Natural Disasters and Intimate Partner Violence: Evidence from Peru

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Motivation

Women are hit hardest in disasters, so why are responses too often gender-blind?

Disaster response and recovery doesn't go far enough in addressing their specific needs.

MARCH 24, 2022

Source: UNDP

Source: The Guardian

Overview

Research questions

- Does violence against women increase in the aftermath of earthquakes?
- What are the underlying channels?

Identification strategy

- **Quasi-exogenous** nature of earthquakes. Spatial and temporal distribution of earthquakes and geographic location of hh

Preview of results

- Exposure to earthquakes ↑ **IPV**
- Driven by women living in **urban** areas and districts **without protective institutions**
- Role of **alcohol consumption** and **intra-hh male dominance**

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- Exposure to earthquakes $\uparrow$ **IPV**
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- Role of **alcohol consumption** and **intra-hh male dominance**

Related literature

Socio-economic effects of weather shocks and natural disasters

- e.g., Miguel et al. 2005; Neumayer & Plümper 2007; Sekhri & Storeygard 2014; Weitzman & Behrman 2016

Determinants of violence against women

- Wage gap (e.g., Aizer 2010); Unemployment (e.g., Anderberg et al. 2016, Bhalotra et al. 2021); Frustration (e.g. Card & Dahl, 2011); Family structures (e.g., Tur-Prats 2019); Protective institutions (e.g., Trako et al. 2021).

Our contribution

- Large-scale disasters and IPV
- Role of individual, societal and institutional factors beyond economic conditions
- Dynamics of the effects

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Context

- Peru is located in the *Ring of Fire*, at the border of the Nazca and South American tectonic plates ▷
- Major seismic activity and volcanic eruptions
- Lacks in terms of disaster preparedness and emergency response (PDC, 2015)
- Large incidence of violence against women
- Rigid gender roles and strong norms of masculinity (Flake 2005; Farfán et al. 2016)
- Public policies to curb violence against women e.g., Women Justice Centers (WJC)

Data

Violence against women

- Georeferenced household-level data: Demographic and Health Surveys (DHS) 2000, 2004-06, 2007-08, and 2009
- Administrative records at the state level: Peruvian Ministry of Women and Vulnerable Populations (MIMP) 2002-2009

Earthquakes

- ShakeMaps of all significant earthquakes in Peru: United States Geological Surveys (USGS) ShakeMaps

Protective institutions

- Location of Women Justice Centers: MIMP WJC

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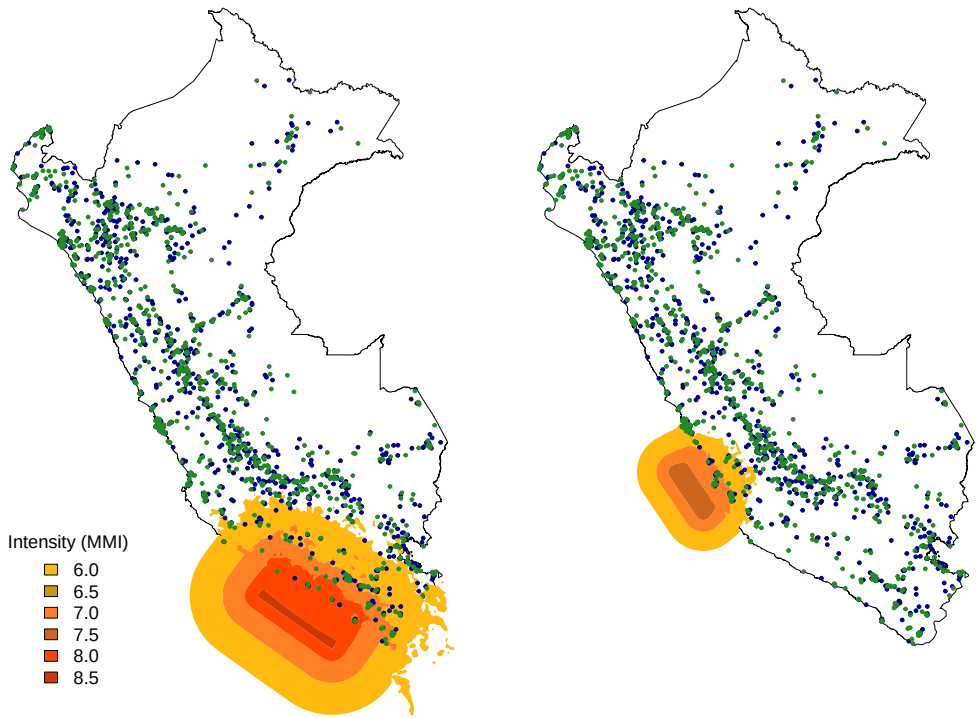
Data

Figure 1: Earthquakes and DHS survey clusters



(a) 2001 (b) 2007

Figures (a) and (b) show earthquake polygons equal to or above 6.0 in the MMI scale for the earthquakes that happened in Peru in 2001, and 2007. In addition, DHS clusters of the 2000 wave are shown in dark blue and DHS clusters of the 2009 wave are shown in forest green.

Empirical model

$$IPV_{wcdsty} = \alpha + \beta Earthquake_{c;(t-i,t)} + \lambda \mathbf{X}_w + \delta_y + \gamma_d + \eta_s \times y + \epsilon_{wcdsty}$$

- Outcome variable: Ever experienced any form of "less severe" violence (0/1)
- Exposure to earthquake $\geq$ 7.0 MMI scale in the past i months (0/1) (Gignoux & Menéndes 2016, Caruso 2017)
- Controls: respondent's age, squared age, age difference with the partner, educational level and partner's educational level
- Year fixed effects δ_y, district fixed effects γ_d, state trends $\eta_s \times y$

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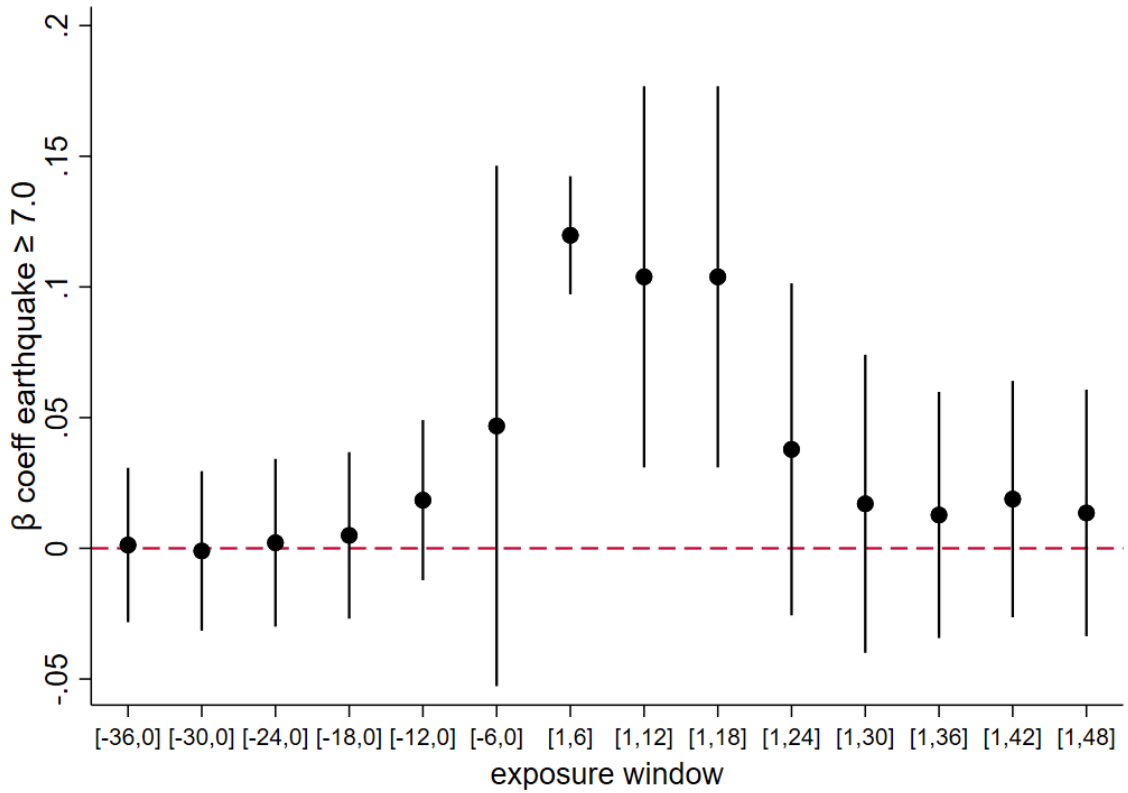
Results

Table 1: Earthquakes and Intimate Partner Violence

	IPV (0/1)			
	(1)	(2)	(3)	(4)
Earthquake $\geq$ 7.0 past 6 months	0.128***	0.105***		
	(0.014)	(0.014)		
Earthquake $\geq$ 7.0 past 12 months			0.079*	0.100**
			(0.043)	(0.047)
Observations	43,110	43,110	43,110	43,110
R^2	0.056	0.074	0.056	0.074
Year FE	✓	✓	✓	✓
District FE	✓	✓	✓	✓
State trends	✓	✓	✓	✓
Controls		✓		✓

Results: Effects over time

Figure 2: Earthquakes and Intimate Partner Violence



Notes: Plots of leads and lags of earthquake coefficient dummies estimated separately for each exposure window with 90% confidence intervals. In these specifications, we focus on earthquakes equal to or above 7.0 in the MMI scale. In each regression, the comparison group are those who have not been affected by an earthquake equal to or above 7.0 in the respective time period.

Robustness, extensions, and limitations

Aggregate-level analysis

- Registered cases of violence against women Aggregate

Alternative exposure definition

- Buffers around DHS survey clusters Buffers
- Different intensity threshold Intensity

Measures of violence

- Different measures of violence against women Measures

Alternative model specifications

- Leads and lags of the exposure variable Event study

Migration

- Baseline model: respondents that have been living in the same location for at least three years

What explains the increase in IPV following earthquakes?

Channels explaining **male violent behavior**

- Partner's alcohol consumption ✓
- Male intra-household economic dominance ✓
- Co-residence
- Objective economic conditions (wealth and female employment)

Channels

Heterogeneities depending on **initial macro characteristics**

- Protective institutions
- Rural vs urban areas

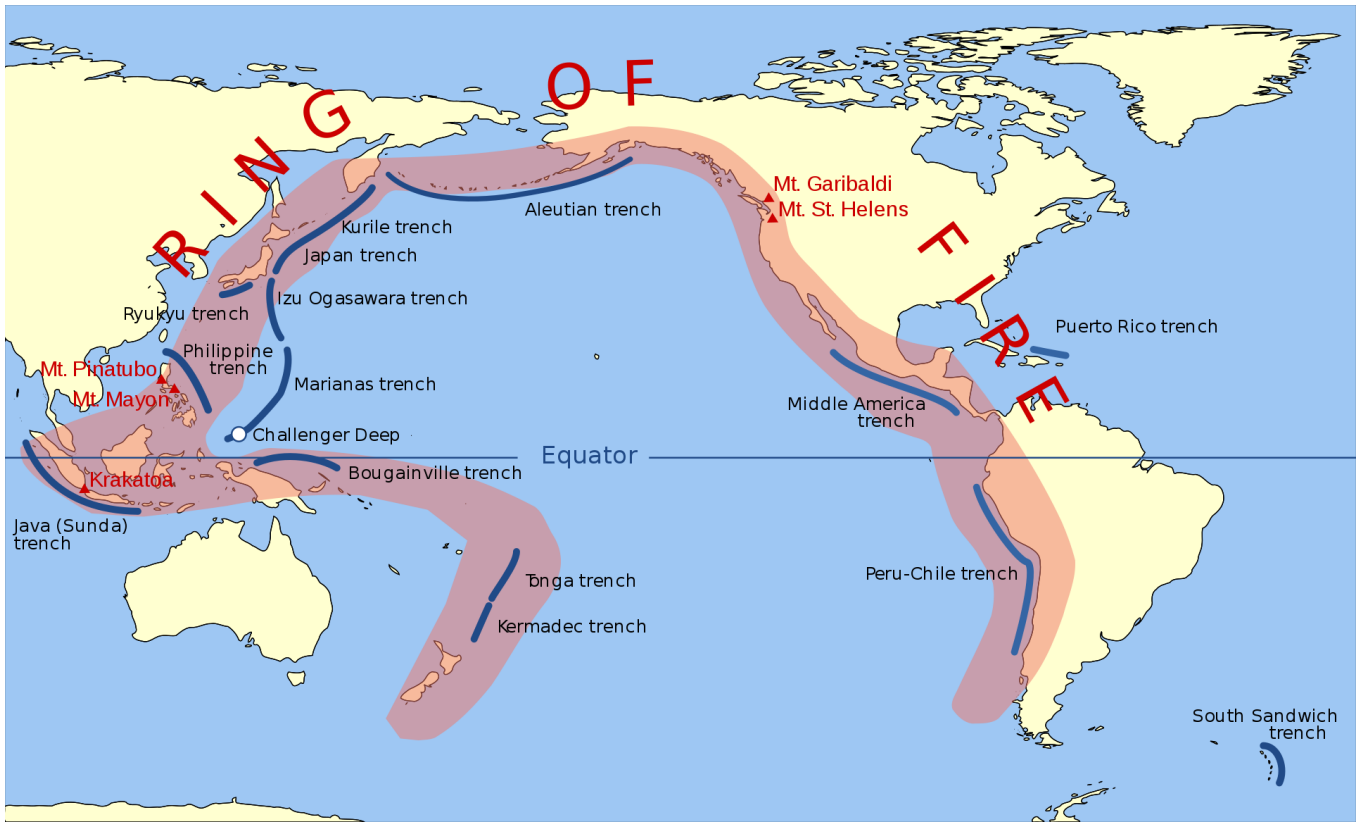
Heterogeneities Rural Urban

Conclusion

- Women experience **higher levels of IPV** following earthquakes in Peru
- Male violent behavior is related to a rise in **alcohol consumption** and an increase in **male intra-household economic power**
- Effect is entirely born by women living in **urban areas without access to protective institutions**
- Post-disaster relief programs should address women's vulnerability to violence following large-scale disasters

Thank you!

Figure 3: Ring of Fire



Source: Wikipedia

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Aggregate-level model

$$\%\Delta Y_{sy} = \alpha + \beta_1 Earthquake_{s,y-1} + \delta_y + \gamma_s + \theta Population_{sy} + \epsilon_{sy}$$

- Y: percentage change no of cases of domestic (or sexual) violence registered in state s and year y
- Exposure to earthquake $\geq$ 7.0 MMI scale (0/1)
- year fixed effects δ_y, state fixed effects θ_s

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Aggregate-level results

Table 2: Earthquake and Intimate Partner Violence

	Percentage change (%Δ) in violence cases			
	Domestic Violence		Sexual Violence	
	(1)	(2)	(3)	(4)
Earthquake $\geq 7.0_{y-1}$	63.626***	60.262***	48.638*	27.825
	(9.673)	(11.704)	(25.059)	(25.986)
In Population		82.613		511.024**
		(167.714)		(222.339)
Observations	137	137	137	137
R^2	0.048	0.050	0.011	0.050

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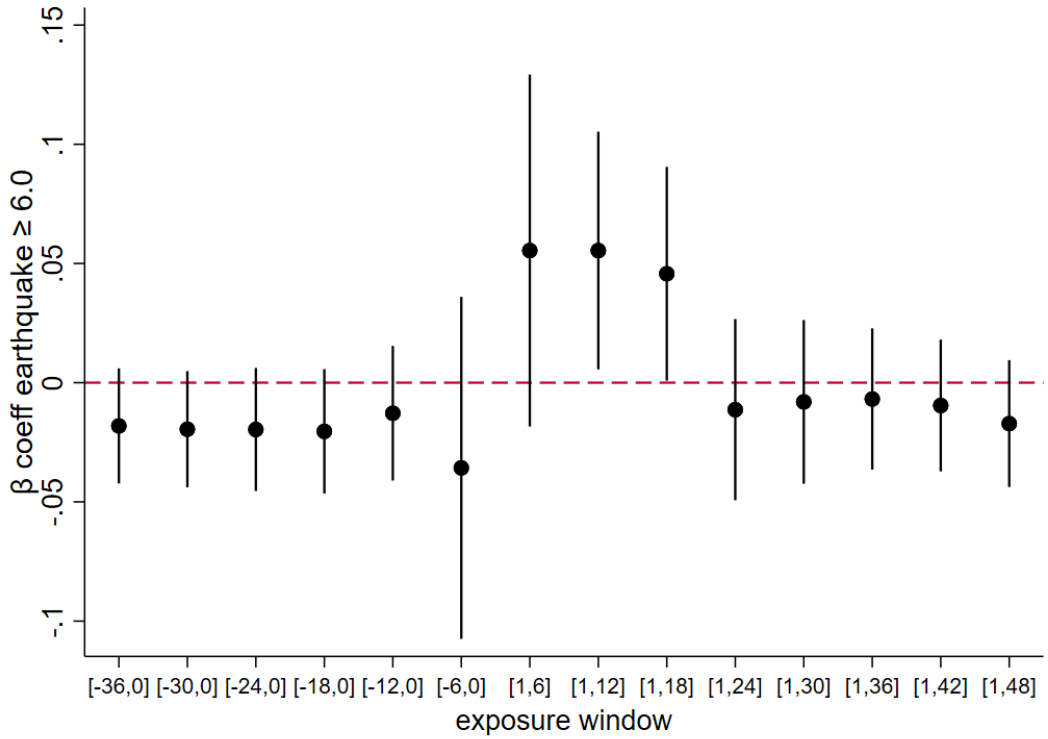
Alternative earthquake exposure measure

Figure 4: Earthquakes and IPV: Threshold 6.0



Notes: Plot of leads and lags of earthquake coefficient dummies estimated separately for each exposure window with 90% confidence intervals. In these specifications, we focus on earthquakes equal to or above 6.0 in the MMI scale. In each regression, the comparison group consists of those who have not been affected by an earthquake equal to or above 6.0 in the respective time period.

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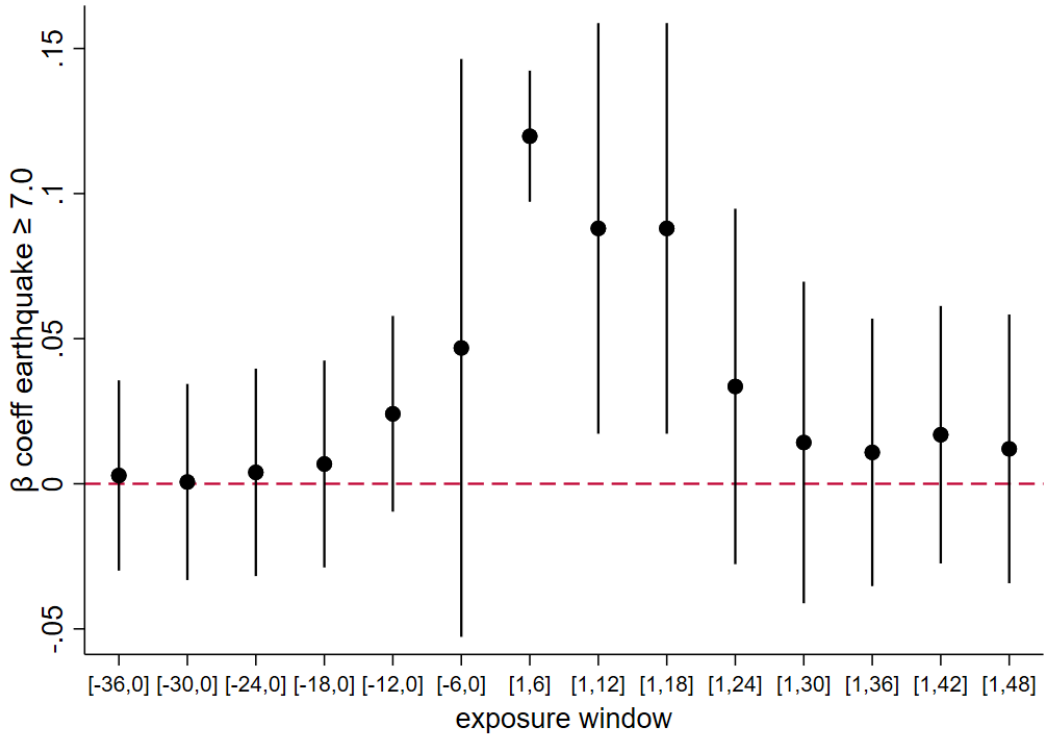
Buffers around clusters

Figure 5: Earthquakes and IPV: Buffers



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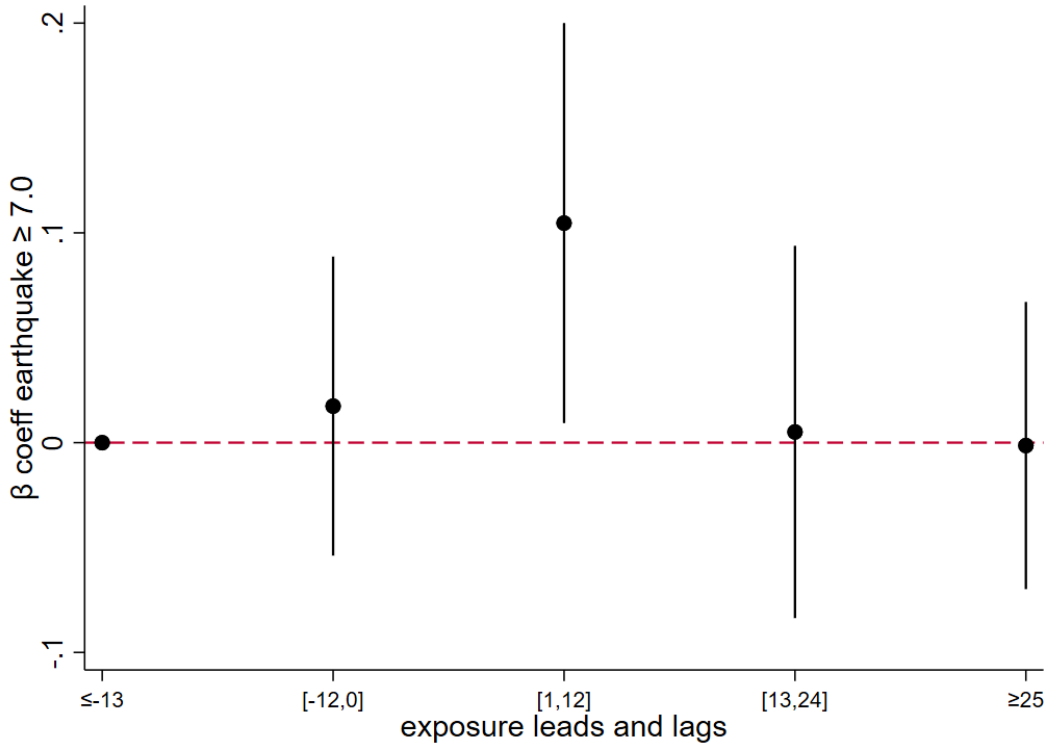
Leads and lags jointly

Figure 6: Earthquakes and IPV: Alternative Definition



Notes: Plot of leads and lags of earthquake coefficient dummies estimated in the event-study specification with 90% confidence intervals. The omitted category in this specification is being affected by an earthquake more than 13 months ago.

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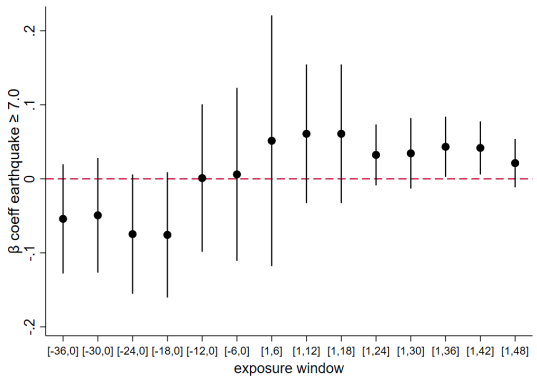
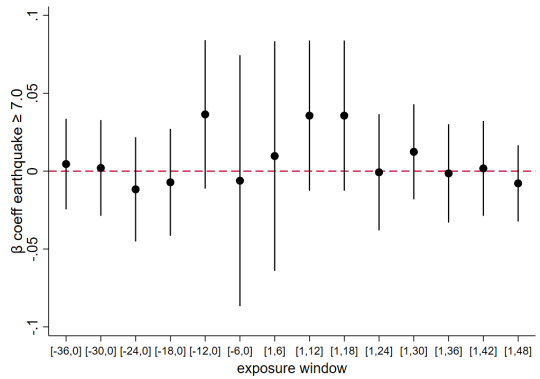
Different outcome variables

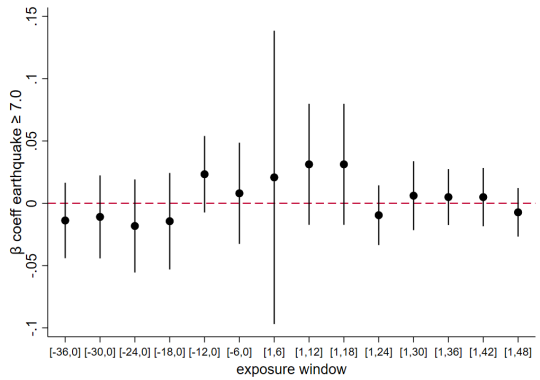
Figure 7: Earthquakes and IPV: Alternative Outcomes



(a) Mental Violence



(b) Severe Violence



(c) Sexual Violence

Descriptive statistics

	mean	sd	min	max
Panel A: Individual-level Information				
IPV - Less Severe Violence	0.385	0.487	0	1
IPV - Mental Violence	0.307	0.461	0	1
IPV - Severe Violence	0.173	0.379	0	1
IPV - Sexual Violence	0.084	0.277	0	1
Earthquake $\geq$ 7.0 in the Past 6 Months	0.001	0.027	0	1
Earthquake $\geq$ 7.0 in the Past 12 Months	0.003	0.055	0	1
Rural	0.445	0.497	0	1
WJC	0.128	0.334	0	1
Currently Employed	0.650	0.477	0	1
Partner Drinks	0.741	0.438	0	1
Partner Frequently Drunk	0.762	0.426	0	1
Partner in the Household	0.958	0.202	0	1
Partner Economic Dominance	0.295	0.456	0	1
Any Joint Decision	0.886	0.317	0	1
Household Wealth Index	0.105	0.957	-2.003	2.511
Age	33.374	8.324	15	49
Squared Age	1183.107	561.625	225	2401
Age Difference	4.064	5.802	-32	72
Number of Living Children	2.902	1.963	0.000	13.000
Respondent Has No Education	0.066	0.249	0	1
Respondent Has Primary Education	0.389	0.488	0	1
Respondent Has Secondary Education	0.376	0.484	0	1
Respondent Has Tertiary Education	0.169	0.375	0	1
Partner Has No Education	0.016	0.125	0	1
Partner Has Primary Education	0.313	0.464	0	1
Partner Has Secondary Education	0.489	0.500	0	1
Partner Has Tertiary Education	0.182	0.386	0	1
Observations	43,110			

Notes: The individual-level data is extracted from four waves of the Peruvian DHS from 2000 to 2009. The department-level data come from the MIMP for the years 2002 to 2009.

Descriptive statistics

	mean	sd	min	max
Panel B: Department-level Information				
%Δ Physical Violence Cases	15.338	38.573	-45	231
%Δ Sexual Violence Cases	20.579	54.835	-82	272
Earthquake $\geq$ 7.0 in the Past Calendar Year	0.015	0.120	0	1
ln Population	13.586	0.841	11.623	15.996
Observations	137			

Notes: The individual-level data is extracted from four waves of the Peruvian DHS from 2000 to 2009. The department-level data come from the MIMP for the years 2002 to 2009.

Channels

Table 3: Earthquake and Intimate Partner Violence: Channels

	Partner Drinks	Frequently Drunk	Male in the hh	Male Dominance	Joint Decision	hh Wealth	Female Work
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Outcome Variable - Channel Variable							
EQ $\geq$ 7.0 past 12 Months	0.153***	0.003	0.032**	0.095*	-0.040*	-0.080	-0.028
	(0.052)	(0.036)	(0.015)	(0.054)	(0.024)	(0.136)	(0.048)
Year FE, District FE, and Department Trend	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	27,290	35,901	43,106	43,106	37,843	27,290	42,118
R^2	0.080	0.054	0.038	0.133	0.112	0.743	0.174
Panel B: Outcome Variable - IPV (0/1)							
Channel Variable	0.169***	0.354***	0.004	0.044***	-0.098***	0.004	0.052***
	(0.007)	(0.009)	(0.011)	(0.005)	(0.008)	(0.007)	(0.005)
Year FE, District FE, and Department Trend	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	27,290	35,901	43,106	43,106	37,843	27,290	42,118
R^2	0.109	0.118	0.079	0.081	0.083	0.087	0.082

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Heterogeneity analysis: Macro characteristics

Table 4: Earthquake and Intimate Partner Violence: Heterogeneity

Heterogeneity Var:	Rural	WJC in District	
		All	Urban
	(1)	(2)	(3)
EQ $\geq$ 7.0 past 12 Months	0.109**	0.168***	0.164***
	(0.043)	(0.043)	(0.029)
EQ $\geq$ 7.0 past 12 Months $\times$ Rural	-0.209***		
	(0.043)		
Rural	-0.078***		
	(0.011)		
EQ $\geq$ 7.0 past 12 Months $\times$ WJC		-0.188***	-0.180***
		(0.043)	(0.029)
WJC		0.027*	0.014
		(0.015)	(0.016)
Linear Combination of Coefficients:			
EQ + EQ $\times$ Var	-0.100***	-0.020*	-0.016
	(0.012)	(0.011)	(0.016)
Year FE, District FE, Department Trend	✓	✓	✓
Controls	✓	✓	✓
Observations	43,110	43,110	23,936
R^2	0.081	0.079	0.071

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Heterogeneity analysis: Rural vs Urban

Table 5: Earthquake and IPV: Rural Clusters

Outcome Variable:	Frequently Drunk	Male in the hh	Male Dominance	Joint Decision	Female Work
	(1)	(2)	(3)	(4)	(5)
EQ $\geq$ 7.0 past 12 Months	-0.119***	0.012*	-0.130***	0.047***	0.212***
	(0.014)	(0.007)	(0.022)	(0.016)	(0.028)
Observations	15,788	19,172	19,173	16,790	18,806
R^2	0.084	0.079	0.164	0.136	0.237

Table 6: Earthquake and IPV: Urban Clusters

Outcome Variable:	Partner Drinks	Frequently Drunk	Male in the hh	Male Dominance	Joint Decision	hh Wealth	Female Work
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EQ $\geq$ 7.0 in the Past 12 Months	0.151**	0.032	0.031*	0.129**	-0.044*	-0.190	-0.019
	(0.061)	(0.040)	(0.017)	(0.059)	(0.026)	(0.125)	(0.048)
Year FE, District FE, and Department Trend	✓	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	15,145	20,113	23,934	23,933	21,053	15,145	23,312
R^2	0.066	0.039	0.028	0.090	0.106	0.584	0.136

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Figure 8: Women Justice Center (WJC)

Source: MIMP

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Figure 9: Modified Mercali Intensity (MMI)

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: United States Geological Survey (USGS)

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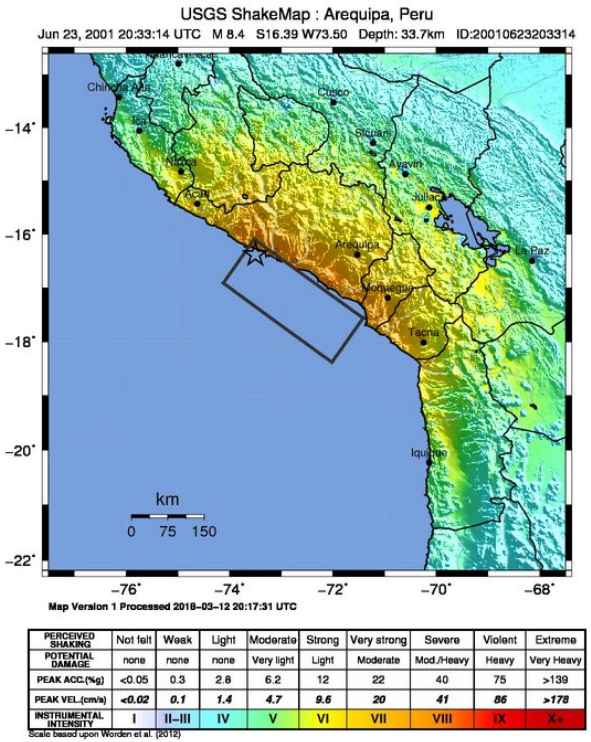
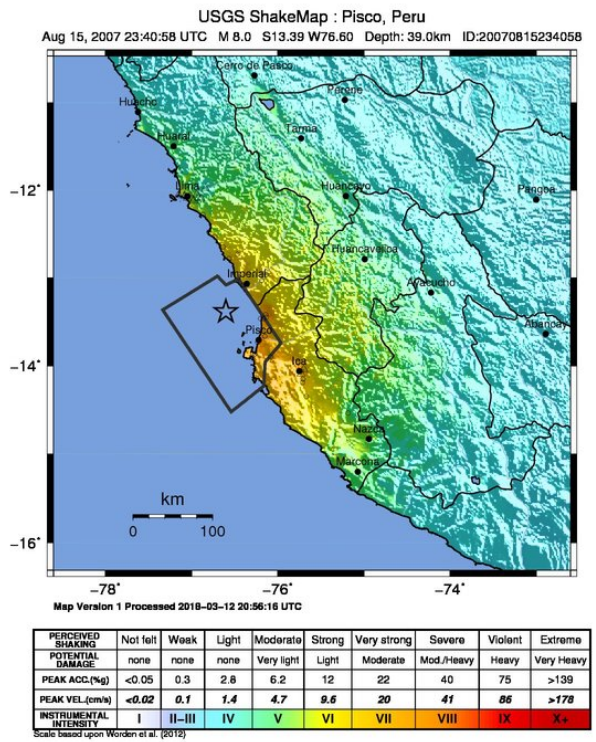
ShakeMaps

Figure 10: ShakeMaps 2001 and 2007 Earthquakes



(a) 2001



(b) 2007

Source: United States Geological Survey (USGS).

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