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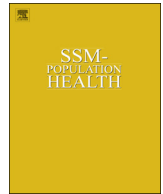
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Article

Exploring the association between segregation and physical intimate partner violence in Lima, Peru: The mediating role of gender norms and social capital[☆]



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ABSTRACT

Intimate partner violence (IPV) has been globally recognized as a major public health problem. A growing body of evidence has identified a significant relationship between living in a neighborhood of concentrated disadvantage and experiencing IPV. Considering the increasing rates of poverty and segregation registered in Latin American cities, research on the effects of segregation on IPV seems to be particularly necessary in the region. Therefore, this study aims to analyze the impact of economic residential segregation on physical IPV, exploring the mediating roles of social capital and gender norms unfavorable to women. This study used an original dataset in which women from five districts of Metropolitan Lima were interviewed. The results show that residential segregation indirectly influences on physical IPV through the considered mechanisms. In this regard, it was found that segregation increases the likelihood of prevailing gender norms unfavorable to women, and this in turn increases the likelihood of IPV. At the same time, segregation fosters the development of greater social ties among the neighbors, which in turn diminish the levels of IPV. Regarding the overall effect of segregation through both mechanisms, on average social capital is a factor of more relevance. The findings suggest that strengthening the informal networks among neighbors is a powerful strategy to reduce physical IPV in contexts of poverty and segregation.

1. Introduction

Intimate partner violence (IPV) can be defined as any behavior within an intimate relationship that causes physical, psychological or sexual harm to those in the relationship (WHO – World Health Organization, 2012). The available data has shown that globally a large number of women have suffered IPV (Devries et al. 2013). Consistent with this, research maintains that most of the violence against women is perpetrated by their intimate partners (García-Moreno, Jansen, Ellsberg, Heise & Watts, 2005). The prevalence of the negative effects of this form of violence on women's and children's health as widely documented in research (Ellsberg, Jansen, Heise, Watts & García-Moreno, 2008; Hindin, Kishor & Ansara, 2008; Heise & García-Moreno, 2002) has prompted researchers to explore the determinants of this

phenomenon.

Contexts of poverty and segregation seem to have particularly negative effects on IPV. A significant body of research has registered a consistent positive relationship between living in a neighborhood of concentrated disadvantage and experiencing IPV (Pinchevsky & Wright, 2012; Miles-Doan, 1998). Thus, the evidence has concluded that living in a more deprived neighborhood increases women's risk of becoming victims of IPV (Cunradi, Caetano, Clark & Schafer, 2000; O'campo et al. 1995), a relationship that remains significant for both lethal (Browning, 2002; Wu, 2009) and non-lethal violence perpetrated against women (Wright & Benson, 2011). It should be noted that the literature has suggested that the concentration of the disadvantaged population, rather than poverty in itself, is essential to explain this association (Pinchevsky & Wright, 2012).

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Specifically, studies developed in low- and middle-income countries suggest that in contexts of poverty, where protection systems do not work properly, two factors seem to be key: gender norms and women's social capital (McCleary-Sills et al., 2016; Benavides, Bellatin, Sarmiento & Campana, 2015). Overall, therefore, studies have found that battered women living in these contexts face several obstacles in accessing protection systems successfully. Given this situation, the two factors mentioned above will determine the way in which the phenomenon of violence against women unfolds (McCleary-Sills et al., 2016; Benavides et al., 2015). Thus, while gender norms will shape the violent behavior of men as well as the level of societal tolerance towards these attitudes, the networks in which women are embedded will determine the sources of support they can draw from to address the problem. In turn, this access to support will determine the level of vulnerability in which women find themselves and the possibilities to cope with this violence.

Considering that the model of urban growth that characterized Latin American cities has resulted in a territorial order where residential segregation has become a typical feature (Sabatini, 2003; Abramo, 2012), research on the effects of segregation on IPV seems to be particularly necessary in the region. Although in Latin America some researchers have developed qualitative studies in this area (Benavides, Bellatin & Cavagnoud, 2017), to the best of our knowledge there is a lack of quantitative studies on the effects of segregation on IPV. Therefore, we aim to examine the effects of residential segregation on physical IPV and the mediating role that social capital and gender norms unfavorable to women play in that association. To that end, we used an original dataset based on interviews with women from five urban low-income districts of Lima, Peru. The hypothesis that guided the analysis was that the interactions of both variables (gender norms and social capital) will determine the effects of segregation on physical IPV.

2. Analytical framework

To understand the effects of the concentration of disadvantaged population on physical IPV it is necessary to first introduce the concept of residential segregation. As Massey and Denton (1988: 282) have stated, this term refers to “the degree to which two or more groups live separately from one another, in different parts of the urban environment”. Even though segregation can be based on different criteria, the effects of economic residential segregation (that is, residential segregation based on economic factors) can be particularly negative as it involves the geographic isolation of low-income populations in specific neighborhoods. Since spatial organization shapes the dynamics that occur within neighborhoods, a large body of evidence has examined the effects of segregation (Massey, 1996; Massey & Denton, 1988).

Segregation has a particular effect on how the phenomenon of violence unfolds. The study by Benavides et al. (2017) conducted in contexts of poverty and segregation in Lima, Peru, suggests that in the face of inefficient protection systems, existing gender norms, as well as social capital, will become particularly important. These factors seem to play a fundamental role in determining to what extent women are able to break the cycle of violence. Next, we will analyze each one of these factors.

2.1. Gender norms

Since social norms govern the acceptable behavior in a society (Cislaghi & Heise, 2018), a broad range of studies have examined its role. In the feminist literature, IPV has been traditionally studied as an expression of patriarchy or a male-dominated culture (Levinson, 1989; Taft, Bryant-Davis, Woodward, Tillman & Torres, 2009; Russo & Pirlott, 2006). Research suggests that when gender norms – defined here as the set of social expectations that prescribe acceptable behavior for men and women (Seguino 2007) – strengthen the dominant position of men

and the subordination of women (Connell & Messerschmidt, 2005) –, they become a fertile ground for the development of physical IPV (WHO – World Health Organization, 2010; Pulerwitz, Hughes, Mehta, Kidanu, Verani & Tewolde, 2015; Clark et al., 2018; Jakupcak, Lisak, & Roemer, 2002). Thus, gender norms unfavorable to women strengthen unequal power relations within male-women relationships which puts the woman in a vulnerable position. Whilst these gender norms legitimize men's dominant position, research has often used the control that males exercise over women and societal tolerance of IPV as proxy variables. In this regard, several studies have found that women who have reported highly controlling behaviors of their partners are more likely to experience physical violence (García-Moreno et al., 2005; Antai, 2011; Kiss, Schraiber, Heise, Zimmerman, Gouveia & Watts, 2012). Furthermore, research shows that physical IPV is also associated with women's accepting attitude towards such violence (Linos, Slopen, Subramanian, Berkman & Kawachi, 2013; García-Moreno et al., 2005; Koenig, Stephenson, Ahmed, Jejeebhoy & Campbell, 2006).

Researchers have argued that contexts of poverty and segregation foster the development of gender norms unfavorable to women. It is suggested that these norms are triggered in response to the structural disadvantages that exists in the aforementioned contexts (MacLeod, 2009; Bourdieu & Passeron, 1990). As different studies have found, the concentration of poverty in some areas increases the number of adversities people living in those areas face, hindering the people's chances of being economically successful (Wilson, 1987; Shihadeh & Flynn, 1996). Men who live in those contexts will then fail to achieve their socially expected roles of providers, which prompts them to resort to exercising their power within their homes to prove their manhood (WHO, 2010; Shihadeh & Flynn, 1996). Consequently, men ultimately base their manhood on their violent behavior. In this context there is a greater likelihood that cultural norms that tolerate and support violent behaviors as a form of addressing problems are disseminated (Leventhal, Dupéré & Brooks-Gunn, 2009; Barker, 2010). This situation will in turn facilitate the emergence of gender norms unfavorable to women. Relatedly, different studies have demonstrated that controlling behaviors and a higher tolerance to physical IPV were more likely to be reported among low income populations (Thompson et al., 2006; Gracia & Tomás, 2014; Waltermaurer, 2012).

Moreover, residential segregation might generate fertile ground for a system of values that promotes gender inequality. The literature has suggested that segregation allows for the emergence and reproduction of local norms that oppose the values supported by mainstream society (Wilson, 1987; Shakya, Hughes, Stafford, Christakis, Fowler & Silverman, 2016; Wacquant, 2008). The limited presence of state institutions (health services, schools, recreational programs, among others) in poor segregated areas hinders the dissemination of the country's values which support the elimination of gender inequalities (Benavides et al., 2015; Leventhal et al., 2009). Furthermore, the social isolation of those who live in segregated areas strengthen the transmission of the existing local norms.

2.2. Social capital

Several studies suggest that contexts of segregation foster a greater intensity of social ties among their neighbours. The social isolation, by restricting the relationships with other groups, leads to an intensification of the social contact within the segregated communities (Wacquant, 2008; Briggs, 2005). In this regard, although segregation could diminish the connection among individuals from different neighborhoods, it enhances the social contact among those who live in the same area (Bolt, Burgers, & Van Kempen, 1998), which allows the emergence of social capital and its social goods. According to Putnam (2000: 19), social capital refers to the “connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them.” This situation involves the development of a dense network of collective solidarity (Portes, 1998; Putnam, 1993, 2000).

Even though social capital can be built on different kinds of networks or associations, the study conducted by Li, Pickles and Savage (2005) states that disadvantaged populations build their social capital on informal neighborhood relations rather than on their participation in associations or in their involvement in civic activities.

Regarding the focus of this present study, research suggests that the social capital that arises within disadvantaged contexts may diminish the levels of physical IPV. As Li et al. (2005) have suggested, individuals in informal neighborhood relations experience a greater sense of belonging to their neighborhood and to their neighbors, from which they perceive more support. Due to the higher attachment among neighbors that arises in segregated neighborhoods, women may find more trust, certainty, and protection to address the violence that they experience (Lanier & Maume, 2009). As Basu (2008) has noted, in these social spaces women may overcome isolation as they build up social trust. In this regard, the evidence has shown that neighbors are a source of support for women to stand up against violence (Benavides et al., 2017). Lanier and Maume (2009) have even registered that women who receive more help from their social networks have a lower risk of suffering violence from their partners.

3. Method

3.1. Participants

The sample used in this study was obtained from a stratified random sampling conducted in five districts of Metropolitan Lima (Carabayllo, El Agustino, Chorrillos, San Juan de Lurigancho, and Villa el Salvador) with high rates of poverty. The survey collected information on domestic violence, socio-demographic data about the respondents (housing characteristics, ownership of assets, educational and occupational data, etc.) and information about the neighborhood.

The selected districts, which showed different patterns of segregation, allowed us to have a sample of neighborhoods representative of the various peripheral areas of Lima. The poor social conditions of these districts include different domains, such as education, access to basic services, income, urban violence, among others. Once the districts were selected, a random sample of approximately 550 households was taken within each district resulting in 2813 households where interviews would be conducted. The fieldwork took place in July, August, and September 2013. It should be noted that although five areas were determined a priori for this study, there was still much heterogeneity of neighborhoods within each area. We tried to address this problem after conducting ethnographic fieldwork in two neighborhoods by grouping families according to the block and/or neighborhood to which they belonged within each of the five areas. This post-categorization resulted in a total of 39 neighborhoods within all areas of the NOPOOR survey¹. To better capture the contexts, these neighborhoods were used within each of the areas.

Since the study focuses on IPV, only women who already had a partner and responded to the household violence questions were included in the analytical sample. In addition, households consisting only of men were eliminated. As a result, the sample for this study comprised only 2545 households.

¹ Two fieldworkers visited the areas selected in the five districts and verified the administrative limits for each of the neighborhoods. Thus, using information from each municipality, as well as data collected during their visits (interviews to key actors within each neighborhood), they were able to select 39 neighborhoods within our full sample.

3.2. Measures

3.2.1. Dependent variable

- Physical intimate partner violence (IPV): a dichotomous variable that took on a value of 1 if a woman was considered to have experienced physical IPV and 0 if not. A woman was considered to have experienced IPV if she replied affirmatively to least one of the following questions: Has your most recent spouse or partner: i) pushed you, shaken you, or thrown something at you?, ii) slapped you or twisted your arm?, iii) punched you or hit you with something that could hurt you?, iv) kicked you or dragged you on the ground?, v) tried to strangled you or burned you?, vi) attacked/assaulted you with a knife, gun, or other weapon? The mean was 43%, and the standard error was 1%.

3.2.2. Mediator variables or mechanisms at neighborhood level²

- Social capital: To assess this variable we used women's neighborhood relations and the network of perceived support which it triggers. Social capital was then measured as the neighborhood-level average of the number of ways that neighbors help/support the respondent. The woman was considered to have received support from her neighbors if she believed that residents in the neighborhood are close to each other, if her neighbors come together to address a problem, if she can count on them when facing a problem or seeking help, if she can borrow money from them, if she believes that her neighbors share similar values, and if her neighbors intervene when problems arose in public spaces.
- Gender norms unfavorable to women: Since these gender norms legitimize men's dominant position, we decided to use the control that men exercise over their female intimate partner as a proxy variable. Gender norms were then measured as the neighborhood-level average of the number of situations that the respondent experienced controlling behaviors from her husband/partner. The woman was considered to be controlled by her spouse/partner if he became jealous when she talked to other people, if he accused her of being unfaithful, if he prevented her from visiting her family members, if he tried to restrict her family visits, if he insisted on always knowing where she is, and if he was suspicious of what she does with money.

3.2.3. Independent variables

3.2.3.1. Individual variables.

- Age: continuous variable measured in years (mean: 41, standard error: 0.3).
- Education level (woman): qualitative dichotomous variable taking the value of 1 if a woman had complete secondary or higher, and 0 otherwise (mean: 41%, standard error: 1%).
- Mother tongue: qualitative dichotomous variable taking the value of 1 if the woman had first learned an indigenous language, and 0 otherwise (mean: 24%, standard error: 0.8%).
- Place of birth: qualitative variable taking the value of 1 if the woman was not born in the region of Lima, and 0 otherwise (mean: 69%, standard error: 1.7%).
- Currently working: qualitative variable taking the value of 1 if the woman said that she holds a steady job, ran an income-generating business, or performed any income-producing activity for at least one hour a day at the time of the interview, otherwise it was set to 0

² The reliability of the scale was 0.70 for both mechanisms according to Cronbach's Alpha. It is necessary to specify that the mechanisms are dependent variables within the system of equations proposed for the Structural Equation Model.

(mean: 47%, standard error: 1%).

3.2.3.2 Family variables.

- Living with her partner: qualitative variable taking the value of 1 if the woman lived with her spouse and 0 otherwise.
- Number of children: continuous variable that took into account the respondent's number of children.
- Residential mobility of the head of household: ordinal variable indicating the number of times that the head of household had lived in a district different from where he/she currently lived, for six months or more (mean: 1.8, standard error: 0.03).
- Poverty: qualitative variable taking the value of 1 if the household was in the lowest two socioeconomic quintiles and 0 otherwise. The socioeconomic quintiles were constructed using the composite score that reflects the socioeconomic status of the household. This composite score comprises information about quality of housing, respondents' durable assets, level of overcrowding, and available basic services. Then, a factor analysis was performed to combine these observed variables into one factor. Finally, we ran a similar analysis using the 2013 National Household Survey (ENAH0 – Encuesta Nacional de Hogares) and we used the estimated national weights for each variable in the NOPOOR survey, to keep the comparability of poverty with national estimates in household surveys.
- Woman experienced childhood violence: qualitative variable taking the value of 1 if the woman was hit as a child and 0 otherwise.
- Violence between her parents: qualitative variable taking the value of 1 if the woman asserted that her father hit her mother and 0 otherwise.

3.2.3.3 Neighborhood variables.

- Socioeconomic residential segregation: continuous variable that reflects the socioeconomic diversity across neighborhoods in our sample. It was measured using the percentage of poor people living in each neighborhood³.
- Years of schooling (neighborhood): continuous variable that indicates the average years of schooling in each neighborhood for individuals who were 24 years old or older.

3.3. Statistical model

The methods used to answer the research questions for this study are presented in this section. First, a logistic regression analysis was conducted to identify the effects of the individual, family, history of violence, and contextual variables on the likelihood that a woman has experienced physical violence. This type of analysis followed the type of statistical model that most studies on the subject have used. In addition, in order to take into account the covariation between women who lived in the same neighborhood, we adjusted the variance-covariance matrix using the cluster correction; then, the standard errors for the contextual variables are adequately estimated. Finally, the structural equation model (Kline, 2005) was utilized to answer the research question related to how economic residential segregation influences the likelihood that a woman has been subjected to physical violence (direct effect) as well as to identify the mechanism or mechanisms (gender norms or social capital) that may influence the likelihood of physical IPV (indirect effects). This modeling allowed us to present how economic segregation has direct and indirect effects on the likelihood that a woman has experienced physical violence. In addition, since this

statistical technique models a set of equation, controls for possible endogeneity problems in our model were estimated.

3.3.1. Logistic regression model

Two logistic regressions models were estimated for this study. Firstly, we estimated the extent to which individual, family, and history of violence variables influenced the likelihood that a woman has experienced physical violence. Secondly, the variable of residential economic segregation at the neighborhood level was included in the regression model to observe its effect on the likelihood that a woman has experienced physical violence⁴.

3.3.2. Structural equation model

One of the main advantages of this type of model is that different equations can be estimated simultaneously—that is, the system includes two or more equations. Thus, a variable can play different roles within the system of estimated equations. In other words, a variable can be explanatory in one equation but a dependent variable in another equation in the system. In the case of this study, the variables that play this double role are the mechanisms through which economic residential segregation influences physical IPV (gender norms and social capital). Another advantage of this type of model is the ability to correlate the errors of different equations within the proposed system. In this way, the possible correlation of unobservable factors between one equation and another can be controlled.

The structural equation model proposed in this study did not include latent variables. The model included a system of equations—that is, it incorporated more than one endogenous variable: social capital, gender norms in the neighborhood, and physical IPV⁵. Lastly, the structural equation model used takes into consideration the hierarchical structure of the data: individuals grouped into communities; in other words, a multilevel structural equation model was used for data analysis (Heck, 2001). This technique allowed us to have consistent and robust standard errors since it does not treat each observation as independent, and instead, considers the covariance between individuals who lives in a same neighborhood.

Fig. 1 presents in a visual form, the model to be estimated and the hypotheses of the relationships.

4. Results

4.1. Descriptive analysis

Table 1 presents the main individual characteristics of the sample. On average, women were 40 years old. Most respondents were not from Lima (but less than a third regarded themselves as indigenous) and had not completed school. Also, we were able to observe that women who had experienced physical IPV were older, less educated, and more likely to be indigenous, have a job, and have lived less time with their partner, in comparison with women who had not experienced physical IPV.

In terms of family characteristics, in Table 2 we can observe that women in our sample have two children on average; the head of household had moved at least twice; and a third of the women were poor. Additionally, we can see that women who had suffered physical IPV had more children and had moved more often.

In terms of the history of violence, Table 3 reflects that 65% of the respondents had experienced violence in childhood, 53% had witnessed violence between their parents, and 43% had been victims of physical IPV. Also, women who had experienced physical IPV had experienced more violence as children and had witnessed more violence between

³ The percentage of poor people living in the neighborhood was used as an indicator for socioeconomic segregation since it is simple and easy to understand for a broader audience, and it correlates 0.87 with the isolation index showing that they measure the same construct.

⁴ Further details on the proposed nonlinear model can be found in Appendix A.

⁵ Further details on the proposed structural equations model can be found in Appendix A.

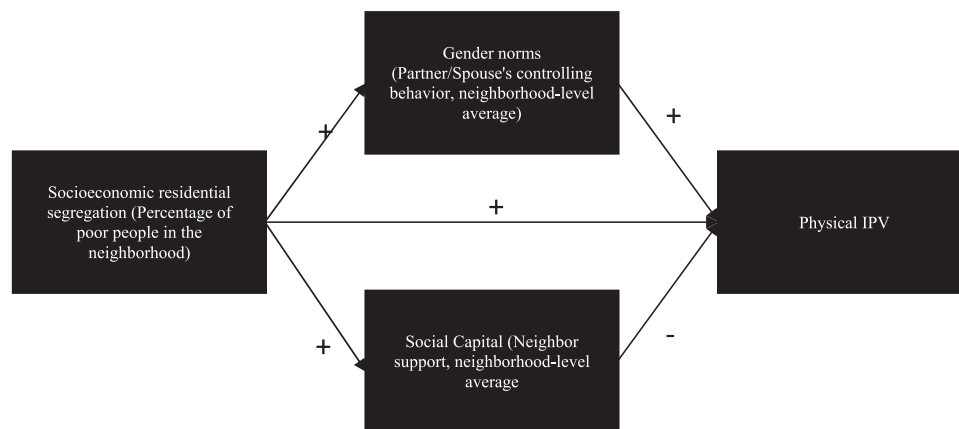


Fig. 1. Flow chart of the proposed system of equations.

Table 1

Individual characteristics of the sample.

Source: 2013 NOPOOR Survey. Prepared by the authors.

Individual characteristics	Full sample	Women that suffered physical IPV	Women that did not suffer physical IPV	Difference
Age	40.6	41.67	39.76	1.91 ***
Education (Completed secondary education or higher)	41.60%	35.50%	46.10%	-0.11 ***
Mother tongue (indigenous)	23.70%	26.60%	21.70%	0.05 **
Place of birth (outside Lima)	66.70%	67.60%	66.10%	0.02
Woman has a job	45.70%	49.30%	42.90%	0.06 **
Woman lives with her partner	76.40%	70.40%	81.20%	-0.11 ***

* $p < 0.05$, + $p < 0.10$

*** $p < 0.001$,

** $p < 0.01$,

Table 2

Family characteristics of the sample.

Source: 2013 NOPOOR Survey. Prepared by the authors.

	Full sample	Women that suffered physical IPV	Women that did not suffer physical IPV	Difference
Number of children	1.88	2.02	1.78	0.24 ***
Residential mobility of the head of household	1.89	2	1.81	0.19 ***
Low level of well-being	32.8%	33.8%	32.0%	0.02

** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

*** $p < 0.001$,

Table 3

History of violence.

Source: 2013 NOPOOR Survey. Prepared by the authors.

	Full sample	Women that suffered physical IPV	Women that did not suffer physical IPV	Difference
Woman experienced physical punishment in childhood	65.4%	70.8%	61.8%	0.09 ***
Woman's mother was hit during woman's childhood	53.1%	59.7%	48.4%	0.11 ***

** $p < 0.01$, * $p < 0.05$, + $p < 0.10$

*** $p < 0.001$,

their parents than women who had never suffered from physical IPV.

On the other hand, in terms of the mechanisms, in areas with more social capital there was less physical IPV, while in areas where gender norms were unfavorable to women (less autonomy), there was more physical IPV (Table 4).

Since our analytic design proposes a relationship between an environment of segregation, gender norms, and social capital, some descriptive graphs are provided below. Fig. 2 and Fig. 3 show that neighborhoods with more segregation also have more social capital and a higher prevalence of gender norms unfavorable to women.

4.2. Multivariate analysis

First, logistic regression models were estimated to identify the net effects of the individual, family, and contextual variables that are associated with physical IPV. Table 5 first presents results obtained using Model 1. It can be observed that the women who were more likely to be subjected to physical IPV were older, did not live with their partners, did not have basic education, moved more frequently, worked, and had more children. Also, women whose mothers had experienced violence from their spouse or partner, or who had experienced violence as

Table 4

Mechanisms.

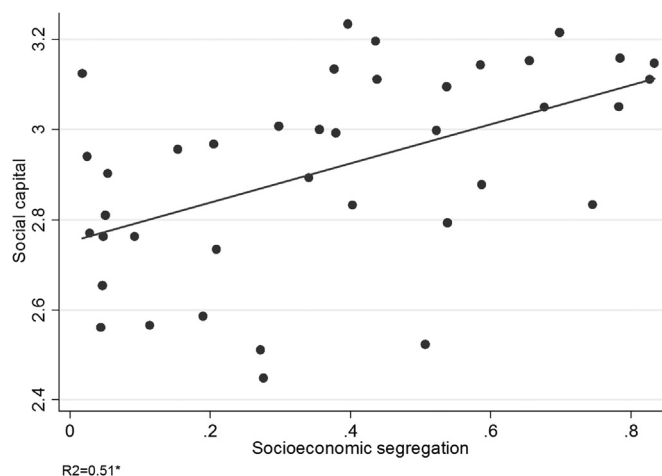
Source: 2013 NOPOOR Survey. Prepared by the authors.

	All samples	Women that suffered physical IPV	Women that did not suffer physical IPV	Difference
Social capital	2.89	2.86	2.91	-0.05 *
Gender norms	0.27	0.43	0.15	0.27 ***

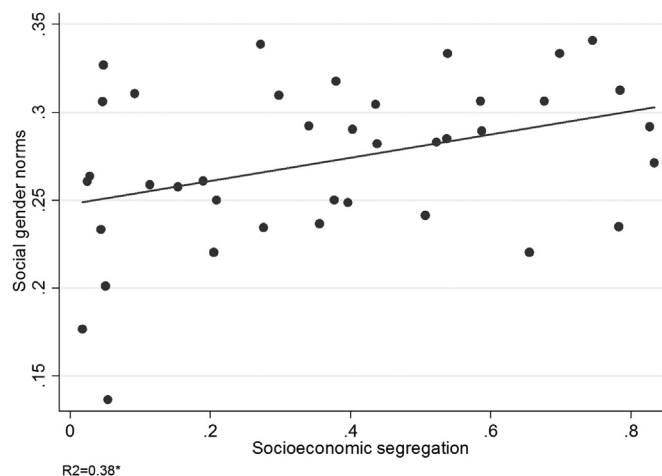
**p < 0.01, + p < 0.10

*** p < 0.001,

* p < 0.05

**Fig. 2.** Relationship between economic residential segregation and social capital (support from neighbors).

Source: 2013 Segregation Survey. Prepared by the authors. *Significant at 5%

**Fig. 3.** Relationship between economic residential segregation and gender norms (control by the spouse).

Source: 2013 Segregation Survey. Prepared by the authors. *Significant at 5%

children were the most likely to experience physical IPV.

Likewise, following Model 2, Table 5 shows that these individual effects remain when social context variables are added. In terms of the social context, neighborhoods with more economic residential segregation experienced less physical IPV (although with a significance level of .10), a surprising result that we will analyze in the next section⁶.

How is socioeconomic residential segregation related to these

Table 5

Effect of the individual, family, history of violence and economic segregation variables on IPV.

	Model 1		Model 2	
	β	EM	β	EM
<i>Individual variables</i>				
Age	0.01	+	0	0.00
Education (Completed secondary education or higher)	-0.24	-	-6	-0.24 *
Mother Tongue (Indigenous)	0.11		0.11	
Place of Birth (outside Lima)	-0.00		0.00	
Woman has a job	0.17	+	4	0.17 +
Woman lives with her partner	-0.56	***	-14	-0.57 ***
<i>Family variables</i>				
Number of children	0.16	***	4	0.15 ***
Residential mobility of the household head	0.07	*	2	0.08 *
Low level of well-being	0.00		0.12	
<i>History of violence</i>				
Woman experienced physical punishment in childhood	0.38	***	9	0.4 ***
Woman's mother was beaten during woman's childhood	0.43	***	10	0.42 ***
<i>Neighborhood variables</i>				
Average years of education at neighborhood level (24 or older)	-0.05		-0.10	
Socioeconomic segregation			-0.54 *	-13
Constant	-0.58		-0.01	
Observations	2389		2389	
Loglikelihood	-1555		-1552	

Cluster-adjusted by neighborhoods

** p < 0.01, + p < 0.1

*** p < 0.001,

* p < 0.05,

mechanisms and connected to physical IPV? To respond to this, we implemented the structural model. Fig. 4 shows the results of the mediation analysis conducted for each of the channels mentioned above. The model has good indicators of overall (RMSEA < 0.06) and comparative (CFI > 0.90) adjustment, indicating that the proposed system of equations is adequate.

With regards to the effects of economic residential segregation on the likelihood of a woman experiencing physical IPV, Fig. 4 shows that the direct effect (positive in the equation above in Table 5) is not significant. This means that the overall effect of economic residential segregation is determined by its indirect effects through the mechanisms that were considered. On the one hand, economic residential segregation is positively and significantly associated with gender norms ($SD = 0.34$), and these in turn are positively and significantly associated with the likelihood that a woman will experience physical IPV ($SD = 0.08$). On the other hand, economic residential segregation is positively and significantly associated with a greater presence of social capital among neighbors ($SD = 0.75$), and this in turn is negatively and significantly associated with the likelihood of physical IPV ($SD = -0.08$).

Finally, what is the overall effect of economic residential segregation, or the balance of the effect of economic residential segregation through both mechanisms? In the case of gender norms, the indirect effect of segregation is $SD = 0.03$ ($0.34 \times 0.08 = 0.03$), and in the case of social capital, the indirect effect is $SD = -0.06$ ($0.75 \times -0.08 = -0.06$). Thus, on average, in segregated contexts, having support and assistance among neighbors is the most relevant factor related to physical IPV. Although gender norms unfavorable to women operate directly on violence in contexts of segregation, their effect in such contexts can be moderated by the effect of social capital.

⁶ We ran the analysis using also Hierarchical Non-Linear Model and the results were similar, and they are available upon request to the first author.

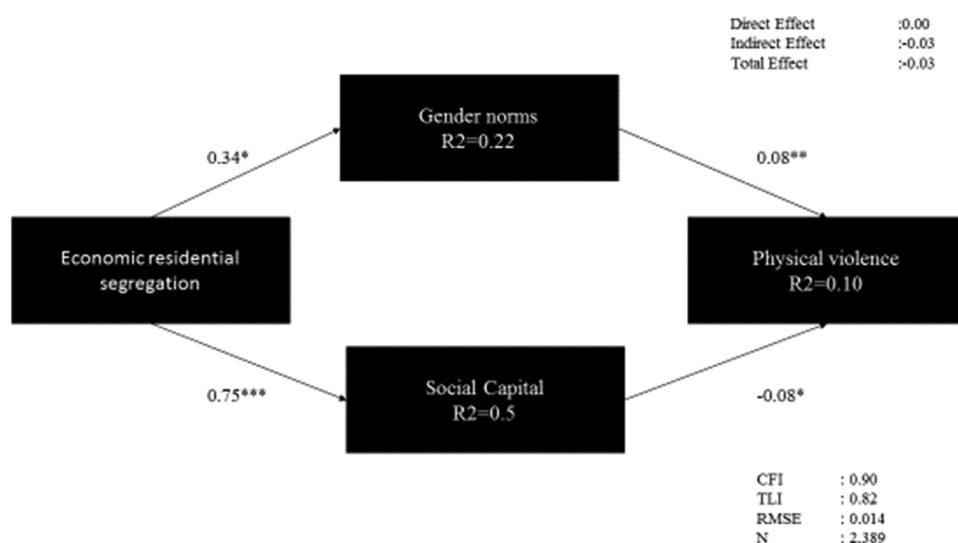


Fig. 4. Results of the structural equation model. Note: The model includes the following control variables: age, education, mother tongue, place of birth, having a job, living with her partner, number of children, residential mobility of the head of household, level of well-being, history of violence (if she suffered child punishment and if her mother was hit when the respondent was a child), average years of education in the neighborhood, and mechanisms (social capital and social gender norms). Finally, the mechanisms also include the average years of education in the neighborhood. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$.

5. Discussion

The study's findings showed that contexts of poverty and segregation does influence physical IPV, but only indirectly. We found that the two proposed variables mediate this effect. In this regard, it was found that these foster both the development of greater social ties among neighbors and the development of gender norms unfavorable to women. However, while a greater intensity of neighborhood relations diminishes the likelihood of physical IPV, gender norms that promote male control over women increases women's risk of becoming victims of this violence. The analysis of the overall effect of segregation shows that having support from the neighbors is a more relevant factor in reducing the likelihood of women experiencing physical IPV.

The results show that in urban contexts of poverty and segregation, social capital has a key impact on physical IPV. Consistent with previous evidence, which found that changing gender norms unfavorable to women would not be enough to change violent behaviors (Shakya, Fleming, Saggurtti, Donta, Silverman & Raj, 2017), the findings of this study suggest that gender norms only have limited effects. In this regard, the positive effects of the greater social ties that emerge within these contexts moderate the negative outcomes of segregation on physical IPV.

The results of this study are valid for contexts of poverty in low and middle-income countries. In these contexts, the inadequate functioning of the protection system would seem to facilitate the reproduction and perpetuation of this phenomenon. Thus, evidence developed in similar contexts suggests that battered women face different obstacles in accessing protection systems (McCleary-Sills, Namy, Nyoni, Rweyemamu, Salvatory & Steven, 2016, Benavides et al., 2015). One of the main obstacles women face in living in disadvantaged contexts is that they tend to mistrust the personnel of the social protection system (Benavides et al., 2015, Menéndez, Pérez & Lorence, 2013). The social ties with her neighbors would allow these women to have and rely on a support system that can help them to cope with their situations.

Social capital theorists have largely documented that social networks enhance the development of norms of reciprocity, social trust and solidarity (Putnam, 2000, Portes, 1998). Considering that, women's social ties with her neighbours would help those experiencing violence to face their situation. The support provided by their neighbors would even encourage abused women to report the violence they experience. Thus, social capital may provide women some forms of protection and confidence to address physical IPV. This would explain why our study has found that women who live in segregated areas tend to experience less violence from their partners.

Moreover, this study may help policy makers develop strategies to

increase the percentage of abused women who report physical IPV. Even though violence against women seems to be a widespread phenomenon, most of the victims do not report this violence to the authorities. In Peru, for instance, only a quarter of the victims sought help in an institution of the social protection system (Alvidrez, 1999; Benavides et al., 2015; Mujica, Zevallos & Vizcarra, 2013). The evidence suggests that most abused women prefer to seek assistance from the people who are close to them (Benavides et al., 2015). In this regard, in segregated communities it is necessary to develop strategies that include leveraging the strong social ties among the neighbours to provide an alternative support system to abused women. In this regard, although it is well known that the groups' gender norms do have an influence on men's perpetration of physical IPV (Mulawa, Kajula & Maman, 2018), strategies to deal with these norms should be accompanied with strategies to strengthen women capacities to cope with IPV.

As we mentioned above, this study seeks to be an evidence-based contribution to the literature on physical IPV for low and middle-income countries. Furthermore, although there are already studies on the effects of segregation on physical IPV, we expect our results to contribute to the analysis of the impacts of the different mediating variables. Further research is needed to replicate these results and to examine the effects of this variables in other settings. Moreover, most of the existing evidence has pointed out that the spatial concentration of this population and their minimal exposure to other groups will strengthen the prejudice and disadvantage of poverty (Massey, 1996; Massey & Denton, 1988). However, the study's findings show that the consequences of living in segregated contexts are not necessarily negative, at least as far as IPV is concerned. Further studies on physical IPV should do the same with other neighborhood-related issues, that is investigating the nuances of social processes, rather than putting forth descriptive and essentialist interpretations of complex social and economic relations.

Research ethics

The sample used was collected in 2013 by GRADE. The procedures followed all the ethical considerations in social science research. Informed consent was required from each participant. They were also informed that answering these questionnaire was strictly voluntary, and that the provided information was intended only for academic purposes. In sum, we have an ethical approval from each of the participants.

Declarations of interest

None.

Appendix A. Specification of the linear regression and structural equations models

The models to be estimated are:

Model 1: Effect of the individual and family variables on physical violence against women.

$$\ln [p/(1-p)] = \beta_0 + \beta_1 I_j + \beta_2 F_j + \beta_3 A_j + \beta_4 C_j.$$

p: likelihood that the event Y will occur (physical violence against the woman), p (Y=1 | I, F, A, C).

p/(1-p): ratio of likelihood (occurrence or non-occurrence of the event Y).

$\ln [p/(1-p)]$: logarithm of the ratio of likelihood of occurrence of the event Y.

I_j: individual variables (e.g., education).

F_j: family variables (e.g., number of children).

A_j: variables related to the history of violence of the woman (she was hit as a child or her father beat her mother).

C_j: neighborhood-level or contextual variables.

β_0 : the intercept.

$\beta_1, \beta_2, \beta_3, \beta_4$: the effect of the independent variables on the likelihood that Y will occur (logit score).

Model 2: Effect of economic segregation on physical violence against women.

$$\ln [p/(1-p)] = \beta_0 + \beta_1 I_j + \beta_2 F_j + \beta_3 A_j + \beta_4 C_j + \beta_5 SE_j.$$

p: likelihood that the event Y will occur (physical IPV), p(Y=1 | I, F, A, C, SE).

p/(1-p): ratio of likelihood (occurrence or non-occurrence of the event Y).

$\ln [p/(1-p)]$: logarithm of the ratio of likelihood of occurrence of the event Y.

SE_j: variable associated with economic segregation (percentage of poor people in the neighborhood).

I_j: individual variables (e.g., education).

F_j: family variables (e.g., number of children).

A_j: variables related to the history of violence of the woman (she was hit as a child or her father hit her mother).

C_j: neighborhood-level or contextual variables.

β_0 : the intercept.

$\beta_1, \beta_2, \beta_3$: the effect of the independent variables on the likelihood that.

β_4, β_5 Y will occur (logit score).

System of structural equations

The model to be estimated is determined by:

$$B_1 = \lambda_0 + \lambda_1 SE + \lambda_2 C + \varepsilon_1 (\text{Social norms}).$$

$$B_2 = \beta_0 + \beta_1 SE + \beta_2 C + \varepsilon_2 (\text{Community support}).$$

$$Y^* = \varphi(\alpha_0 + \alpha_1 B_1 + \alpha_2 B_2 + \alpha_3 I + \alpha_4 F + \alpha_5 A + \alpha_6 C + \alpha_7 SE + \varepsilon_3) \\ (\text{Physical violence against women}).$$

$$\text{cov}(\varepsilon_1, \varepsilon_2) \neq 0.$$

Y*: likelihood of a woman experiencing physical IPV.

B₁: social norms in the neighborhood.

B₂: community support.

λ_0 : intercept for the model of social norms.

β_0 : intercept for the model of community support.

α_0 : intercept for the model of physical IPV.

λ_m : coefficients associated with each independent variable in the model for B₁.

β_m : coefficients associated with each independent variable in the model for B₂.

α_m : coefficients associated with each independent variable in the model for Y*.

I_j: individual variables.

F_j: family variables.

A_j: variables related to the history of violence of the woman.

C_j: neighborhood-level or contextual variables.

SE_j: contextual variables.

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