

Balance of Power, Domestic Violence and Health Consequences: Evidence from Demographic and Health Survey of Nepal

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Abstract:

A large literature studying Domestic Violence (DV) has documented a complex relationship between intimate partner violence, domestic risk factors, women empowerment and health outcomes. In this paper we attempt to disentangle this complex relationship using data drawn from Nepal Demographic and Health Survey, 2011. Empirically, a two-equation system is estimated, where the first equation models the relationship between domestic violence and health outcomes (physical injuries) whereas the second equation models the relationship of domestic violence to domestic risk factors and women's empowerment. The study finds evidence that both education and cooperative environments lessen the likelihood of violence. Additionally, a number of household and cultural factors influence DV including alcoholic husband, multiple unions and religion. Finally, in terms of health outcomes we find that the likelihood of facing all the negative health outcomes increases exponentially with higher intensities of violence.

Keywords: Domestic Violence, Empowerment, Risk Factors, Balance of power, IV oprobit.
JEL codes: J120, I14, I15

Introduction

Domestic violence (DV) is a substantial problem, especially in the developing world. For instance a World Health Organization (WHO) study found violence rates to be 71% in Ethiopia, 62% in Bangladesh and 69% in Peru (García-Moreno *et al.* 2005). DV can take many forms and lead to a multitude of negative outcomes including physical injuries, permanent disability, reproductive health issues and mental health problems to death (Jacqueline Campbell 2002). However, in spite of the widespread prevalence and significant negative consequences, many times social constructs do not acknowledge it as a problem. Moreover, historically gender based DV was accepted to be ‘normal’ in many societies. However, this is starting to change. In part due to the World Conference on Human Rights, held in Vienna in 1993, and the Declaration on Elimination of Violence against Women in the same year, civil society and governments in developing countries have begun to realize the magnitude of violence against women and emphasize it as a public policy and human rights concern.

The first World Report on Violence found that 1.6 million people lost their lives in the year 2000 due to some form of violence for an age adjusted rate of 28.8 per 100,000 population (Etienne G Krug *et al.* 2002). Since then, country specific studies have come out on physical health consequences of intimate partner violence (Michelle Hindin and Linda Adair 2002; Alice Kramer, Darcy Lorenzon, and George Mueller 2004; Anastasia Gage 2005; Rocca *et. al* 2008, Leland Ackerson and Subu. V. Subramanian 2008). Campbell (2002) found that a significantly higher number of health issues are reported by abused women. Additionally, abused woman sustain a 2-3 times more injuries that require surgery. DV can lead to violent injuries in head, face, neck, thorax, breasts, and abdomen and further suicidal attempts (Rosenberg ML, O'Carroll PW, Powell KE 1992).

Beyond the immediate consequences, DV can impact reproductive health outcomes through restricted antenatal visits along with general health conditions of anemia and other gynecological symptoms (Jacqueline Campbell, Claudia Garcia-Moreno and Phyllis Sharps 2004; and Leland Ackerson and Subu V Subramanian 2008). Additionally, DV can also result in long term chronic health issues, leading to poor quality of life and neurological disorder. It is also important to note risky behaviors and other potential confounding factors, like nutritional and economic status of women, may lead to general negative health consequences. Other characteristics such as educational status, intermittent unemployment, and alcohol or drug use, estranged husband are also highlighted as potential risk factors leading to negative health outcomes for woman in United States (Demetrios Kyriacou *et al.* 1999).

Obviously, there is a tremendous need to combat the negative consequences of DV. To do this, the root causes of DV need to be identified and strategies used to combat DV need to be better articulated (Suneeta Krishnan *et al.* 2012). One mechanism that can be used to challenge oppression is empowering women (Deborah Eade and Suzanne Williams 1995). However, empowerment is complicated. A number of studies suggest that as women become more economically independent (one form of empowerment), they tend to experience less violence (Abdullahel Hadi 2005; Anastasia Gage 2005; Manasi Bhattacharya; Arjun Bedi, and Amrita Chhachhi 2011; Jhumka Gupta *et al.* 2013). But, there is also ambiguity in the effectiveness of such mitigation strategies (Michael Koeing *et. al* 2003; Lisa Bates *et.al* 2004 and GencBurazeri *et al.* 2005). A recent study in India showed that employed women who experienced a higher level of DV were less likely to have the control on their earned money (Haimanti Bhattacharya, 2015). Instead of exclusive power, it has been suggested that empowerment can be understood as the sharing of power or cooperative decision making (Carolyn M Shrewsbury 1993). For instance, Hindin and Adair (2002) using the Cebu Longitudinal Health and Nutrition Survey (CLHNS) found that patterns of decision making power is a strong predictor of violence. As decisions are taken exclusively either by men or women, it increases the likelihood of women experiencing violence. When decisions are made jointly, only 6% of the women reported having violence compared to 25% in the absence of any cooperative decisions.

Overall, it is clear from various strands of literature that the relationship between domestic risk factors, women empowerment, intimate partner violence and health outcomes is complex. In this study we build upon prior literature by examining the relationship between these factors using the Nepal Demographic Health Survey (NDHS), a novel survey dataset of married women of Nepal in 2011. We evaluate the role of empowerment (in the form of joint decision making) and domestic risk factors on DV and associated health injuries. Also methodologically, previous studies in area have applied cross-sectional data to reduced form models to analyze such relationships. Instead, in this paper we add to this literature by estimating the relationship between empowerment, domestic risk factors, DV and physical injuries using a two stage simultaneous ordinal model. The estimation method followed to analyze the relationship is Endogenous Ordered Probit model under Conditional Mixed Process Estimator (cmp) set up. This model is an improvement over traditional models because it allows us to examine the impact of empowerment and domestic risk factors on domestic violence and sequentially estimate the impact of domestic violence on self-reported health outcomes¹. Additionally, using this sequential model, we are able to more efficiently estimate the direct impact of empowerment and domestic risk factor on health outcomes.

¹ The words Health outcomes , Health injuries and Physical injuries is used interchangeably in the paper.

Overall, we find that risky domestic factors such as alcoholic husband and marital dysfunctions are associated with increased violence and that the likelihood of facing all the health outcomes increases exponentially with higher intensities of violence. Additionally, we find that education and cooperative home environments reduce the likelihood of violence.

Background of Domestic Violence in Nepal

Potentially surprising to the rest of the world, Nepal has a substantial level of DV which went largely unrecognized till 2008. Recently, two studies have explored the relationship between empowerment and DV in Nepal using primary survey data collected by Centre for Research on Environment Health and Population Activities (CREHPA) in four districts of Nepal. Notably, Prabhat Lamichhane *et al.* (2011) found that half of the married women (51.9%) reported experiencing physical and/or sexual violence.ⁱ These high rates of DV have been attributed to the cultural norms in most of the South Asian countries as well as in Nepal. Additionally, educational level between the couples, husband's characteristics, less autonomy among the women and women at their younger age are most prone to any kind of violence (Mahesh Puri *et al.* 2012).

In 2008 the Domestic Violence (Crime and Punishment) Act was passed, which aimed at punishing criminals of violence and offered immediate relief to the victims of violence by providing medical and temporary accommodations. Following this parliamentary move, the Government of Nepal declared 2010 as the year to combat gender based violence by developing a National Gender-Based Violence Plan of Action. Additionally, in 2011 Nepal Demographic Health Survey was implemented to study for the first time Nepalese women's experience of violence.

Of the studies that have used the Demographic Health Survey data to study violence in Nepal, it has been found that women who don't experience any violence has 34% lower odds of having anemic children and 70% higher odds of making the required four antenatal care visits (Sabita Tuladhar *et al.* 2013). Moreover, Liladhar Dhakal, Gabriele Berg-Beckhoff and Arja R Aro (2014) found that women reporting intimate spousal violence in last 12 months are more likely to report STI.

Data and Measures

The data for this study comes from the fourth nationally represented comprehensive survey Nepal Demographic Health Survey (NDHS) 2011, which is conducted as a part of the worldwide DHS project in the country. The survey was funded by the United States Agency for International Development through

its mission in Nepal and is executed by New ERA for all the subsequent rounds. A total of 12,674 women were interviewed using the women's questionnaire of which 4,204 were selected to be interviewed in the domestic violence module. The module on Domestic violence was introduced for the first time in NDHS in 2011 survey. Of 4,204 women under the DV module, 3,380 women (80.4%) are married and form the concerned sample of our paper.

Physical violence and Health outcome variables

Women selected for the domestic violence module reported their experience of physical violence based on the following categories: (1) push you, shake you, or throw something at you? (2) slap you (3) twist your arm or pull your hair? (4) punch you with his fist or with something that could hurt you (5) been kick you, drag you or beat you up (6) try to choke you or burn you on purpose, or (7) threaten or attack you with a knife, gun or any other weapon. Respondents answered each question with one of the four responses: never, yes, but not in 12 months, often and sometimes.

To utilize this information, we create an index, where the responses to the seven categories of violence are recoded with 'never' experienced any violence coded as 0 and 'often' been experienced violence coded as 3. The index is created by summing all the seven recoded categories of violence and the resultant physical violence index is a continuous variable where 0 refers to not experiencing any violence and 21 means experiencing all the seven categories of violence at the highest intensity.

Additionally, as part of the survey self-reported health outcomes specific to the experience of violence were collected. The questions used in the survey used the following format: "*Did the following ever happen as a result of what your (last) husband/partner did to you?*" and the health outcomes elicited include: (1) cuts, bruises or aches (2) eye injuries, sprains, dislocations or burns, (3) deep wounds, broken bones, broken teeth or other serious injuries. To utilize these questions, again an index is created, this time with rank 0 to 3, indicating the number of health outcomes the woman had experienced. The paper described health outcomes as these specific violence related short term health injuries.

Empowerment variables

In this paper we define empowerment by the balance of power that exists in a relationship which is captured using self-reported answers. To capture information about these decisions, participants were asked questions about various issues like safer sex, household purchases, permission of meeting and contacting her own family members, decision of spending women's earnings and decision to purchase her own health care. To utilize this information, joint decision making power is captured in three different ways: Joint

decision-1 where it is the difference of number of decisions taken jointly as opposed to number of decisions taken exclusively by either wife or others in the family. Joint decision - 2 is the cooperative decisions as opposed to exclusive decisions of wife and similarly Joint decision-3 is the cooperation versus decisions taken by others in the family.

In addition to information about joint decision making, other indicators of empowerment are available from the survey including educational level and economic independence and community participations. In measuring educational attainment of women, the education variable has been recoded into ‘No education’, ‘Primary education’ and ‘Secondary & Higher education’. An interaction variable of women who are working and earning cash is used as an indicator of economic empowerment. Additionally, information on women’s memberships in community and social groups has also been assessed as an empowerment tool.

Domestic Risk Factors and Control Variables

To identify domestic risk factors which are more susceptible to the experience of violence, women are asked two questions: (1) Did your husband/partner drink alcohol? (2) Whether the women have been married more than once? Both the variables are included as binary variables in the regression equation. Additionally, we control for the cultural background of women defining their religion and ethnicity. Geographical locations of whether belonging to mountain, hill or terai region are also included along with information on type of residences. We also control for the age and the general health status of the women through their body mass index (BMI) levels.

Empirical Estimation

To estimate the relationship between health outcomes, domestic violence and empowerment a two-equation system approach is used. Specifically, an IV Ordered Probit estimation strategy is used where our primary equation of interest is *Health outcome*, an ordinal variable which is assumed to be directly affected by the level of *Physical violence* faced in the household.

The conceptual framework of the model is given below:

$$[Outcome Equation] \quad h_{j,n}^* = \alpha_j X_n + \beta_j V_n + \vartheta_{j,n}^* \quad (1)$$

$$[First stage Equation] \quad V_n^* = \gamma X_n + \delta Z_n + \varepsilon_{j+1,n}^* \quad (2)$$

The intensity of *Health outcome* of an individual n in the health category j (1,2,3) is denoted as $h_{j,n}^*$ which can be explained by exogenous variables X_n and an endogenous (*Physical violence*) variable V_n . The unobserved intensity of the endogenous variable V_n depends on the same exogenous variables X_n and on a vector of instrumental variables Z_n . α_j , β_j , γ and δ are the parameters of the models which measures the relative impact of the associated variables on the dependent variables. The *Health outcome* and the *Physical violence* equations are simultaneously determined and the errors follow a multivariate normal distribution common for all the individuals in the sample. Since cmp accounts for the correlation between the first stage and final stage equations, the covariance between the error terms are non-zero.

$$\epsilon = [\vartheta_{j,n}^*, \varepsilon_{j+1,n}^*] \sim N(0_{1 \times 3}, \Sigma_{3 \times 3}), \text{ where } \Sigma = \begin{bmatrix} 1 & \rho_{12} & \rho_{13} \\ \rho_{21} & 1 & \rho_{23} \\ \rho_{31} & \rho_{32} & 1 \end{bmatrix}$$

By assuming the joint normality of the error terms, the first stage and the second stage equations are estimated simultaneously using a joint likelihood functionⁱⁱ.

Depending on the specifications of the models, we also included control factors in the outcome equation. The simultaneity issue enters into our model because of the endogeneity of the *Physical violence* variable. It is our interest to examine various factors that contribute to the environment leading to *Physical violence*. In particular, we look at the role of women's empowerment (*Education*, *Joint decision-1*ⁱⁱⁱ, *Community*, *Work - cash*) and the domestic risk factors (*Alcoholic husband*, *Unions*) as the primary causes of *Physical violence*. We believe that the *Health outcome* are directly related not only to *Physical violence*, but also to body mass index (*BMI_women*) and age (*Age*, *Age2*) of the women. Another novelty of this paper is estimating the Endogenous Ordered Probit regression method (IV ordered Probit model) more efficiently under the Conditional (recursive) mixed-process estimator (cmp)^{iv}. Unlike traditional two stages limited information IV estimation method, cmp accounts for the correlation between the reduced form first stage regression and the second stage regression.

For further sensitivity checks, we also run Ordered Probit with Heckman selection modeling and Simple OLS. Running Heckman model is justified because of the way the health outcome question being asked in the survey questionnaire. The breakdown of the data suggests that reporting of health outcome is conditional on experiencing violence. The model specification and theoretical framework of Heckman can be found in the end notes^v.

Results

Summary Statistics

Table 1 shows the distribution of women in our sample experiencing health outcomes as a result of violence. The total married women in our sample are 3380, of which 22.89% face violence at least once ever in their lifespan. Of those who face violence, 49.48% have at least one type of health outcome.

[Table 1 about here]
Half page

Table 2 describes the variables used in our study. The mean age is 31 years where 60% of the women are not educated and only 19% of the women who works earns in cash. Additionally, 85% of the sample belongs to Hindu religion and 42% is of Brahmin/ Chettri ethnicity. In terms of our joint decision indices, Joint decision-1 index is negative which suggests that households are polarized in their decision making process. On average most of the decisions are taken exclusively either by wife or by other members of the family and few decisions are taken jointly under cooperative setting. Domestic risk factors, believed to have contributed in perpetrating violence shows that 53% of the women have alcoholic husband and 5% are in a dysfunctional relationship with more than one union. The table also reports all the seven categories of self- reported physical violence and health outcome measures. Being slapped by husband /partner (31%) is the most prevalent of all forms of violence whereas being pushed by husband/ partner (24%) and being kicked (16%) are also common forms of physical violence. Though not in a substantial proportion, serious attempts of threat through choking, burns or display of guns and knives are not completely absent in the society. Health outcomes depict the injuries associated with the experience of violence. 48% of married women who face violence do suffer from cuts and bruises, 13% underwent other injuries, burns and dislocations followed by 11% of women with broken teeth and bones.

[Table 2 about here]
Two full pages

Figure 1 presents kernel density plot showing the underlying distribution of *Physical Violence* variable. Physical violence is a positively skewed variable ranging from 0 to 21 with higher density of women having no experience of violence ever in their life. The physical violence variable is interpreted in the way that higher orders are represented by higher magnitude of violence and as magnitude increases the percentage of women represented in each of the higher order of categories decreases.

[Figure 1 about here]
Half page

Endogenous Ordered Probit regression results

We estimate the Endogenous Ordered Probit model under the cmp framework, the results are presented in Table 3. Three separate models have been run with some added specifications under each consecutive model. The first column of all the three models shows the intensity of *Health outcome* as a result of *Physical violence* and the second column is the first stage equation of the determinants of *Physical violence*. In the first model, we endogenised *Physical violence* using domestic risk factors (*Alcoholic husband*, *Unions*) and women empowerment variables (*Education*, *Joint decision-1*, *Community*, *Work –cash*) as the instruments. For brevity, we present our main regression results with *Joint decision-1* variable whereas we test the sensitivity of our finding as well with the other two measures of joint decision making. In the second model, we added cultural (*Buddhist*, *Muslim religion*, *Other religion*, *Janajati*, *Dalit*, *Muslim*), socio demographics (*BMI_women*, *Age*, *Age2*) and geographic variables (*Rural*, *Mountain*, *Hill*) as additional primary determinants of *Physical violence*. In the final model, the cultural, socio demographics and geographic variables have been controlled for in the outcome equation. Irrespective of the specifications used, the results of all the three models complement each other. *Physical violence* which is our primary independent variable in the outcome equation is seen to be significant in all the models which say that as the magnitude of violence increases, the intensity of *Health outcomes* increases significantly. This can further be seen in Figure 2 where we plotted the predicted probabilities of facing health outcomes against the magnitude of violence. Probability of women facing all the three health outcomes increased exponentially after a certain magnitude of violence. Of all sets of empowerment tools that have been included in the models, it shows that educated women who tend to enter in a cooperative relationship with their husband are significantly less likely to face violence. In other words, our *Joint decision-1* is negative and significant which says that as more numbers of decisions are taken jointly by wife and husbands and less numbers of decisions are taken exclusively by anyone we see the magnitude of experiencing violence by the women decreases. The result further acknowledge the fact that better societal outcome underlies in cooperation and in maintaining a balance of power between the couple without the authority being bestowed to any particular partner. We can also infer that domestic risk factors such as having *Alcoholic husband* or being in an unstable marital relationship because of more than one union (*Unions*) make the women more vulnerable to violence. Additionally, we see that belonging to a certain socio demographic section of society especially for a *Dalit* or *Muslim* women, the tendency of facing *Physical violence* increases significantly. Of the three geographic regions of Nepal, women from *Hill* and *Mountain* region relative to plain land of Nepal are associated with lower likelihood of *Physical violence*. We have also calculated

marginal effects of all the health outcome categories as influenced by violence². As physical violence increases the probability of facing no health outcome decreases by 6% whereas the probability of facing 1,2 and 3 categories of health increases respectively by 4.7%, 1.2% and 0.43% respectively. The strength of the instruments is determined by the F- stat value of the individual first stage regressions. The fact that F stat is greater than 10 and that all the instruments are significant at the first stage proves the validity of the instruments.

[Table 3 about here]
Two full pages

[Figure 2 about here]
Half page

Ordered Heckman Selection and OLS Results

We did a series of robustness checks to ensure that our findings of primary model hold under different specifications. Given the nature of the health outcome question in the survey, we thought it is imperative to run a sample selection model where women facing *Physical violence* self-select themselves into experiencing any kinds of *Health outcome*. The same arrangement and sequence of variables of our primary model has been followed in running the Heckman selection Model. The results of Heckman selection are presented in Table 4 and confirm our primary findings. We see *Physical violence* is positively and highly significantly influencing *Health outcome*. From the selection equation we reiterate our earlier findings of being in a cooperative relationship and being educated women reduces the tendency of *Physical violence* whereas risky factors increases the magnitude of *Physical violence*. The results also substantiate our findings on cultural and socio- demographic factors.

[Table 4 about here]
Two full pages

Finally, we ran an OLS model without assuming any endogeneity of *Physical violence*. The results of which are presented in Table 5 and exactly conforms our earlier findings of IV ordered Probit and Heckman selection.

² The marginal analysis results are available upon request.

[Table 5 about here]
Two full pages

Overall review of results: Hypothesis Table

In the hypothesis Table 6, we present the results of different indices of Joint decision making being run on all the three models of our IV Ordered Probit regressions. We replicated the table with OLS and Ordered Heckman Selection procedures and we found our results to be insensitive to any choice of methods. The hypothesis table shows that irrespective of the models that we are using, our results state that *Physical violence* is always positively and significantly impacting *Health outcome*. All the three joint decision variables (*Joint decision-1*, *Joint decision-2* *Joint decision-3*) are highly significant and negatively affecting the likelihood of occurring *Physical violence*. *Education* on the other hand significantly contributes in reducing the likelihood of *Physical violence*.

[Table 6 about here]
One page

Additional robustness checks

Using the most preferred IV Ordered Probit model based on Akaike Information Criteria (AIC), we ran additional regressions for further sensitivity checks by incorporating wealth index of the households, age difference between wife and husband, earning difference and educational difference between the couples. Our results are robust to all these sensitivity checks. Further, we have also run our models with the absolute measures of joint decision variables without taking any deviations and the results came out to be identical.

Thereby, we can claim the validity of our findings that educated women who are in cooperative relationship with her husband where they share the household decision making process are less likely to suffer violence, whereas any kind of marital dysfunction or alcoholic nature of husband may trigger violence. Importantly, intensity of physical violence always explains a higher intensity of health outcomes.

Conclusion

Previous literature depicts the interdependence and coexistence of intimate partner violence, domestic risk factors, women empowerment and health outcomes. However, not much is known about the

simultaneous impact of violence and empowerment tools on health outcomes. Moreover, empirical models are typically specified in reduced form, which has looked into the individual effects of risk factors either on experiencing violence or on observing health impacts. In this paper, we evaluate this question using a unique domestic violence module of Nepal Demographic and Health Survey, 2011. Specifically, we use a two stage techniques under an ordinal response of outcome equation. We estimated the Endogenous Ordered Probit model under conditional mixed process estimator set up. Our study endogenised Physical violence with empowerment variables and domestic risk factors and we found our results to be identical across different methods and specifications. Higher magnitude of physical violence is always related with higher adversities of health outcomes. We took an in-depth analysis of the nature of power sharing as exist in any marital relationship. Power sharing has been looked upon from the dimension of maintaining a balance of power in the household. Balance of power has been measured by the cooperation of wife and husband in various decision making process. We found that irrespective of the nature of joint decision making indices; cooperation always defines a healthy environment with less likelihood of violence and subsequently less impacts on health. Thus, we claim that it is not only the autonomy of women but empowerment can be redefined through maintaining an equal balance of power in the family through participating and sharing decision making process. We also identified a certain set of domestic risk factors the presence of which makes a woman highly prone to violence.

As evident from our results, promoting the idea of joint decision making and not necessarily autonomy of decisions can be looked upon as an important policy recommendation to the policy makers. NGOs, health workers and social workers should make concerted efforts in promoting this concept through holding discussions with the married couples. Promoting the level of education and making women understand that education can give them the authority to be able to participate in any decision making process is also important step to be pursued. Additionally, ground level measures should be undertaken by the local authorities especially towards those households who are prone to violence as identified by the presence of domestic risk factors.

The paper contributes to the existing state of literature in substantial ways. First, with an unexplored module of the NDHS data set, this paper nationally represents facts on the relationship of violence and specific health outcomes in Nepal. Similar studies done before in Nepal are based on district wise primary survey estimates mainly looked into the determinants of violence and very generic health outcomes. Second, in going beyond the single stage regressions, we believe this is the first attempt to address the issue through a sophisticated methodology applying two stage estimation procedures. Finally, the contribution lies in moving beyond the conventional idea of empowerment through participating and sharing in the decision

making process and not only autonomy.

Table 1

Distribution of violence

	Health outcomes	No Health outcome	Total
Face Violence	383 (49.48)	391 (50.52)	774 (22.89%)
No Violence	10 (0.38)	2,596 (99.62)	2606 (77.10%)
Total	393 (11.62%)	2987 (88.37%)	3380 (100)

Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011.

Table 2

Descriptive Statistics of variables

Notations	Descriptions	Mean	S.D
<i>Age</i>	Current age of the women	31.09	8.25
<i>Education</i>	Education Level: No Education=1 Primary Completed=1 Secondary and Higher=1	0.6 0.25 0.15	0.48 0.43 0.35
<i>Work –cash</i>	Currently works and earns in cash?	0.19	0.39
<i>Joint decision- 1</i>	Index1: Joint decisions - (Single decisions of wife and others)	-1.3	2.3
<i>Joint decision- 2</i>	Index 2: Joint decisions - (Single decisions of wife)	0.07	2.1
<i>Joint decision- 3</i>	Index 3: Joint decisions - (Single decisions of others)	-0.29	0.33
<i>Joint decisions</i>	Absolute joint decisions taken by wife and husband	1.17	1.24
<i>Single decisions-1</i>	Absolute single decisions taken by wife	1.1	1.29
<i>Single decisions-2</i>	Absolute single decisions taken by others in the family	1.46	1.26
<i>Community</i>	Participates in Community Organizations?	0.48	0.49
<i>BMI_women</i>	Body Mass Index	22.23	6.3
<i>Wealth index</i>	Wealth Quintile 1 (Poorest)=1 Wealth Quintile 2 (Poorer)=1 Wealth Quintile 3 (Middle)=1 Wealth Quintile 4 (Rich)=1 Wealth Quintile 5 (Richest)=1	0.21 0.19 0.18 0.17 0.23	0.4 0.39 0.38 0.38 0.42
<i>Hindu</i>	Religion of women: Hindu [Base variable]	0.85	0.35
<i>Buddhist</i>	Buddhist	0.08	0.27
<i>Muslim religion</i>	Muslim religion	0.02	0.14
<i>Other religion</i>	Other religions	0.03	0.19
<i>Brahmin</i>	Ethnicity of women: Brahmin [Base variable]	0.42	0.49
<i>Dalit</i>	Dalit	0.15	0.35
<i>Janajati</i>	Janjati	0.3	0.46
<i>Muslim_others</i>	Muslim and others	0.11	0.32
<i>Urban</i>	Type of residence: Urban [Base variable]	0.27	0.44

<i>Rural</i>	Rural area	0.73	0.44
<i>Terai</i>	Geographic area: Terai [Base variable]	0.43	0.49
<i>Hill</i>	Hill	0.39	0.48
<i>Mountain</i>	Mountain	0.16	0.37
<i>Alcohol husband</i>	Alcoholic Husband	0.53	0.49
<i>Unions</i>	Numbers of Unions involved in		
	Once	0.94	0.22
	More than once	0.05	0.22
<i>Physical violence</i>	Push you, shake you, or throw something at you?	0.24	0.64
	Slap you?	0.31	0.67
	Punch you with his fist or with something that could hurt you?	0.13	0.48
	Kick you, drag you or beat you up?	0.16	0.53
	Try to choke you or burn you on purpose?	0.04	0.29
	Threatened or attacked with a knife, gun or any other weapon?	0.03	0.25
	Twist your arm or pull your hair?	0.15	0.57
<i>Health outcome</i>	You had cuts, bruises or aches?	0.48*	0.49
(Physical Injuries)	You had eye injuries, sprains, dislocations or burns?	0.13*	0.33
	You had deep wounds, broken bones, broken teeth or any other serious injury?	0.11*	0.32

Number of observations

3380

* Total number of observations is 774 for the categories of health outcomes.

Table 3
IV Ordered Probit [FIML Results]

	Variables	Model 1		Model 2		Model 3	
		<i>Health outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>
Endogenous							
	<i>Physical violence</i>	0.203*** (3.43)		0.170*** (2.85)		0.205*** (3.52)	
Empowerment							
	<i>Education</i>		-0.467*** (-6.82)		-0.337*** (-4.81)		-0.335*** (-4.80)
	<i>Joint decision-1</i>		-0.105*** (-4.49)		-0.098*** (-4.37)		-0.098*** (-4.34)
	<i>Community</i>		-0.181 (-1.54)		-0.132 (-1.12)		-0.128 (-1.09)
	<i>Work -cash</i>		0.265* (1.81)		0.203 (1.34)		0.22 (1.46)
Domestic Risk Factors							
	<i>Alcoholic husband</i>		0.943*** (7.98)		1.083*** (8.98)		1.087*** (9.1)
	<i>Unions</i>		2.048*** (4.37)		2.110*** (4.78)		2.102*** (4.74)
Socio Demographics							
	<i>BMI_women</i>	0.006 (1.11)	-0.018*** (-3.18)	0.006 -1.03	-0.015*** (-2.65)	0.004 (0.71)	-0.016*** (-2.66)
	<i>Age</i>	0.0258 (0.56)	-0.0511 (-0.91)	0.024 (0.52)	-0.0549 (-0.96)	0.0329 (0.7)	-0.056 (-0.98)
	<i>Age2</i>	-0.0002 (-0.37)	0.00069 (0.81)	-0.0002 (-0.32)	0.0008 (0.97)	-0.0003 (-0.52)	0.0008 (0.99)
Cultural							
	<i>Buddhist</i>				-0.146 (-0.71)	0.0711 (0.34)	-0.147 (-0.72)
	<i>Muslim religion</i>				1.064** -1.97	-0.327 (-1.08)	1.072** (2.00)
	<i>Other religion</i>				1.023** (2.29)	-0.033 (-0.14)	1.022** (2.28)
	<i>Janajati</i>				-0.0757 (-0.54)	-0.239 (-1.63)	-0.075 (-0.54)
	<i>Dalit</i>				0.503** (2.35)	-0.0142 (-0.09)	0.503** (2.36)
	<i>Muslim_others</i>				0.508** (2.42)	-0.0854 (-0.47)	0.509** (2.43)
Geographic							

<i>Rural</i>			0.170*	-0.247**	0.175*
			(1.67)	(-2.14)	(1.73)
<i>Mountain</i>			-0.353**	0.416***	-0.354**
			(-2.26)	-3.19	(-2.35)
<i>Hill</i>			-0.470***	0.114	-0.470***
			(-3.98)	(0.97)	(-4.00)
<i>Constant</i>	0.368	-0.182		-0.169	
	-0.36	(-0.17)		(-0.16)	

N	3380	3380	3380
Log Likelihood	-9018.3	-8961.4	-8951.3
Chi-Squared	16.78	12.19	36.6
AIC	18074.7	17978.7	17976.5
BIC	18191	18150.3	18203.2
Rho	-0.11	-0.01	-0.11
	(-0.64)	(-0.06)	(-0.68)

Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011

t statistics in parentheses *p<0.1 ** p<0.05 *** p<0.01

Table 4
Ordered Heckman Selection Model

		Model 1		Model 2		Model 3	
		<i>Health Outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>
Endogenous							
	<i>Physical violence</i>	0.161*** (10.79)		0.166*** (12.23)		0.166*** (12.95)	
Empowerment							
	<i>Education</i>		-0.425*** (-7.67)		-0.330*** (-5.86)		-0.324*** (-7.03)
	<i>Joint decision-1</i>		-0.053*** (-3.80)		-0.051*** (-3.60)		-0.045*** (-4.05)
	<i>Community</i>		-0.0356 (-0.55)		0.00101 (-0.02)		0.036 (-0.68)
	<i>Work -cash</i>		0.180** (2.11)		0.11 (1.26)		0.186*** (2.66)
Domestic Risk Factors							
	<i>Alcoholic husband</i>		0.522*** (7.96)		0.653*** (9.19)		0.601*** (10.67)
	<i>Unions</i>		0.515*** (4.22)		0.606*** (4.79)		0.652*** (6.39)
Socio- Demographics							
	<i>BMI_women</i>	0.0079 (1.16)	-0.0167** (-2.54)	0.00499 (0.74)	-0.0122** (-2.12)	0.00212 (0.35)	-0.0083 (-1.37)
	<i>Age</i>	0.0219 (0.47)	0.012 (0.42)	0.0249 (0.54)	0.0118 (0.41)	0.0342 (0.83)	0.00081 (0.03)
	<i>Age2</i>	-0.0002 (-0.29)	-0.0002 (-0.45)	-0.0002 (-0.34)	-0.0001 (-0.24)	-0.0004 (-0.62)	0.00008 (0.24)
Cultural							
	<i>Buddhist</i>				-0.193 (-1.53)	0.25 (1.34)	-0.193* (-1.84)
	<i>Muslim religion</i>				0.694*** (3.43)	-0.143 (-0.57)	0.483*** (2.82)
	<i>Other religion</i>				0.419*** (2.70)	0.0041 (0.02)	0.281** (2.23)
	<i>Janajati</i>				0.164* (1.87)	-0.272** (-2.07)	0.206*** (2.92)
	<i>Dalit</i>				0.337*** (3.45)	-0.0872 (-0.62)	0.373*** (4.81)
	<i>Muslim_others</i>				0.401*** (3.63)	-0.178 (-1.07)	0.428*** (4.66)

Geographics

<i>Rural</i>			0.0778 (1.05)	-0.217** (-2.11)	0.0525 (0.81)
<i>Mountain</i>			-0.277*** (-3.07)	0.371*** (3.01)	-0.263*** (-3.25)
<i>Hill</i>			-0.413*** (-6.11)	0.0675 (0.61)	-0.401*** (-6.82)
<i>Constant</i>	-0.839* (-1.72)	-1.449*** (-2.84)		-1.437*** (-3.42)	

N	3380	3380	3380
Log_Likelihood	-2486.4	-2393.3	-2311.6
Chi-Squared	131.6	156.6	217.3
AIC	5008.8	4840.5	4695.2
BIC	5119.1	5005.9	4915.7
Rho	-0.12 (-0.75)	0.09 (-0.56)	-0.12 (-0.57)

Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011
t statistics in parentheses *p<0.1 ** p<0.05 ***p<0.01

Table 5
OLS Results

		Model 1		Model 2		Model 3	
		<i>Health outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>	<i>Health outcome</i>	<i>Physical violence</i>
Endogenous							
	<i>Physical violence</i>	0.123*** (15.53)		0.123*** (15.53)		0.123*** (15.57)	
Empowerment							
	<i>Education</i>		-0.396*** (-6.70)		-0.307*** (-5.07)		-0.307*** (-5.07)
	<i>Joint decision-1</i>		-0.0789*** (-4.20)		-0.0724*** (-3.92)		-0.0724*** (-3.92)
	<i>Community</i>		-0.0997 (-1.09)		-0.0464 (-0.50)		-0.0464 (-0.50)
	<i>Work -cash</i>		0.299** (2.52)		0.269** (2.23)		0.269** (2.23)
Domestic Risk Factors							
	<i>Alcoholic husband</i>		0.909*** (10.34)		0.968*** (10.80)		0.968*** (10.80)
	<i>Unions</i>		2.002*** (5.97)		2.069*** (6.28)		2.069*** (6.28)
Socio- Demographics							
	<i>BMI_women</i>	0.00222 (0.62)	-0.0147** (-2.27)	0.00222 (0.62)	-0.0128* (-1.86)	0.00058 (0.16)	-0.0128* (-1.86)
	<i>Age</i>	0.0217 (0.85)	-0.0547 (-1.29)	0.0217 (0.85)	-0.0583 (-1.37)	0.0216 (0.84)	-0.0583 (-1.37)
	<i>Age2</i>	-0.0002 (-0.50)	0.00078 (1.18)	-0.0002 (-0.50)	0.0009 (1.37)	-0.0002 (-0.52)	0.0009 (1.37)
Cultural							
	<i>Buddhist</i>				-0.174 (-1.01)	0.176 (1.37)	-0.174 (-1.01)
	<i>Muslim religion</i>				0.779* (1.86)	-0.0934 (-0.63)	0.779* (1.86)
	<i>Other religion</i>				0.644** (2.12)	0.0644 (0.50)	0.644** (2.12)
	<i>Janajati</i>				0.0633 (0.52)	-0.173** (-2.21)	0.0633 (0.52)
	<i>Dalit</i>				0.529*** (3.31)	-0.0255 (-0.31)	0.529*** (3.31)

Geographics	<i>Muslim_others</i>				0.564*** (3.19)	-0.0813 (-0.83)	0.564*** (3.19)
	<i>Rural</i>				0.173* (1.75)	-0.135** (-2.04)	0.173* (1.75)
	<i>Mountain</i>				-0.374*** (-2.81)	0.181** (2.18)	-0.374*** (-2.81)
	<i>Hill</i>				-0.487*** (-4.75)	0.0136 (0.20)	-0.487*** (-4.75)
	<i>Constant</i>	-0.382 (-0.93)	0.191 (0.26)	-0.382 (-0.93)	-0.182 (-0.24)	-0.195 (-0.46)	-0.182 (-0.24)
<hr/>							
	N	774	3380	774	3380	774	3380
	Log_Likelihood	-882.5	-8024.1	-882.5	-7980.6	-873.5	-7980.6
	AIC	1775	16068.2	1775	15999.2	1774.9	15999.2
	BIC	1798.2	16129.4	1798.2	16115.6	1840	16115.6

Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011

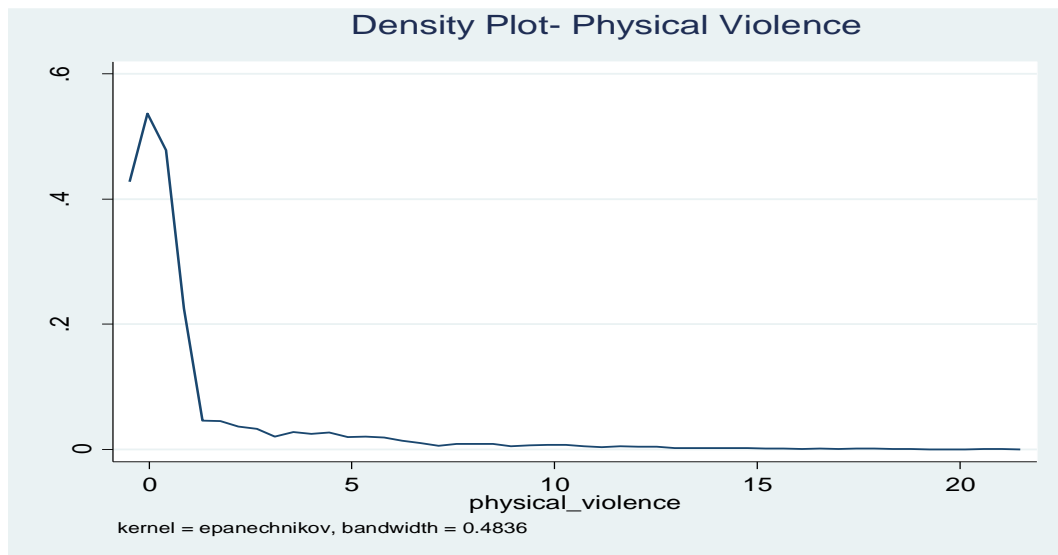
t statistics in parentheses * p<0.1 ** p<0.05 *** p<0.01

Table 6
Hypothesis Table

3 Joint decision making indices	Health outcome (2nd stage equation)	Physical violence (1st stage equation)					Domestic Risk Factors		BMI
	<i>Physical violence</i>	<i>Education</i>	Women Empowerment			<i>Community cash</i>	<i>Alcoholic husband</i>	<i>Unions</i>	<i>BMI</i>
			<i>Joint decision 1</i>	<i>Joint decision 2</i>	<i>Joint decision 3</i>				
Model 1									
Model 1.1	***	***	***				*	***	***
Model 1.2	***	***		***		*	*	***	***
Model 1.3	***	***			***		*	***	***
Model 2									
Model 2.1	***	***	***					***	***
Model 2.2	***	***		***				***	***
Model 2.3	***	***			***		*	***	***
Model 3									
Model 3.1	***	***	***					***	***
Model 3.2	***	***		***				***	***
Model 3.3	***	***			***		*	***	***

Notes: The baseline Model 1 contains only the variable of interest and Model 2 and Model 3 has all other controls for sensitivity. Shaded cells indicate the negative values, whereas unshaded cells are positive coefficients. Stars indicate the significance levels such that * p<0.1 ** p<0.05 *** p<0.01.

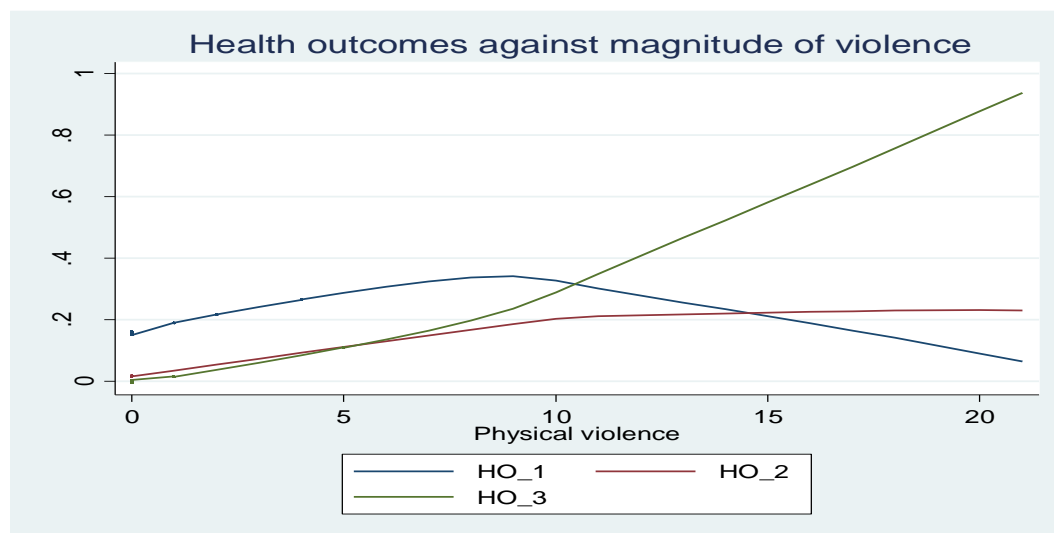
Figure 1
Density Plot of Physical Violence



Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011

Figure 2

Health outcomes against experiences of violence



Source: Calculated from data provided by Nepal Demographics and Health Survey, 2011

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End Notes

- i 46.2% and 25.3% reported of sexual and physical violence respectively, where 19.6% disclosed of facing both forms of violence.
- ii $L_n(\theta) = \int \prod_{j=1}^4 R_{j,n}(\theta|u^{\sim}) d\Phi_J(u^{\sim})$ where Φ_J is a J dimensional multivariate normal distribution and $R_{j,n}(\theta|u^{\sim})$ is the joint probability of observing a profile of ordinal responses conditional on unobserved u^{\sim} . The integrals are estimated using GHK2 () mata function under the cmp stata command.
- iii For brevity, we just included the Joint decision-1 in our main model and we robusted our findings with all the three Joint decision variables, the results of which can be found in Table No 6.
- iv The cmp package as written and created by David Roodman (2009) in Stata has been implemented for estimation purposes. Conditional recursive mixed estimators can be applied in the models where the structure of the data shows a truly recursive data-generating process. They are also appropriate for simultaneous models where the use of instruments reduces the simultaneity to a recursive set of equations. The cmp approach assumes that the errors in all of the equations follows a Gaussian distribution and the system of equation is perfectly recursive.
- v Under the same cmp setup we complement the results of endogenous order probit regression with a sample selected ordered probit model (William Greene and David Hensher, 2010, Debdutta Pal and Arnab Laha, 2015). The theoretical model of Heckman ordered probit regression model is given below:

$$Z^* = W'\alpha + \mu$$

$$Y^* = X'\beta + \varepsilon$$

Where Z is the observed binary variable (Z=1 indicates experience of violence and Z=0 indicates no violence). Z^* is a latent continuous variable related to Z ranges from $-\infty$ to $+\infty$. Y^* is the ordinal variable representing the health outcome and Y^* is a latent variable ranging from $-\infty$ to $+\infty$. W' and X' are the set of exogenous variables with atleast some instruments influencing only the selection equation is not controlled for in the outcome equation. τ_1 and τ_2 are the unknown parameters and μ and ε are the random joint errors distributed as bivariate normal with zero mean, unit variances and correlation coefficient rho (ρ). The maximum likelihood function for the sample of the of the ordered pair $(Z_1, Y_1), (Z_2, Y_2), \dots (Z_n, Y_n)$ can be written as:

$$L = (\theta) = \sum_{i=1}^n \{ (1 - z_i) \ln(\pi_{0i}(\theta)) + \sum_{h=1}^4 I(y_i = h) \ln(\pi_{hi}(\theta)) \}$$

where, $\theta = (\alpha, \beta, \tau, \rho)$, $\pi_0(\theta) = 1 - \beta; -\rho) \Phi(\alpha W')$
 $\pi_h(\theta) = (W'\alpha, \tau_{h-1} - X'\beta; -\rho) - (W'\alpha, \tau_{h-2} - X'$

For more details, the readers may consult Debdutta Pal and Arnab K. Laha (2015) and Luca De Giuseppe and Valeria Perotti (2010).