was better implemented in states that already had a high incidence of domestic violence (leading to reverse causality) or in

more developed states. In order to control for the latter issue, the instrumental variable specification controls for per capita income of each state according to the 2011 census. Further, to ensure that the program implementation did not have a positive relationship with pre-existing higher incidence of self reported domestic violence, we test the effect of proportion of POs on self-reported domestic violence in 2005 using NFHS-3 data. We see that the correlation between the proportion of POs and domestic violence is in fact negative, thus confirming that the Act was not endogenous to the high incidence of domestic violence pre-existing in the state.

Conclusion

This paper aimed to study the relationship between domestic violence on mothers and their children's health outcomes. We found there to be a negative relationship between the two, implying that higher incidence of domestic violence on mothers has an adverse effect on her children's health outcomes. Although this negative impact is statistically insignificant, this could be attributed to the large number of missing observations, weak instrument and the risk of potential endogeneity in the instrument.

While some limitations have been addressed along with the endogeneity problem, that list is non-exhaustive. Firstly, the external validity of this paper can be contested. While NFHS is nationally representative, given the complex demographic and societal structure of the Indian population, the results of this paper may not be applicable to other countries and populations.

The paper also suffers from the omitted variable bias. An important factor to look at in this regard is the way in which we quantify a woman's autonomy and bargaining power in the household - financial independence may not be a completely accurate indicator of these measures, as larger factors such as acceptability of domestic violence in the household/community might overshadow financial independence and reverse its relationship with the independent and dependent variable.

While the survey measures the incidence of domestic violence, the variable does not have a time dimension, i.e. we do not know how long ago and how often the woman has faced abuse. Having access to this data would help in gaining a nuanced understanding of the main

relationship, as the health outcomes for a child whose mother continues to face domestic violence regularly might be different to those for a child whose mother no longer faces domestic violence/does not face it regularly.

The NFHS dataset also suffers from some major problems. There is a large incidence of missing data across several variables, which reduces our sample size and the general applicability of this study. The magnitude of missing data also prevented us from using controls such as whether the partner consumes alcohol - which is an important factor to consider given the relationship we are studying. Secondly, a lengthier questionnaire could lead to poorer quality of data, and given the length of the NFHS survey (the women's questionnaire has 1,139 questions), we may suffer from poor quality of data.

We have tried to address as many of these concerns through our usage of the instrumental variable - the implementation of the Protection of Women from Domestic Violence Act, 2005. However, this instrument can also suffer from problems. Given the dearth of information about the Act, especially with regards to its implementation, we are unable to ratify how exogenous its implementation is. While we tried to control for whether developed states had better implementation, state wise per capita income may not be an entirely accurate measure of development as economic development may not be the main indicator considered while measuring how developed a state was at the time of implementation. For example, some states might have been more socially or politically active, which could influence the speed of implementation of the Act. Moreover, we also suffer from the problem of employing a weak instrument.

Overall, while the estimates may not be entirely impactful (due to some degree of statistical insignificance), it still provides important information about the impact of domestic violence on children's health. In a country like India, which is still rooted in the patriarchy, women who are victims of domestic violence continue to be stigmatised and made to feel unsafe in their own home. This study also shows how this violation of human rights also has damaging long term impacts on those caught in the crossfire of this abuse.

Further research should employ more comprehensive health and violence related data in order to determine a more robust relationship between domestic violence on mothers and their

children's health outcomes. The focus should be on employing non self-reported data, so as to increase its accuracy. Given the severe restrictions on movement put in place by the Coronavirus lockdowns in 2020, researchers should also look into whether there was an increase in domestic violence incidence over the lockdown period.

The results of this paper imply that the Act does seem to be increasing the reporting of domestic violence. However while increased reporting is no doubt a feat, our data does not provide any evidence of the Act actually reducing domestic violence. One explanation for this could be due to the Act being a civil law and not a criminal law. This implies that the Act can only support women who report crime, but cannot make any arrests until a protection order is breached. However, the institution of a protection order against the husband might in fact lead to a more unsafe environment for the wife, subjecting her to the risk of more harm. Thus, from a policy standpoint, the Act should be reexamined to ensure that it is not only meeting its objectives, but also doing so in a more effective and safe manner.

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