Neighborhood characteristics and violence behind closed doors: The spatial overlap of child maltreatment and intimate partner violence

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Abstract

In this study, we analyze first whether there is a common spatial distribution of child maltreatment (CM) and intimate partner violence (IPV), and second, whether the risks of CM and IPV are influenced by the same neighborhood characteristics, and if these risks spatially overlap. To this end we used geocoded data of CM referrals (N = 588) and IPV incidents (N = 1450) in the city of Valencia (Spain). As neighborhood proxies, we used 552 census block groups. Neighborhood characteristics analyzed at the aggregated level (census block groups) were: Neighborhood concentrated disadvantage (neighborhood economic status, neighborhood education level, and policing activity), immigrant concentration, and residential instability. A Bayesian joint modeling approach was used to examine the spatial distribution of CM and IPV, and a Bayesian random-effects modeling approach was used to analyze the influence of neighborhood-level characteristics on small-area variations of CM and IPV risks. For CM, 98% of the total between-area variation in risk was captured by a shared spatial component, while for IPV the shared component was 77%. The risks of CM and IPV were higher in neighborhoods characterized by lower levels of economic status and education, and higher levels of policing activity, immigrant concentration, and residential instability. The correlation between the log relative risk of CM and IPV was .85. Most census block groups had either low or high risks in both outcomes (with only 10.5% of the areas with mismatched risks). These results show that certain neighborhood characteristics are associated with an increase in the risk of family violence, regardless of whether this violence is against children or against intimate partners. Identifying these high-risk areas can inform a more integrated community-level response to both types of family violence. Future research should consider a community-level approach to address both types of family violence, as opposed to individual-level intervention addressing each type of violence separately.

Introduction

Child maltreatment (CM) and intimate partner violence (IPV) are both major social, public
health, and human rights problems, highly prevalent globally, and with severe and far-reaching
consequences not only for victims but also for the wider society [1–13]. CM and IPV are two
forms of family violence (the umbrella concept under which these two types of violence
among intimates are often included) with common characteristics and risk factors [14–17].
Both forms of violence are considered risk factors for the other [18–22], and as the high rates
of co-occurrence of CM and IPV reported in the literature illustrates, they tend to overlap in
the same families [15,16,23–25]. Although existing research has examined the co-occurrence
of these two types of violence in the same families, no research has examined whether the risk
of CM and IPV also overlap in the same neighborhoods. This is a relevant research question,
because if the interconnection of CM and IPV also occurs at the community-level, neighbor-
hood-level interventions targeting high-risk areas would emerge as a cost-effective and inte-
grative public health approach to reduce both types of family violence within the same policy
agenda.

CM and IPV have both been considered as types of crime that tend to occur 'behind closed
doors' [26,27]. However, and despite the often-hidden nature of these offenses, a substantial
body of research supports the idea that, beyond individual and relational factors, 'place'
also matters for both CM and IPV. Research based on social disorganization and ecological
perspectives points to the importance of community characteristics (e.g., neighborhood con-
centrated disadvantage) in explaining rates of both CM and IPV [28–32]. As similar neighbor-
hood risk factors have been linked to these two types of family violence, it is likely that they
will both tend to occur more often in neighborhoods that are characterized by those risk fac-
tors. In this study we hypothesize that the risk of CM and IPV will overlap spatially in the same
neighborhoods.

Previous research has showed that CM and IPV, respectively, tend to spatially concentrate
in certain city areas [33–39]; however, no studies have yet examined both types of family
violence simultaneously, using appropriate spatial techniques to analyze whether the risks of
CM and IPV are influenced by the same neighborhood characteristics, and tend to spatially
overlap.

Material and methods

Outcome variables

The study was conducted in the city of Valencia (Spain). Valencia is the third largest city in
Spain with a population of 736,580 (2013 data). For this study, census block groups were used
as the neighborhood proxy, and were the unit of analysis. Valencia is divided into 552 census
block groups (with populations ranging from 630 to 2,845).

Two different outcomes were collected for this study. First, addresses for all IPV cases with
an associated protection order issued between 2011 and 2012 were provided by the Valencia
Police Department. Protection orders represent severe cases of IPV, as they are issued by
a court of law to provide special protection for the victim. In this study, we consider only
male-against-female IPV. The number of protection orders in this period was 1,450. Second,
addresses for all child maltreatment referrals investigated by the city's Child Protection Ser-
vices during the same years (2011 to 2012) were provided by this agency. To avoid data depen-
dency, child maltreatment referrals were per family unit (i.e., each family investigated is
included only once), as a family can have more than one child with protection measures. This
did not apply to IPV protection orders, as only one protection order was associated with each

case. The total number of family units with child maltreatment referrals was 588. Data for IPV cases and CM referrals were geocoded using the address where the incidents occurred.

This research was conducted under two Joint Research Agreements signed between the University of Valencia and the Valencia Police Department, and the Social Welfare Department of the Valencia City Hall, respectively. Both agencies, the Valencia Police Department, and the Valencia Social Welfare Department through its Child Protection Services, participated actively in this research project by facilitating the data required. Permissions to access police records regarding address of IPV incidents were granted by the Head of the Valencia Police Department. This research was approved and funded by the Spanish Institute for Women (Instituto de la Mujer, Ministerio de Sanidad, Servicios Sociales e Igualdad) and the European Social Fund as part of project MUJER2012-PI-154, and by the Spanish Ministry of Economy and Competitiveness as part of project PSI2014-54561-P. For this observational study, both the Ethics and Data Protection Committees of the University of Valencia were consulted to address potential confidentiality issues. All data used for this study was completely anonymized, and did not include any identifying information about individuals or families. Also for further anonymization, for analyses, all geographical coordinates corresponding to cases of IPV and CM were aggregated at the census block group level, so no individual addresses can be identified.

Covariates

Different neighborhood-level characteristics were used as covariates based on a classic social disorganization theory approach [28,29,30,32,37]. We used three indicators to assess concentrated neighborhood disadvantage (neighborhood economic status, neighborhood education level, and policing activity, as a proxy of neighborhood public disorder and crime) one indicator of ethnic heterogeneity (immigrant concentration), and an indicator of residential instability.

Economic status: A factor analysis derived scale was used to measure neighborhood-level economic status; the scale contained 4 indicators: cadastral property value, percentage of high-end cars, percentage of financial business, and percentage of commercial business.

Education level: The value of this covariate was calculated as the average level of education in each census block group based on the percentage of the population in each education level category measured on a 4-point scale where 1 = less than primary education, 2 = primary education, 3 = secondary education, 4 = college education.

Policing activity: An index for each census block group was provided by senior police officers composed of 5 items measured on a 5-point Likert scale (0 = very low level of interventions, and 4 = very high level of interventions), which included police interventions such as drug-related crime, drunkenness and fights, vandalism, homeless people and truancy.

Immigrant concentration: Percentage of immigrant population in each census block group.

Residential instability: Proportion of the population who had moved into or out of each census block group during the previous year (rate per 1,000 inhabitants).

Table 1 summarizes the descriptive statistics for all variables.

Statistical analysis

Two different analytic approaches were used. First, a Bayesian joint modeling analysis was conducted to examine the spatial distribution of IPV and CM cases [40]. We assumed that the outcomes followed a conditional independent Poisson distribution, and a shared component

Table 1. Variables (mean, standard deviation, minimum and maximum values) at the census block group level.

Variable	Mean (SD)	Min	Max
Economic Status			
Property value (€/m^2)	260.10 (74.61)	111.50	590.70
High-end cars (%)	5.75 (3.62)	1.30	24.80
Financial activities (%)	18.15 (7.77)	0	43.20
Commercial activities (%)	34.03 (9.21)	7.50	66.40
Education level	3.15 (.33)	2.39	3.86
Policing activity	7.16 (3.99)	0	19
Immigrant concentration (%)	13.45 (6.53)	1.90	40.20
Residential instability	288.00 (87.98)	91.10	649.80

Abbreviations: SD, standard deviation; Min, minimum; Max, maximum €/ m^2, euros per square meter.

was introduced in the model:

$$Y_{ik} \sim Po(\mu_{ik})$$

$$\log \mu_{i1} = \log E_{i1} + \alpha_1 + \phi_i * \delta + \psi_{i1}$$

$$\log \mu_{i2} = \log E_{i2} + \alpha_2 + \phi_i/\delta + \psi_{i2}$$

where Y_{ik} are the observed counts for the outcome k (1 for IPV, and 2 for CM cases) in census block group i, μ_{ik} is the unknown mean, E_{ik} are the expected counts for the outcome k in i-census block group (in proportion to the number of female population over 16 years old for IPV, and in proportion to the number of family units for CM); α_k is the intercept, δ represents the scaling factor which allows the risk gradient for the shared component to be different for each outcome; ϕ is the shared component, and ψ_{i1} and ψ_{i2} are the two specific components. ϕ and ψ were composed of unstructured and structured spatial components [41]. We used the logarithmic transformation of the shared component proposed by Knorr-Held and Best [40]. The unstructured term was modeled by means of independent identically distributed Gaussian random variables, and the spatially structured term was modeled as a conditional spatial autoregressive (CAR) model [41]. Additionally, an improper uniform distribution was used for α_1 and α_2. We obtained the proportion of shared variance for each outcome (η_k).

Second, after examining the common spatial distribution of IPV and CM, a Bayesian Poisson spatial regression modeling was conducted for each outcome. The five variables (economic status, education level, policing activity, immigrant concentration, and residential instability) were introduced in the models, and two spatial effects were assessed (structured and unstructured terms). The models were defined as follows:

$$\log \mu_{ik} = \log E_{ik} + \alpha + X_i\beta + S_{ik} + U_{ik}$$

where $\propto$ is the intercept, β represents the regression coefficients vector, X is the matrix of covariates, and S and U are the structured and unstructured terms, respectively. Thus, the log relative risk was modeled as $\alpha + X_i\beta + S_{ik} + U_{ik}$.

Vague Gaussian distributions were used for the fixed effects β, while α was considered as an improper uniform distribution. U was modeled by means of independent identically distributed Gaussian random variables, and S was modeled as a CAR model [41].

Markov Chain Monte Carlo (MCMC) simulation techniques were applied to perform the Bayesian models [42], using software R and the WinBUGS package. 100,000 iterations were

Table 2. Results from Bayesian joint modeling of the shared spatial component between intimate partner violence and child maltreatment risks.

	Mean	SD	CrI 95%
α_1	-.096	.040	-.174, -.018
α_2	-1.828	.082	-1.973, -1.670
δ	.703	.052	.606, .813
η_1	.768	.162	.459, .995
η_2	.978	.046	.832, .999

Abbreviations: SD, standard deviation, CrI, credible interval.

[1] Intimate partner violence.

[2] Child maltreatment.

generated in each of the models assessed, and the first 10,000 were discarded as a burn-in period. The $\hat{R}$ parameter (the convergence diagnosis) showed a suitable convergence for all parameters.

Results

Joint modeling results were firstly assessed (Table 2). For IPV cases, about 77% of the total between-area variation in risk was captured by the shared component. For CM referrals, about 98% of the total between-area variation in risk was captured by the shared component. Both outcomes, therefore, showed a common spatial pattern. Fig 1 illustrates this shared spatial component.

Secondly, a Bayesian Poisson spatial regression was conducted for each outcome. In both models, the covariates presented the same relationship with the outcome (see Table 3). Specifically, results indicate that IPV and CM risks were higher in disadvantage neighborhoods, with lower levels of economic status and education, and higher levels of policing activity, immigrant concentration, and residential instability.

The relative risks of each model were correlated using Pearson's correlation coefficient and a scatter plot. Fig 2 shows a high correlation between the log relative risks for IPV and CM (r = .85, CrI = [.81, .88]). In addition, Fig 3 displays the census block groups where the log relative risks for each outcome overlap (above-average and below-average risk levels). Most of the census block groups have low or high risks in both outcomes: only 10.5% of the areas have mismatched risks.

Discussion

In this study, we analyzed first whether there was a common spatial distribution of IPV and CM in the city of Valencia and, second, whether the risks of IPV and CM were influenced by the same neighborhood characteristics, and if these risks spatially overlap. As hypothesized, results showed a common spatial distribution of CM and IPV, as a large percentage of the variation in both types of family violence across city areas was explained by a common spatial component (98% of the between-area variation for CM, and 77% for IPV). Results also showed that the same neighborhood characteristics (i.e., neighborhood economic status, neighborhood education status, policing activity, immigrant concentration, and residential instability) explained the risk of CM and IPV, and that these risks were higher in city areas with low economic and education status and with high levels of policing activity, immigrant concentration, and residential instability. Finally, our study clearly illustrated the spatial overlap of CM and IPV risks, as the correlation of the relative risks for the two types of family violence was .85,
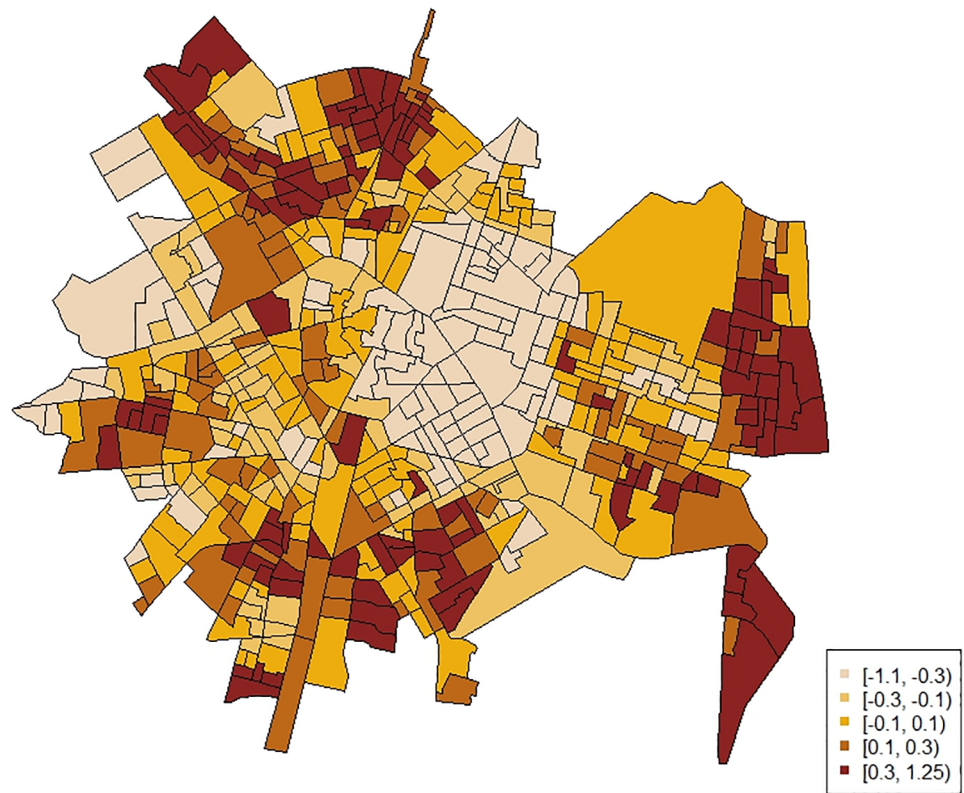
Fig 1. Shared spatial component from the joint modeling between child maltreatment and intimate partner violence risks.

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with only 10.5% of the city areas having mismatched risks (most areas of the city had coincident lower or higher risks than the city average in both outcomes).

The co-occurrence of CM and IPV in the same families is a well-established finding in the literature [15,16, 23–25]. What the present study highlights is that the overlap of these two types of family violence occurs not only at the individual (e.g., having been victim of CM and perpetrator of IPV later in life) or family levels (families in which both CM and IPV occur), but that the overlap between CM and IPV also occurs at the neighborhood level. In this regard, our results extend the common ground connecting these two types of family violence to the social context in which the families live, acknowledging the importance of neighborhood

Table 3. Results from Bayesian Poisson spatial regression models of intimate partner violence and child maltreatment risks.

	Intimate partner violence			Child maltreatment		
	Mean	**SD**	**95% CrI**	**Mean**	**SD**	**95% CrI**
Intercept	.182	.617	-.982, 1.403	2.498	1.127	.222, 4.586
Economic status	-.131	.070	-.263, .004	-.145	.135	-.414, .117
Education level	-.287	.184	-.644, .060	-1.121	.341	-1.760, -.418
Policing activity	.016	.009	-.001, .033	.032	.015	.004, .060
Immigrant concentration	.030	.008	.013, .146	.018	.014	-.009, .044
Residential instability	.001	.009	-.001, .002	.001	.001	-.001, .003

Abbreviations: SD, standard deviation, CrI, credible interval.

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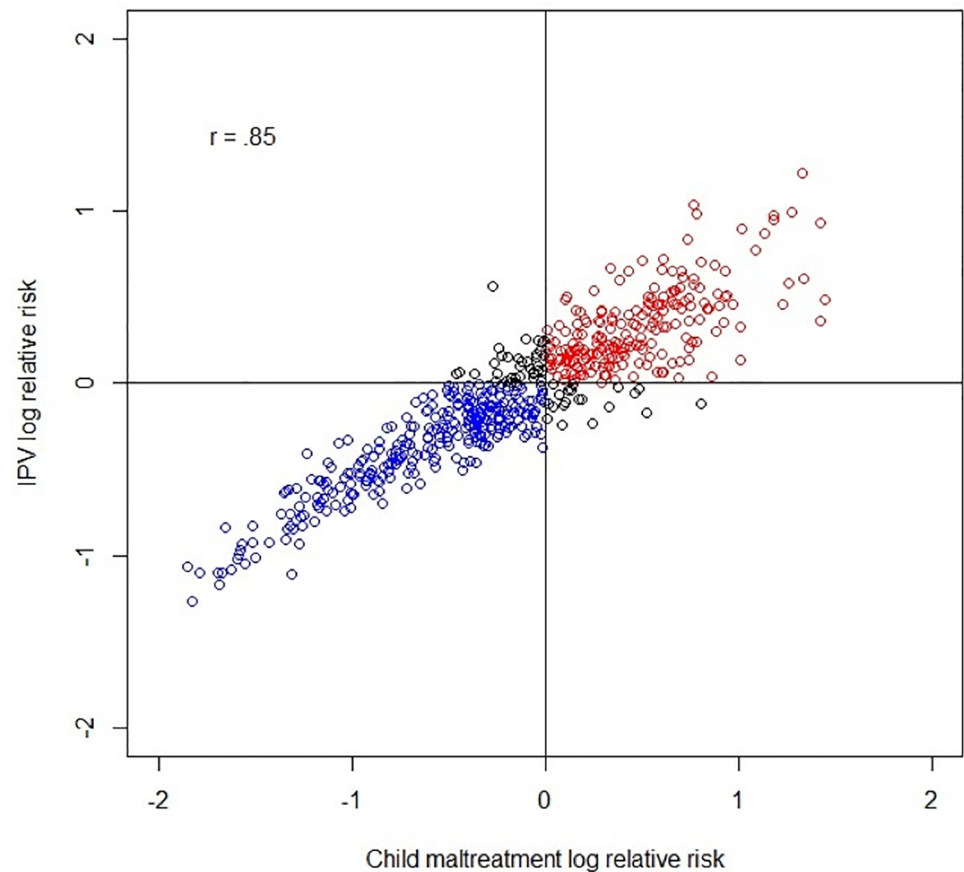
Fig 2. Scatter plot of the correlation between child maltreatment and intimate partner violence log relative risks.

characteristics as common risk factors for both CM and IPV. This study not only supports previous research showing that 'place' matters for CM and IPV [28–32], independently, but provides evidence that the risks for both types of violence are simultaneously high or low in the same places. Our study illustrated that certain neighborhood characteristics indicative of social disorganization (i.e., low economic and education status, high levels of policing activity indicative of public disorder and high criminality, immigrant concentration, and residential instability) increases the risk of family violence, regardless of whether this violence is against children or against intimate partners.

Various psychosocial processes can be called upon to explain why neighborhoods where these characteristics concentrate are associated with family violence, increasing the risk of both CM and IPV [27–32]. First, from a social disorganization perspective, neighborhood concentrated disadvantage has been linked with reduced social control, and this diminished social control would be responsible for the relationship between these neighborhood characteristics and family violence. In disadvantaged neighborhoods, mistrust and a lack of social cohesion among residents may inhibit prosocial behavior and social control, reducing willingness to become involved in other residents' lives (e.g., challenging other residents' behavior toward their children or partners, or reporting known cases of CM or IPV), thus explaining the link between neighborhood disadvantage and family violence [43–50]. Second, isolation from mainstream values of what is acceptable in intimate relationships may also explain the higher risk of family violence in disadvantaged neighborhoods. Some behaviors involving the use of
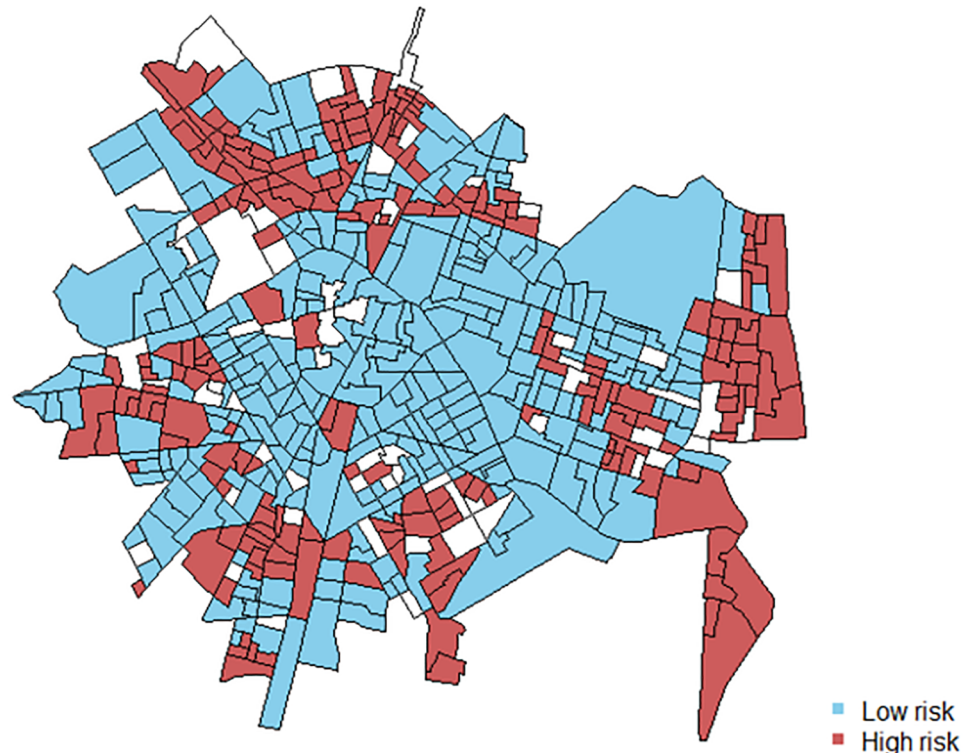
Fig 3. Map of the census block group with coincident low (blue) and high (red) relative risks for child maltreatment and intimate partner violence.

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violence in intimate partner and parent-child relationships may be more tolerated and accepted in these neighborhoods, compared to mainstream norms or values regarding family violence (e.g., not disapproving of violent behaviors toward intimates in certain circumstances, or approving violence as an accepted way of settling family conflicts). These social norms have been defined as "cognitive landscapes or ecologically structured norms (normative ecologies) regarding appropriate standards and expectations of conduct" ([51] p. 63) that would provide the bases for a social climate of greater tolerance of family violence, whereby violence among intimates is not recognized or condemned as deviant but considered as a tolerated and accepted strategy that in these contexts, increases the risk of CM and IPV. From this perspective, disadvantaged neighborhoods can become fertile grounds for socialization that fosters attitudes accepting violence in intimate relationships, and internalizing these attitudes as acceptable violence becomes an appropriate strategy to resolve relationship conflicts, and either CM or IPV are not considered as important social problems deserving the mobilization of informal social control [44,52–58]. Finally, another possible explanation of the link between concentrated neighborhood disadvantage and risk of family violence is that these residential/social contexts can be highly stressful, reducing the quality of family life, and triggering violence in both parent-child and intimate partner relationships [27,30,32,59–62]. However, these variables were not available for this study, and we cannot test hypotheses on these alternative or complementary explanations.

This study also has several implications for advancing our understanding of and responses to family violence. Calls have been made for a greater integration of research addressing CM and IPV [15–17,63–68]. The interconnection between CM and IPV at the community level

illustrated in this study not only advances our understanding of the causes of family violence by identifying common risk/protective factors at the community level, but also supports the need for a more integrative and broader approach in the prevention of family violence. Neighborhood conditions linked to both CM and IPV are modifiable risk factors, and identifying high-risk areas for both of them can potentially have an important preventive effect by targeting these two types of family violence within a same preventative/policy agenda. The high-resolution approach used in this study provides information that is more significant for policy relevance, as area-specific risk estimations are provided to inform a more localized intervention strategy. Furthermore, this community-level approach to address both types of family violence, as opposed to individual-level intervention addressing each type of violence separately, can reach a larger number of families in a more integrative and cost-effective way [28,31,65–71].

Finally, this study has both strengths and limitations. Examining for the first time the spatial overlap of CM and IPV within the same research framework, using appropriate analytical techniques and high-resolution disease mapping methods, thus providing greater policy relevance, are clearly among the study's strengths. As for its limitations, this study uses only official cases of CM and IPV, and we cannot generalize our results regarding the overlap of CM and IPV to underreported cases, which is a common issue in both types of family violence [12,13]. Regarding the covariates used in this study, other socioeconomic measures such as rates of unemployment or income, other neighborhood variables linked in other studies to both types of family violence, such as alcohol outlets, and neighborhood processes such as those mentioned above were not available for this study [33,34,72–76]. Finally, the results correspond to a European city, and future research should examine the overlap of CM and IPV in other cities that may differ in structure and organization, as well as in other cultural contexts.

Supporting information

S1 Data.
(CSV)

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References

1. Campbell JC. Health consequences of intimate partner violence. Lancet. 2002; 359: 1331–6. https://doi.org/10.1016/S0140-6736(02)08336-8 PMID: 11965295

2. Devries KM, Mak JYT, Garcia-Moreno C, Petzold M, Child JC, Falder G, et al. The global prevalence of intimate partner violence against women. Science. 2013; 340(6140):1527–8. https://doi.org/10.1126/science.1240937 PMID: 23788730

3. Ellsberg M, Jansen HA, Heise L, Watts CH, Garcia-Moreno C. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. Lancet. 2008; 371:1165–72. https://doi.org/10.1016/S0140-6736(08)60522-X PMID: 18395577

4. European Union Agency for Fundamental Rights. Violence against women: an EU-wide survey. Luxembourg: Publications Office of the European Union; 2014.

5. Fang X, Brown DS, Florence CS, Mercy JA. The economic burden of child maltreatment in the United States and implications for prevention. Child Abuse Negl. 2012; 36:156–65. https://doi.org/10.1016/j.chiabu.2011.10.006 PMID: 22300910

6. Finkelhor D, Turner HA, Shattuck A, Hamby SL. Prevalence of childhood exposure to violence, crime, and abuse: results from the National Survey of Children's Exposure to Violence. JAMA Pediatr. 2015; 169:746–54. https://doi.org/10.1001/jamapediatrics.2015.0676 PMID: 26121291

7. Finkelhor D, Turner HA, Shattuck A, Hamby SL. Violence, crime, and abuse exposure in a national sample of children and youth: an update. JAMA Pediatr. 2013; 167:614–21. https://doi.org/10.1001/jamapediatrics.2013.42 PMID: 23700186

8. Gilbert R, Kemp A, Thoburn J, Sidebotham P, Radford L, Glaser D, et al. Recognising and responding to child maltreatment. Lancet. 2009; 373:167–80. https://doi.org/10.1016/S0140-6736(08)61707-9 PMID: 19056119

9. Reading R, Bissell S, Goldhagen J, Harwin J, Masson J, Moynihan S, et al. Promotion of children's rights and prevention of child maltreatment. Lancet. 2009; 373:332–43. https://doi.org/10.1016/S0140-6736(08)61709-2 PMID: 19056117

10. Stöckl H, Devries K, Rotstein A, Abrahams N, Campbell J, Watts C, et al. The global prevalence of intimate partner homicide: a systematic review. Lancet. 2013; 382(9895):859–65. https://doi.org/10.1016/S0140-6736(13)61030-2 PMID: 23791474

11. Stoltenborgh M, Bakermans-Kranenburg MJ, Alink LR, IJzendoorn MH. The prevalence of child maltreatment across the globe: review of a series of meta-analyses. Child Abuse Rev. 2015; 24:37–50.

12. World Health Organization. European report on preventing child maltreatment. Copenhagen, Denmark: Regional Office for Europe, World Health Organization; 2013.

13. World Health Organization. Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence. Geneva: World Health Organization; 2013.

14. Daro D, Edleson JL, Pinderhughes H. Finding common ground in the study of child maltreatment, youth violence, and adult domestic violence. J Interpers Violence. 2004; 19:282–98. https://doi.org/10.1177/0886260503261151 PMID: 15005993

15. Capaldi DM, Kim HK, Pears KC. The association between partner violence and child maltreatment: a common conceptual framework. In: Whitaker DJ, Lutzker JR, editors. Preventing partner violence: Research and evidence-based strategies. Washington, DC: American Psychological Association; 2009. pp. 93–111.

16. Guedes A., Bott S., Garcia-Moreno C, Colombini M. Bridging the gaps: a global review of intersections of violence against women and violence against children. Global Health Action. 2016; 9(1):31516.

17. Gracia E, Rodriguez CM, Martín-Fernández M, Lila M. Acceptability of family violence: underlying ties between intimate partner violence and child abuse. J Interpers Violence. 2017. https://doi.org/10.1177/0886260517707310.

18. Rumm PD, Cummings P, Krauss MR, Bell MA, Rivara FP. Identified spouse abuse as a risk factor for child abuse. Child Abuse Negl. 2000; 24:1375–81. PMID: 11128171

19. Schumacher JA, Feldbau-Kohn S, Slep AMS, Heyman RE. Risk factors for male-to-female partner physical abuse. Aggress Violent Behav. 2001; 6:281–352.

20. Graham-Bermann SA, Edleson JL. Domestic violence in the lives of children: The Future of research, intervention, and social policy. Washington, DC: American Psychological Association; 2001.

21. Margolin G, Gordis EB, Medina AM, Oliver PH. The co-occurrence of husband-to-wife aggression, family-of-origin aggression, and child abuse potential in a community sample. J Interpers Violence. 2003; 18:413–40.

22. Capaldi DM, Knoble NB, Shortt JW, Kim HK. A systematic review of risk factors for intimate partner violence. Partner Abuse. 2012; 3:231–80. https://doi.org/10.1891/1946-6560.3.2.231 PMID: 22754606

23. Appel AE, Holden GW. The co-occurrence of spouse and physical child abuse: A review and appraisal. J Fam Psychol. 1998; 12:578–99.

24. Edleson JL. The overlap between child maltreatment and woman battering. Violence Against Women. 1999; 5:134–54.

25. Tolan P, Gorman-Smith D, Henry D. Family violence. Annu Rev Psychol. 2006; 57:557–83. https://doi.org/10.1146/annurev.psych.57.102904.190110 PMID: 16318607

26. Strauss MA, Gelles RJ, Steinmetz SK. Behind closed doors: violence in the American family. Garden City, NY: Doubleday Press; 1980.

27. Wright EM, Benson ML. Clarifying the effects of neighborhood context on violence "behind closed doors". Justice Q. 2011; 28:775–98.

28. Freisthler B, Merritt DH, LaScala EA. Understanding the ecology of child maltreatment: a review of the literature and directions for future research. Child Maltreat. 2006; 11:263–80. https://doi.org/10.1177/1077559506289524 PMID: 16816324

29. Coulton CJ, Crampton DS, Irwin M, Spilsbury JC, Korbin JE. How neighborhoods influence child maltreatment: a review of the literature and alternative pathways. Child Abuse Negl. 2007; 31:1117–42. https://doi.org/10.1016/j.chiabu.2007.03.023 PMID: 18023868

30. Pinchevsky GM, Wright EM. The impact of neighborhoods on intimate partner violence and victimization. Trauma Violence Abuse. 2012; 13(2):112–32. https://doi.org/10.1177/1524838012445641 PMID: 22589222

31. Petersen AC, Joseph J, Feit M. New directions in child abuse and neglect research. Washington, DC: National Academics Press; 2014.

32. Beyer K, Wallis AB, Hamberger LK. Neighborhood environment and intimate partner violence: a systematic review. Trauma Violence Abuse. 2015; 16(1):16–47. https://doi.org/10.1177/1524838013515758 PMID: 24370630

33. Freisthler B, Gruenewald PJ, Remer LG, Lery B, Needell B. Exploring the spatial dynamics of alcohol outlets and child protective services referrals, substantiations, and foster care entries. Child Maltreat. 2007; 12:114–24. https://doi.org/10.1177/1077559507300107 PMID: 17446565

34. Cunradi CB, Mair C, Ponicki W, Remer L. Alcohol outlets, neighborhood characteristics, and intimate partner violence: ecological analysis of a California city. J Urban Health. 2011; 88:191–200. https://doi.org/10.1007/s11524-011-9549-6 PMID: 21347557

35. Gracia E, López-Quílez A, Marco M, Lladosa S, Lila M. Exploring neighborhood influences on small-area variation in intimate partner violence risk: a Bayesian random-effect modeling approach. Int J Environ Res Public Health. 2014; 11:866–82. https://doi.org/10.3390/ijerph110100866 PMID: 24413701

36. Morton CM, Simmel C, Peterson NA. Neighborhood alcohol outlet density and rates of child abuse and neglect: moderating effects of access to substance abuse services. Child Abuse Negl. 2014; 38:952–61. https://doi.org/10.1016/j.chiabu.2014.01.002 PMID: 24529493

37. Gracia E, López-Quílez A, Marco M, Lladosa S, Lila M. The spatial epidemiology of intimate partner violence: do neighborhoods matter? Am J Epidemiol. 2015; 182:58–66. https://doi.org/10.1093/aje/kwv016 PMID: 25980418

38. Daley D, Bachmann M, Bachmann BA, Pedigo C, Bui M, Coffman J. Risk terrain modeling predicts child maltreatment. Child Abuse Negl. 2016; 62:29–38. https://doi.org/10.1016/j.chiabu.2016.09.014 PMID: 27780111

39. Gracia E, López-Quílez A, Marco M, Lila M. Mapping child maltreatment risk: A 12-year spatio-temporal analysis of neighborhood influences. Int J Health Geogr. 2017; 16:38. https://doi.org/10.1186/s12942-017-0111-y PMID: 29047364

40. Knorr-Held L, Best NG. A shared component model for joint and selective clustering of two diseases. J R Stat Soc Ser A Stat Soc. 2001; 164:73–85.

41. Besag J, York J, Mollié A. Bayesian image restoration, with two applications in spatial statistics. Ann Inst Stat Math. 1991; 43:1–20.

42. Gelman A, Carlin J, Stern H, Dunson DB, Vehtari A, Rubin DB. Bayesian data analysis. Boca Raton, FL, USA: CRC Press; 2013.

43. Gracia E, Herrero J. Perceived neighborhood social disorder and residents' attitudes toward reporting child physical abuse. Child Abuse Negl. 2006; 30:357–65. https://doi.org/10.1016/j.chiabu.2005.11.001 PMID: 16600375

44. Browning CR. The span of collective efficacy: extending social disorganization theory to partner violence. J Marriage Fam. 2002; 64(4):833–50.

45. Gracia E, Herrero J. Perceived neighborhood social disorder and attitudes towards reporting domestic violence against women. J Interpers Violence. 2007; 22(6):737–52. https://doi.org/10.1177/0886260507300755 PMID: 17515433

46. Freisthler B, Maguire-Jack K. Understanding the interplay between neighborhood structural factors, social processes, and alcohol outlets on child physical abuse. Child Maltreat. 2015; 20:268–77. https://doi.org/10.1177/1077559515598000 PMID: 26251328

47. Kim B, Maguire-Jack K. Community interaction and child maltreatment. Child Abuse Negl. 2015; 41:146–57. https://doi.org/10.1016/j.chiabu.2013.07.020 PMID: 23981436

48. Molnar BE, Goerge RM, Gilsanz P, Gilsanz P, Hill A, Subramanian SV, et al. Neighborhood-level social processes and substantiated cases of child maltreatment. Child Abuse Negl. 2016; 51:41–53. https://doi.org/10.1016/j.chiabu.2015.11.007 PMID: 26684963

49. Maguire-Jack K, Showalter K. The protective effect of neighborhood social cohesion in child abuse and neglect. Child Abuse Negl. 2016; 52:29–37. https://doi.org/10.1016/j.chiabu.2015.12.011 PMID: 26774530

50. Fujiwara T, Yamaoka Y, Kawachi I. Neighborhood social capital and infant physical abuse: a population-based study in Japan. Int J Ment Health Syst. 2016; 10:13. https://doi.org/10.1186/s13033-016-0047-9 PMID: 26925161

51. Sampson RJ, Lauritsen JL. Violent victimization and offending: Individual-, situational-, and community-level risk factors. In: Reiss AJ Jr, Roth J, editors. Understanding and preventing violence: Social Influences. Washington, DC: National Academy Press; 1994: pp. 1–114.

52. Taylor CA, Sorenson SB. Community-based norms about intimate partner violence: putting attributions of fault and responsibility into context. Sex Roles. 2005; 53:573–89.

53. Raghavan C, Mennerich A, Sexton E, James SE. Community violence and its direct, indirect, and mediating effects on intimate partner violence. Violence Against Women. 2006; 12:1132–49. https://doi.org/10.1177/1077801206294115 PMID: 17090690

54. Gracia E, Herrero J. Beliefs in the necessity of corporal punishment of children and public perceptions of child physical abuse as a social problem. Child Abuse Negl. 2008; 32; 11:1058–62. https://doi.org/10.1016/j.chiabu.2008.05.004 PMID: 19027163

55. Gracia E, Herrero J. Is it considered violence? The acceptability of physical punishment of children in Europe. J Marriage Fam. 2008; 70(1):210–17.

56. Waltermaurer E. Public justification of intimate partner violence: a review of the literature. Trauma Violence Abuse. 2012; 13:167–75. https://doi.org/10.1177/1524838012447699 PMID: 22643069

57. Gracia E, Tomás JM. Correlates of victim-blaming attitudes regarding partner violence against women among the Spanish general population. Violence Against Women. 2014; 20:26–41. https://doi.org/10.1177/1077801213520577 PMID: 24476756

58. Tsai AC, Kakuhikire B, Perkins JM, Vorechovska D, McDonough AQ, Ogburn EL, et al. Measuring personal beliefs and perceived norms about intimate partner violence: Population-based survey experiment in rural Uganda. PLoS Med. 2017; 14(5):e1002303. https://doi.org/10.1371/journal.pmed.1002303 PMID: 28542176

59. Benson ML, Fox GL, DeMaris A, Van Wyk J. Neighborhood disadvantage, individual economic distress and violence against women in intimate relationships. J Quant Criminol. 2003; 19(3):207–35.

60. Hill TD, Ross CE, Angel RJ. Neighborhood disorder, psychophysiological distress, and health. J Health Soc Behav. 2005; 46(2):170–86. https://doi.org/10.1177/002214650504600204 PMID: 16028456

61. Ross CE, Mirowsky J. Neighborhood disorder, subjective alienation, and distress. J Health Soc Behav. 2009; 50(1):49–64. https://doi.org/10.1177/002214650905000104 PMID: 19413134

62. Maguire-Jack K, Font SA. Intersections of individual and neighborhood disadvantage: implications for child. Child Youth Serv Rev. 2016; 72:44–51.

63. MacMillan HL, Wathen CN. Family violence research: lessons learned and where from here? JAMA. 2005; 294:618–20. https://doi.org/10.1001/jama.294.5.618 PMID: 16077058

64. Grych JH., Swan S. Toward a more comprehensive understanding of interpersonal violence: Introduction to the special issue on interconnections among different types of violence. Psychol Violence. 2012; 2:105–10.

65. Heise L. What works to prevent partner violence? an evidence overview. London: STRIVE, London School of Hygiene and Tropical Medicine; 2011.

66. Banyard VL. Go big or go home: reaching for a more integrated view of violence prevention. Psychol Violence. 2013; 3:115–20.

67. Hamby S, Grych J. The web of violence: Exploring connections among different forms of interpersonal violence and abuse. London: Springer Publishers; 2013.

68. Jewkes R. (How) Can we reduce violence against women by 50% over the next 30 years? PLoS Med. 2014; 11:e1001761. https://doi.org/10.1371/journal.pmed.1001761 PMID: 25423110

69. Sampson RJ. Great American city: Chicago and the enduring neighborhood effect. Chicago, IL: University of Chicago Press; 2012.

70. Díez-Roux AV, Mair C. Neighborhoods and health. Ann NY Acad Sci. 2010; 1186:125–45. https://doi.org/10.1111/j.1749-6632.2009.05333.x PMID: 20201871

71. Voith LA. Understanding the relation between neighborhoods and intimate partner violence: an integrative review. Trauma Violence Abuse. 2017. https://doi.org/10.1177/1524838017717744.

72. Marco M, Gracia E, Tomás JM, López-Quílez A. Assessing neighborhood disorder: Validation of a three-factor observational scale. Eur J Psychol Appl Legal Context. 2015; 7(2):81–89.

73. Freisthler B, Midanik LT, Gruenewald PJ. Alcohol outlets and child physical abuse and neglect: applying routine activities theory to the study of child maltreatment. J Stud Alcohol. 2004; 65:586–92. PMID: 15536767

74. Freisthler B, Needell B, Gruenewald PJ. Is the physical availability of alcohol and illicit drugs related to neighborhood rates of child maltreatment? Child Abuse Negl. 2005; 29:1049–60. https://doi.org/10.1016/j.chiabu.2004.12.014 PMID: 16168479

75. Morton CM, Simmel C, Peterson NA. Neighborhood alcohol outlet density and rates of child abuse and neglect: moderating effects of access to substance abuse services. Child Abuse Negl. 2014; 38:952–61. https://doi.org/10.1016/j.chiabu.2014.01.002 PMID: 24529493

76. Marco M, Gracia E, López-Quílez A. The university campus environment as a protective factor for intimate partner violence against women: An exploratory study. J Community Psychol. 2018.