

Women's Health and Intimate Partner Violence: Individual and Social Costs

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- Violence against women (VAW), very specially intimate partner violence (IPV), is a social blot worldwide.
 - It is a extreme manifestation of gender discrimination.
 - It represents an obstacle to socioeconomic development.
- According to the Special Eurobarometer by the EC (2010):
 - About 25% of European women experience domestic violence some time in their lives.
 - 6 – 10% suffer IPV in a given year.
- However, IPV has not surged as a major problem of social concern in most countries.
 - In the Spanish citizen barometer of December 2017 (CIS, study no. 3199), VAW was ranked as the 16th problem of concern. Only 1.8% reported this problem among the three main problems.

Motivation: IPV-health link

- IPV is still seen mostly as a private issue that entails mostly private costs.
- However, IPV might entail substantial public costs too.
 - IPV is associated with further adverse women's outcomes, such as labor market and health outcomes (Brown et al., 2008).
- Hence, IPV might entail a substantial excess cost burden to the health system.

Motivation: IPV-health link

- A relevant body of research, mainly from the medical literature, have provided an accurate description of IPV consequences on health, in two instances:
 - The association of IPV and health status (Ellsberg et al., 1994; Roberts et al., 1998; Campbell, 2002; Bonomi et al., 2006).
 - The burden that IPV places on health care systems (Koss et al., 1991; Rivara et al., 2006; Brown et al., 2008; Wisner et al., 2008; Kruse et al., 2011).
 - On average, abused victims experience more operative surgery, prescriptions, health care, and hospital stays than non-victims.
- Contributions from the economic literature are scarce.
 - Aizer (2011) overcomes potential endogeneity bias to measure causal effect of IPV on newborn weight.
 - Rice and Vall Castelló (2018) analyzes the causal link between withdrawal of healthcare and changes in help-seeking behavior of victims.

Motivation: IPV-health link

- However, most contributions establish association between:
 - IPV and health outcomes;
 - IPV and healthcare cost burden.
- But causality cannot be established.
- Endogeneity bias.
 - E.g. if bad health outcomes are more likely for women whose unobserved characteristics are associated with an increasing (decreasing) risk of IPV, it will tend to overestimate (underestimate) the causal effect.

- We analyze the impact of IPV on health and the subsequent cost due to excess use of medical services.
- The major challenge is to gauge the causal effect of IPV on health status.
 - Key to yield more effective policy recommendations.
- Estimate the causal effects of:
 - IPV on woman's health.
 - IPV on the excess healthcare costs.
- For such purposes, we use individual-level Spanish data.

Challenges: Data

- Lack of a single data base that includes woman's information on IPV, health status and measures of healthcare care utilization.
- Instead we have two complementary data sets that provide representative samples for the same year, 2011:
 - The Spanish Violence Against Women Survey (VAWS) provides woman's information on IPV and health status but not on healthcare care use.
 - The Spanish National Health Survey (NHS) provides information on several measures of healthcare care use and health status, but not on IPV exposure.
 - Both surveys provide comparable information on characteristics of each woman and her environment.

Challenges: Identification of causal effects

- Potential endogeneity of main variables of interest.
- We must account for endogeneity bias to identify the effect of:
 - IPV on health.
 - Health on use of healthcare services.

Our approach: exploiting complementary data sets

- If both VAWS and NHS samples are compatible, we can combine them (Arellano and Meghir, 1992).
 - Inasmuch most of the variables common to the two data sets are defined alike and both data sets are drawn from the same population, it seems plausible NHS and VAWS samples to be compatible.
- To check compatibility, we need a comparable set of conditioning variables common to both samples.
 - The main focus must be the conditional distribution of the health status variable.
 - To that end, we must estimate specifications for health status on a set of common conditioning variables:
 - Test for the equality of slope coefficients between both samples.

Our approach: identification of causal effects

If sample compatibility is not rejected, we will proceed in several steps:

1. Estimate a model of woman's health status (using the VAWS sample), as a function of IPV and a set of conditioning variables → estimated **marginal effect of IPV on health status**.
 - We consider:
 - the ordered discrete nature of health status (HS);
 - the potential endogeneity of IPV in the HS equation.
2. Estimate a model of use of healthcare services (using the NHS sample), as a function of a health index and a set of conditioning variables → estimated **marginal effect of health status on use of healthcare services**.
 - We consider:
 - the discrete nature of healthcare use;
 - the potential endogeneity of health index in healthcare use equations.

Our approach: identification of causal effects (cont.)

3. Estimate the marginal effect of IPV on medical care costs as
estimated marginal effect of IPV on health \times
estimated marginal effect of health index on healthcare use.
4. Given the prevalence of IPV according to the VAWS survey (proportion or number of women experiencing abuse),
the excess healthcare costs due to IPV is approximately the product of this last figure times the marginal effect obtained in the previous step.

Data sources: main datasets

- VAWS (Violence Against Women Survey) for Spain for 2011.
 - Representative sample for adult women living in Spain.
 - Based on face-to-face interviews to women at their homes.
 - Includes woman's individual information and IPV experience, household and environment characteristics and partner's information.
 - Also includes self-declared woman's health status for the 1st time.
- NHS (National Health Survey) for Spain for 2011.
 - Representative sample for people aged 15 and over living in Spain.
 - Based on face-to-face interviews at homes of interviewed.
 - Includes individual information of the interviewed and self-declared health status, household and sociodemographic characteristics and partner's information.
- Sample selection criteria: Women 25 – 64 years, cohabiting with her partner (or who have cohabited with a partner in the last 12 months).

Definition of main variables

- Health status: each interviewed woman are asked to rate their health as any of 5 discrete states. (VAWS & NHS)
 - Its discrete ordered nature is accounted → ordered response model.
- IPV: gathered by means of a multiple choice question module (26 abusive behaviors). (VAWS)
 - Based on direct questions about specific acts of violence, rather than generic questions, following gold standard methods (WHO, 2013).
 - Equals value 1 if partner's respondent has frequently undertaken any of the 13 behaviors that are considered as serious abuse (physical or non physical).
- Use of healthcare services: three binary variables of utilization of the following health services in the last 12 months: (NHS)
 - hospitalization;
 - emergency care;
 - consumption of sedatives and/or antidepressants.

- IPV:
 - About 12% of women in the sample reported IPV (either physical or non physical).
 - Significant negative association between IPV and health status.

Table 5 - Self-declared health status by IPV status (%)

IPV status	Health status					Eq. test
	Very bad	Bad	Med-iocre	Good	Very good	
No	1.4	3.9	20.6	58.2	16.0	
Yes	2.8	7.6	32.1	48.7	8.8	0.0000 ^S

- Large differences in health states by IPV status.

- Stepwise approach using the two main data sets (VAWS & NHS) –after checking their compatibility–.
 - Estimate the effect of IPV on HS (using the VAWS).
 - Estimate the effect of HS on use of healthcare services (using the NHS).
 - Estimate the effect of IPV on use of healthcare services.

Effect of IPV on Health status (VAWS)

- Let
 - HS^* : (continuous) latent process driving woman's health;
 - IPV^* : (continuous) latent process driving IPV status.
- Assume they are characterized by the following underlying behavioral model:

$$HS^* = \mathbf{X}'_1 \boldsymbol{\beta}_1 + \gamma IPV + v_1, \quad (1)$$

$$IPV^* = \mathbf{Z}'_1 \boldsymbol{\delta}_1 + v_2, \quad (2)$$

where:

- $IPV = \mathbf{1}(IPV^* > 0)$: binary indicator of IPV;
- $\mathbf{X}_1, \mathbf{Z}_1$: sets of exogenous variables (there can be some overlap);
- v_1, v_2 : corresponding unobserved error terms.

Effect of IPV on HS: Ordered response

- The continuous latent variable featuring health HS^* is not fully observed.
- Instead, observed HS is reported as any of 5 ordered discrete states.
- Assume observed self-reported health HS reflect woman's underlying health HS^* through

$$HS = s \quad \text{if and only if } \pi_{s-1} < HS^* < \pi_s, \quad s = 1, \dots, 5$$

where $\pi_0 = -\infty$, $\pi_5 = +\infty$, $-\infty < \pi_{j-1} < \pi_j < +\infty$ ($j = 1, \dots, 4$).

- If v_1 in (1) were normal and independent of v_2 in (2), so that IPV would be exogenous \Rightarrow
ordered probit model for self-reported health.
 - The parameters β_1, γ of eq. (1) could be estimated separately by ML.

Effect of IPV on HS: Ordered response with endogenous binary regressor

- But if v_1, v_2 not independent, parameters in (1) cannot be estimated separately.
- Let \mathbf{Z}_1 , instrument set for IPV
 - If $IPV \mid \mathbf{X}_1, \mathbf{Z}_1 \sim N(\mu_{IPV}(\mathbf{X}_1, \mathbf{Z}_1), \sigma_{IPV}^2)$, parameters in (1) could be estimated by means of a two-stage method.
 - However, IPV is a binary indicator \Rightarrow its (conditional) distribution cannot be normal \Rightarrow
Two-stage methods not valid!!
- We thus need to perform joint ML estimation of the two-equation model (1) and (2).

Effect of IPV on HS: Two-eq. model (ML)

- We aim at estimating
 - the parameters $\beta_1, \gamma, \delta_1$,
 - the 4 threshold parameters π_s ($s = 1, \dots, 4$),
 - the correlation coefficient ρ .
- Let $d_s = \mathbf{1}(HS = s)$: binary indicator taking the value 1 if HS^* falls in interval s and 0 otherwise.
- For a sample of $i = 1, \dots, N$ independent observations, the likelihood function is:

$$L = \prod_{i=1}^N \prod_{s=1}^S (\Pr(\pi_{s-1} < HS^* < \pi_s, IPV^* > 0))^{d_{is}} \\ \times \Pr(\pi_{s-1} < HS^* < \pi_s, IPV^* < 0)^{d_{is}}.$$

- **Exclusion restrictions** are required for **identification** (Maddala, 1983).
- We include indicators of woman's awareness of IPV episodes among her female acquaintances.
 - IPV episodes among her female relatives are disregarded to preclude effects via genetic transmission of IPV experience!!!

Effect of HS on healthcare use (NHS)

- Let U be a binary variable on whether the woman uses a certain healthcare service.

$$\Pr(U = 1 | \mathbf{X}_2, HS^*) = \Phi(\mathbf{X}'_2 \boldsymbol{\beta}_2 + \alpha HS^*), \quad (3)$$

where:

- \mathbf{X}_2 : set of covariates, HS^* : continuous latent health index.
- $\boldsymbol{\beta}_2, \alpha$: coefficients associated to \mathbf{X}_2, HS^* .
- There is a potential selection problem as HS^* potentially correlated with omitted factors that might increase the probability of healthcare use.
- We could specify a model for HS^* as a function of a set of variables that affects U only through HS^* :

$$HS^* = \mathbf{Z}'_2 \boldsymbol{\delta}_2 + v_3, \quad (4)$$

- In addition of sociodemographic variables we should include potential determinants of individual HS that do not directly healthcare use:
 - Bad quality of drinkable water at woman's home.
 - Province-level information on air pollutants released by industrial complexes.

Effect of HS on healthcare use: Estimation

- We follow Mallar's (1977) two-stage approach:
 - (i) Estimate a reduced form ordered probit for self-reported HS,

$$\Pr(HS = s | \mathbf{Z}_2) = \Pr(\tau_{s-1} < HS^* < \tau_s), \quad s = 1, \dots, 5, \quad (5)$$

to compute the predicted values $\widehat{HS}^* = \mathbf{Z}'_2 \widehat{\delta}_2$.

- (ii) Estimate probits for use of healthcare services,

$$\Pr(U = 1 | \mathbf{X}_2, HS^*) = \Phi(\mathbf{X}'_2 \beta_2 + \alpha \widehat{HS}^*). \quad (6)$$

(computation of the std. errors should account for the use of the generated regressor \widehat{HS}^* instead of the actual index HS^*).

- The AME of HS^* on the prob. of healthcare use is the sample avg. of

$$\frac{\partial \Pr(U = 1 | \mathbf{X}_2, \widehat{HS}^*)}{\partial HS^*} = \alpha \phi(\mathbf{X}'_2 \beta_2 + \alpha \widehat{HS}^*). \quad (7)$$

Effect of IPV on the use of healthcare services

- We combine the aforementioned estimates of the AME to estimate the impact of IPV on the probability of use of healthcare services.
- The ME of *IPV* on the health index HS^* estimated from model (1)-(2) is,

$$E(HS^* | \mathbf{X}, IPV = 1) - E(HS^* | \mathbf{X}, IPV = 0) = \gamma. \quad (8)$$

- The ME of HS^* on the probability of using health services is

$$\frac{\partial \Pr(U = 1 | \mathbf{X}_2, \widehat{HS^*})}{\partial HS^*} = \alpha \phi(\mathbf{X}'_2 \beta_2 + \alpha \widehat{HS^*}). \quad (9)$$

- Our ME of interest is thus,

$$\begin{aligned} \Pr(U = 1 | \mathbf{X}_2, HS^*(IPV = 1)) - \Pr(U = 1 | \mathbf{X}_2, HS^*(IPV = 0)) & \quad (10) \\ & = \alpha \phi(\mathbf{X}'_2 \beta_2 + \alpha \widehat{HS^*}) \times \gamma. \end{aligned}$$

- A measure of the “excess” healthcare cost due to IPV is this last figure, (10), times the proportion of women affected by IPV.

Compatibility of VAWS and NHS samples

- Following Arellano and Meghir (1992) we test whether the conditional distribution of the health status variable is the same in both samples.
- We pool both data sets and estimate a model for discrete health status given conditioning variables common to both data sets.
 - Allow for differences in slopes across samples and test for equality of coefficients across samples.
 - Consider differences in sampling criteria, which determine different weights to different provinces.
(Allowing for different province coefficients across samples).
- We find that:
 - Equality of province coefficients across samples is rejected.
 - But equality of coefficients of the covariates across samples is not rejected.
- Hence, after controlling for province of residence, both samples are compatible.

Table 8: ML estimates of woman HS and IPV

	Single eq. (I)	Two-equation (II)	
	Health	Health	IPV
IPV	-0.3327 [§] (0.0532)	-0.5369 [†] (0.2203)	
IPV awareness: non relatives			0.1821 [§] (0.0696)

Table 9: AME of IPV on health status

Health status	Single eq. (I)	Two-equation (II)
Very bad	0.0158 [§] (0.0034)	0.0299* (0.0178)
Bad	0.0264 [§] (0.0050)	0.0459 [†] (0.0227)
Mediocre	0.0661 [§] (0.0105)	0.1040 [§] (0.0388)
Good	-0.0456 [§] (0.0098)	-0.0864* (0.0486)
Very good	-0.0627 [§] (0.0088)	-0.0934 [§] (0.0304)

Estimates of the effect of IPV on HS: Summary

- Our instrument is a strong predictor of IPV.
 - (p-value = 0.0088).
 - AME of instrument on IPV: being aware that some non-relative female is victim of IPV increases IPV risk by 3.4 p.p.
- We observe a damaging effect of IPV on health.
 - Its estimated effect is much larger when endogeneity of IPV is accounted for.
- The AMEs are positive for the three worst health states.
 - The magnitudes of the estimated AMEs of the two-eq model double those from the single equation model.
 - And the magnitudes of the effects are substantial.

Estimates of the effect of IPV on HS: Summary

- On average, the exogenous presence of IPV makes 18 p.p. more likely any of the three worst health states.
 - Probability in three worst states is 1.7 times higher for abused than for non abused women.
- Enjoying any two best health states is 8.6 and 9.3 p.p. less likely for abused than for non abused women (0.8 and 0.4 times lower)
 - Estimated probability of enjoying a very good health state decreases from 16% for non-abused women to less than 7% for abused women.

Estimates of the effect of HS on use of health services

Reduced form model of HS

- We use as instruments
 - Bad quality of tap water at woman's home.
 - Province-level information of industrial emissions of air pollutants.
- We find strong evidence of instrument relevance.

Table 12: Probit estimates for healthcare use

Variable	(1) Hospitalization	(2) Emergency care	(3) Sedatives and/or antidepressants
\widehat{HS}^*	-0.2856 (0.1751)	-0.5128 [§] (0.1323)	-0.6779 [§] (0.1874)

Table 13: AME of health index on healthcare use

Variable	(1) Hospitalization	(2) Emergency care	(3) Sedatives and/or Antidepressants
\widehat{HS}^*	-0.0499 (0.0306)	-0.1658 [§] (0.0427)	-0.1240 [§] (0.0346)

Estimates of the effect of health index on use of health services

Probit estimates for healthcare use

- \widehat{HS}^* has a negative effect on the use of the three healthcare services
 - But effects significant only for emergency care and sedatives.
- Increasing \widehat{HS}^* by 1 unit leads to a 16.6 point and 12.4 point decrease in the probability of using emergency care and consuming sedatives, respectively.
 - 1 std.dev. increase in \widehat{HS}^* (i.e. approx. a 2-levels increase in health status), would reduce the probability of using emergency care by 7 p.p., and the probability of consuming sedatives or antidepressants by 5.2 p.p.
 - These magnitudes significant and relevant too!!
(note that unconditional probabilities of emergency care use and sedatives consumption are, 28.1% and 12.3% respectively).

Table 14: AME of IPV on healthcare use

Variable	(1) Hospitalization	(2) Emergency care	(3) Sedatives/ Antidepressants
<i>IPV</i>	0.0268	0.0890	0.0666

Estimates of the effect of IPV on use of health services

Implications on healthcare costs

- IPV increases the probability of using emergency care and consuming sedatives by 8.9 and 6.7 p.p., respectively.
- As IPV incidence is 12% \Rightarrow 1.07% of the cost of the emergency care and 0.8% of cost of sedatives is due to the existence of IPV.
 - Total medical expenses for nervous system amounted to 2,229 million euros in Spain in 2018. Hence, about 18 millions could be saved in the absence of IPV (70% of the budget for preventing IPV of the Spanish Ministry of Health, Social Services and Equality).
 - Total cost of the emergency services is around 3,000 million euros in 2015. Hence, the overall cost in the absence of IPV would have decreased by 30 million euros

Estimates of the effect of IPV on use of health services

Implications on healthcare costs

- In 2013, public health expenditure amounted to 61,710 million euros in Spain.
- If we extrapolate the percentage excess cost for the whole public health system (around 1%), absence of IPV would save about 600 million euros.
- These estimated savings just consider the direct impact of IPV through the excess use of healthcare services by victimized women.
- Indirect effects through negative outcomes on children who witness marital violence (Heise, 1998) have not been accounted for.

Conclusions

- We have addressed the consequences of IPV suffered by Spanish adult women on victims' health and on the excess health care use.
 - We have combined information from two different, representative samples, for the same year, after checking its (conditional) compatibility.
 - We have accounted for potential endogeneity of the two main covariates, IPV and HS, using exogenous sources of variation based on individual information and on geographical variation.
- Our estimation results using the VAWS show that the probabilities of suffering very bad or bad health are about 3 and 2 times, respectively, significantly higher for abused than for non abused women.
- Combining the previous effect with the AME of HS on healthcare use, we find that IPV increases the probability of using emergency services and consuming sedatives by 8.9 and 6.7 p.p., respectively.
- Our results suggest an excess cost of 1.07% of emergency care services and 0.8% of sedatives and antidepressants consumption due to the existence of IPV.

- Woman's victimization represents a significant drain on available health resources.
- Policies aimed at preventing IPV can also contribute to reduce social health care costs (Bonomi et al., 2006).
 - Primary prevention programs could include:
 - routine interviews to female adult women and adolescents about partner violence;
 - targeted intervention strategies to foster healthy relationships.
 - Secondary prevention requires systematic referral for women reporting IPV to health care services.