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Journal article

Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities

Dias, N. G., Fraga, S., Soares, J., Hatzidimitriadou, E., Ioannidi-Kapolou, E., Lindert, J., Sundin, O., Toth, O., Barros, H. and Ribeiro, A. I.

“This is a post-peer-review, pre-copyedit version of an article published in International Journal of Public Health. The final authenticated version is available online at:

<http://dx.doi.org/https://doi.org/10.1007/s00038-020-01516-x>”.

International Journal of Public Health

Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities. --Manuscript Draft--

Manuscript Number:	IJPB-D-18-00972R2	
Full Title:	Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities.	
Article Type:	Original article	
Keywords:	Intimate partner violence; inequalities; multilevel analysis; Socioeconomic factors; Social Support.	
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Funding Information:	European Comission (20081310)	Not applicable
	Fundação para a Ciência e a Tecnologia (POCI-01-0145-FEDER-006862)	Not applicable
	Fundação para a Ciência e a Tecnologia (UID/DTP/04750/2013)	Not applicable
	Fundação para a Ciência e a Tecnologia (CEECIND/02386/2018)	Dr Ana Isabel Ribeiro
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Abstract:	Objectives: To assess whether city-level characteristics influence the risk of intimate partner violence (IPV) victimization across six European cities. Methods: The DOVE Study included 3496 participants from Athens-Greece, Budapest-Hungary, London-UK, Östersund-Sweden, Porto-Portugal and Stuttgart-Germany. IPV victimization was assessed using the Revised Conflict Tactics Scales and several contextual variables were included: GINI coefficient, gender equality index, an index of social support, unemployment rate and proportion of residents with tertiary education. Multilevel	

models were fitted to estimate the associations (Odds ratio, 95% Confidence Intervals) between each type of victimization and contextual and individual-level variables. Results: 62.3% of the participants reported being a victim of IPV during the previous year, with large between-city differences (53.9%-72.4%). Contextual variables accounted for a substantial amount of this heterogeneity. Unemployment rates were associated with psychological (1.05, 1.01-1.08) and physical IPV (1.07, 1.01-1.13). GINI coefficient showed a positive association with any form of IPV (1.06, 1.01-1.11) and sexual coercion (1.13, 1.01-1.25). Conclusions: We found significant associations between contextual determinants and IPV, which emphasizes the importance of considering contextual socioeconomic conditions when policy measures are designed to address IPV.

RESPONSE TO REVIEWERS

Dear Editor,

We are glad to know that our manuscript was considered potentially acceptable for publication in *International Journal of Public Health* subject to the requested minor revision. We would like to thank you the opportunity to revise and improve our manuscript. Attached to this letter is our point-by-point response to the reviewers.

We have also revised and uploaded the new manuscript file (a manuscript with tracked changes is also provided).

We hope that the revised manuscript now meets all the requirements for publication.

We thank you in advance for your consideration and look forward to hearing from you soon.

Yours faithfully,

Reviewer #3: Comments for the Author(s) (please use as much space as you require):

You calculated the variance and then plug these values into the MOR formula. The problem with this approach is that you are assuming (with likelihood-based estimation) asymptotic normality. It could also be better present 95% credible intervals opting for MCMC estimation. One can anticipate that the distribution of the variance will be positively skewed especially in the case of this study where there are not many higher-level units.

RESPONSE: Firstly, we would like to thank the reviewer for his/her constructive criticism of our manuscript and for giving us the opportunity to respond to the issue here raised.

As requested, we now provide the 95% Confidence Intervals for the Median Odds Ratio (MOR) in Table 2 and we included a short description of the computation method that can be found in lines 193-194 of the methods section.

Reviewer #4: Comments for the Author(s) (please use as much space as you require):

This paper To assess whether city-level characteristics influence the risk of intimate partner violence (IPV) victimization across six European cities. The authors addressed in a compelling manner the issues raised by the Reviewers.

RESPONSE: Firstly, we would like to thank the reviewer for his/her constructive criticism of our manuscript and for giving us the opportunity to respond to the points raised

Nonetheless, prior to publication I would argue that the following minor aspects ought to be addressed:

1. Introduction: the authors updated the references supporting their theoretical approach. However, I wonder if the (, 1942) could be supported by other more recent scientific publications?

RESPONSE: As recommended, we coupled the Shaw and McKay 1942 citation (which is the original study on the topic) with a more recent one by R Wickens (2017). Please see lines 47-49 of the revised manuscript.

2. Methods:

a. Given that the data at individual level was collected in 2010, the authors should provide an indication of year for the data used at community/national level (contextual variables):

i. The GINI coefficient: provide year and the range for scores (0 to 1)

ii. The gender equality index was extracted from the European Institute for Gender Equality (EIGE 2015): in which year was this data collected?

iii. Contextual social support was computed using data from the European Social Survey (ESS) - data from which survey round was used.

RESPONSE: We agree with the reviewer, these details were missing. Please find them in lines 135-143 of the revised version of the manuscript. All contextual variables were from 2010.

When the authors describe the ESS measure, the paragraph (lines 153-157) should be incorporated into the previous paragraph in such the reader can easily understand that the description of items refers to the ESS measure.

RESPONSE: We agree with the reviewer. Thus, we include the description of the social support metric based upon ESS variable in the same paragraph. Please see Lines 142-173.

Line 158: Please add in brackets which are these variables (In the case of the last three variables)

RESPONSE: As requested the variables were added in brackets. Please see lines 160-170.

Editorial comments:

References: Please provide 3 authors before et al, and please take care of the word limit of 4000 words max in the revised version.

RESPONSE: The manuscript is now under the 4000 words limit (3986 words) and the citations were corrected so that there are 3 authors listed before the et al.

Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities.

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Abstract: 180 words

Text body: 3.986 words

Compliance with ethical standards

Conflicts of interest: None declared.

Ethical approval: The study protocol was approved by the local Institutional Research Ethics Committees. The World Health Organization (WHO) ethical and safety guidelines were followed to ensure privacy and safety of the participants and interviewers.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Funding:

DOVE project – Domestic Violence against women/men in Europe – prevalence, determinants, effects, and policies/practices, was supported by the Executive Agency for Health and Consumers - European Commission [Contract Number: 20081310]. This study was funded by FEDER through the Operational Programme Competitiveness and Internationalization and national funding from the Foundation for Science and Technology—FCT (Portuguese Ministry of Science, Technology and Higher Education) under the Unidade de Investigação em Epidemiologia—Instituto de Saúde Pública da Universidade do Porto (EPIUnit) (POCI-01-0145-FEDER-006862; Ref. UID/DTP/04750/2013). Ana Isabel Ribeiro and Silvia Fraga were supported by National Funds through FCT within the contract CEECIND/02386/2018 and CEECIND/01516/2017, respectively.

Acknowledgments:

The authors would like to thank Dr. Milton Severo for kindly helping with the statistical analysis and the anonymous reviewers for their comments that helped to improve the manuscript.

1 Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities.

2

3 ABSTRACT

4 Objectives: To assess whether city-level characteristics influence the risk of intimate partner violence (IPV)

5 victimization across six European cities. Methods: The DOVE Study included 3496 participants from

6 Athens-Greece, Budapest-Hungary, London-UK, Östersund-Sweden, Porto-Portugal and Stuttgart-

7 Germany. IPV victimization was assessed using the Revised Conflict Tactics Scales and several contextual

8 variables were included: GINI coefficient, gender equality index, an index of social support, unemployment

9 rate and proportion of residents with tertiary education. Multilevel models were fitted to estimate the

10 associations (Odds ratio, 95% Confidence Intervals) between each type of victimization and contextual and

11 individual-level variables. Results: 62.3% of the participants reported being a victim of IPV during the

12 previous year, with large between-city differences (53.9%-72.4%). Contextual variables accounted for a

13 substantial amount of this heterogeneity. Unemployment rates were associated with psychological (1.05,

14 1.01-1.08) and physical IPV (1.07, 1.01-1.13). GINI coefficient showed a positive association with any

15 form of IPV (1.06, 1.01-1.11) and sexual coercion (1.13, 1.01-1.25). Conclusions: We found significant

16 associations between contextual determinants and IPV, which emphasizes the importance of considering

17 contextual socioeconomic conditions when policy measures are designed to address IPV.

18 Keywords: Intimate Partner Violence; Inequalities; Multilevel analysis; Socioeconomic factors; Social

19 Support.

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31 INTRODUCTION

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33 Intimate Partner Violence (IPV) is a major public health problem placed by the Global Burden of
34 Disease Study in the 16th position among risk factors for Disability Adjusted Life Years. According to
35 WHO estimates (Organization. 2013), there are geographical and cultural differences in IPV victimization,
36 with prevalence rates ranging from 23.2% in high-income countries to 37.7% in low- and middle-income
37 countries. Similarly, in Europe, a large between-city variation in the prevalence of victimization has been
38 reported (Costa, Soares, Lindert et al. 2015). These differences may be partially explained by individual-
39 level determinants, although the importance of the context is increasingly recognized (Capaldi, Knoble,
40 Shortt et al. 2012). Thus, an ecosocial model that conceptualizes violence as a multifaceted phenomenon
41 grounded in an interplay among personal, situational, and sociocultural factors would contribute to better
42 understand IPV (Heise and Kotsadam 2015; VanderEnde, Yount, Dynes et al. 2012).

43 Theories explaining geographical and other contextual variation in violence are mostly grounded
44 in social disorganization theory. Accordingly, communities characterized by socioeconomic deprivation
45 (high levels of unemployment, poverty, low levels of education) are constrained to organize for the common
46 good, which diminishes the community's capacity to regulate crime (Shaw and McKay 1942; Wickes
47 2017). Deprived communities are also less likely to have social support networks to help regulate intimate
48 partner violence occurrence (Shaw and McKay 1942; Wickes 2017). Besides, community social structure
49 was shown to be a marker of social processes that accompany socioeconomic development, namely those
50 related with income and gender-equity, including erosion of social norms supporting male authority and
51 higher social/economic participation among women, and a more equitable income distribution (Heise and
52 Kotsadam 2015).

53 Some of these theoretical models were transported to IPV research and were confirmed by
54 empirical investigations. For instance, community and regional-level poverty and unemployment rates were
55 found to be positively associated with IPV risk (Bonomi, Trabert, Anderson et al. 2014; Sanz-Barbero,
56 Vives-Cases, Otero-Garcia et al. 2015; VanderEnde, Yount, Dynes et al. 2012; Vyas and Heise 2016).
57 Similarly, lower city-levels of education were also linked with increased risk of psychological abuse among
58 European elderly, although no association was observed with income inequality (Fraga, Lindert, Barros et
59 al. 2014). High gender inequality, including societal norms supporting male authority and discriminatory
60 ownership rights, has also been related with increased levels of IPV (Heise and Kotsadam 2015) and

61 reduced the ability of the victims leave abusive relations and/or seek support (Etienne G. Krug 2002). And,
62 finally, the idea that community levels of interpersonal trust, cohesion and strong social ties may protect
63 citizens against IPV was supported by US studies that showed neighbourhood collective efficacy (social
64 cohesion among neighbors) was associated with lesser violent crime (Sampson, Raudenbush and Earls
65 1997).

66 Despite this accumulated knowledge, it is important to highlight that research on IPV still
67 overlooks the role of contextual factors (Heise and Kotsadam 2015), paying much more attention to the
68 role of personal and relational factors. Addressing the role of community- and macro-level determinants is
69 helpful for improving our explanatory models about IPV and for planning and implementing public health
70 programs (Heise and Kotsadam 2015).

71 Using data from the multicenter European project Domestic Violence Against women/men in
72 Europe—prevalence, determinants, effects, and policies/practices (DOVE), the present study aimed to assess
73 whether country- and city-level characteristics, namely socioeconomic circumstances, gender and income
74 inequality as well as levels of social support, influence the risk of victimization across six European cities.

75

76 METHODS

77

78 *Study design and participants*

79 This study used data from the DOVE Project, funded by the European Commission, with the
80 Contract Number 20081310 (Costa, Soares, Lindert et al. 2013). The DOVE Project collected data from
81 3496 non-institutionalized adults (18–64 years) sampled from the general population of six European cities:
82 Athens–Greece, Budapest–Hungary, London–United Kingdom, Östersund–Sweden, Porto-Portugal and
83 Stuttgart–Germany. Sites were selected based on previous collaboration, and to represent geographical and
84 cultural diversity across Europe (Costa, Soares, Lindert et al. 2015; Lindert, de Luna, Torres-Gonzales et
85 al. 2013; Matanov, Tulloch, Priebe et al. 2012). Samples were proportionally stratified according to age
86 and sex. The study design and sampling strategy has been described in detail elsewhere (Costa, Soares,
87 Lindert et al. 2015; Costa, Soares, Lindert et al. 2013).

88 Information related to socio-demographic and lifestyle factors, health care use, intimate partner
89 violence and social support was collected through structured questionnaires. Data collection was carried
90 out between September 2010 and May 2011.

91 The study protocol was approved by the local Institutional Research Ethics Committees. The
92 World Health Organization (WHO) ethical and safety guidelines were followed to ensure privacy and safety
93 of the participants and interviewers.

94

95 *Victimization outcomes*

96 IPV victimization was assessed using the Revised Conflict Tactics Scales (CTS2) (Straus, Hamby,
97 Boney-McCoy et al. 1996). Four subscales of the CTS2 were used to assess victimization in past year,
98 considering a current or former intimate partner: psychological aggression (8 items – e.g. "My partner called
99 me fat or ugly"), physical assault (12 items – e.g. "My partner twisted my arm or hair"), sexual coercion (7
100 items - e.g. "My partner insisted on have sex with me when I did not want to") and injury (6 items – e.g. "I
101 had a broken bone from a fight with my partner"). Ever-partnered included those in a dating,
102 cohabiting/marital relationship that lasted more than one month. Cronbach alpha in the global sample was
103 0.90 (from 0.83 in Budapest to 0.96 in London). Respondents who have referred at least one act of violence
104 were considered a victim. In the present study we only considered psychological aggression, physical
105 assault and sexual coercion. Injury was excluded from our analysis because the number of injury victims
106 (n=155) did not allow multilevel models to converge, thus preventing this type of inference.

107

108 *Individual-level variables*

109 We have considered the following variables in the analysis: sex, age, education, marital status,
110 occupation and social support. Education levels were categorized as primary education or less (equal or
111 less than 9 years of schooling), secondary education (10-12 years of schooling) and university (more than
112 12 years of schooling). Occupations were classified as upper white collar, lower white collar and blue collar
113 following the International Standard Classification of Occupations. Marital status was classified as
114 cohabiting, married, divorced/separated/widowed and single.

115 Social support was assessed with the Multidimensional Scale of Perceived Social Support (Zimet,
116 Dahlem, Zimet et al. 1988). The scale encompasses 12 questions (graded 1-7) with components of support
117 from family, friends and others. High scores correspond to high perceived social support. The
118 Multidimensional Scale of Perceived Social Support was translated, culturally adapted, and validated for
119 the countries under study (Dambi, Corten, Chiwaridzo et al. 2018). Cronbach alpha for this scale was 0.94.

120

121 *Contextual variables*

122 The selection of the contextual variables was made after a literature review of the contextual
123 determinants of violence (Bonomi, Trabert, Anderson et al. 2014; Fraga, Lindert, Barros et al. 2014; Heise
124 and Kotsadam 2015; Sampson, Raudenbush and Earls 1997; Sanz-Barbero, Vives-Cases, Otero-Garcia et
125 al. 2015; VanderEnde, Yount, Dynes et al. 2012; Vyas and Heise 2016). Based on that review, we selected
126 the following variables at city-level, from 2010, obtained from the national statistics offices: proportion of
127 unemployed individuals and proportion of individuals with tertiary education. Although we acknowledge
128 that substantial variation between communities in the same country or culture may exist, due to the lack of
129 official and harmonized information at city-level, we used the following indicators at country-level: the
130 GINI coefficient (from the year 2010; range: 0-1); the gender equality index (year 2010) and a summary
131 index of contextual social support that was created specifically for this study (based on 2010 data from the
132 European Social Survey, ESS, round 5).

133 The GINI coefficient is a measure of income inequality, and it was retrieved from the EUROSTAT.
134 The greater the coefficient, the greater the income inequality. Although GINI index at city-level was
135 previously calculated for London (www.centreforcities.org) and for Athens (www.athenssocialatlas.gr), we
136 opted to use nationwide measures of GINI to guarantee cross-national comparability and to avoid having a
137 combination of city and country-level GINI estimates.

138 The gender equality index was extracted from the European Institute for Gender Equality (EIGE
139 2015). This index covers several domains – work, power, violence, money, time, knowledge and health –
140 and measures the gender gap between women and men in the European Union, ranging from 1 for total
141 inequality to 100 for full equality.

142 The summary index of contextual social support was computed using the following variables from
143 ESS: ‘most people can be trusted or you can’t be too careful’, ‘most people try to take advantage of you, or
144 try to be fair’, ‘most of the time people helpful or mostly looking out for themselves’, ‘trust in the legal
145 system’, ‘trust in the police’, ‘trust in the politicians’, ‘how often socially meet with friends, relatives or
146 colleagues’, ‘anyone to discuss intimate and personal matters with’, ‘how much time during past week you
147 felt lonely’. These ESS variables were selected because these were related with the concept of social
148 support, presented in the introduction. In most of these variables (‘most people can be trusted or you can’t
149 be too careful’, ‘most people try to take advantage of you, or try to be fair’, ‘most of the time people helpful
150 or mostly looking out for themselves’, ‘trust in the legal system’, ‘trust in the police’, ‘trust in the

151 politicians'), the respondents could select one value in an ordinal 0-10 scale, where the first category was
152 the worst option and the last the best. For instance, in the question 'most people can be trusted or you can't
153 be too careful', 0 corresponded to 'you can't be too careful' and 10 to 'most people can be trusted'. To
154 obtain a summary score for each variable, we multiplied each value (0-10) by the proportion of the
155 respondents and then we summed the products, leading to a weighted score. In the case of the last three
156 variables ('how often socially meet with friends, relatives or colleagues', 'anyone to discuss intimate and
157 personal matters with', 'how much time during past week you felt lonely'), we converted them into a 0-10
158 scale, grading the possible options from the worst (0) to the best options (10) and giving intermediate values
159 to the remaining answers. The summary score was then computed as before. Finally, the social support
160 index for each country was derived by calculating the arithmetic average of all the previously obtained
161 weighted summary scores.

162

163 *Statistical analysis*

164 Firstly, a correlation matrix was created to investigate the presence of multicollinearity between
165 contextual variables (Figure 1). The variables measuring the same dimension that showed strong and
166 significant autocorrelation (Spearman's *rho* larger than 0.8) were excluded from the analysis: GDP per
167 capita and proportion of population at-risk-of-poverty.

168 Then, a two-level multilevel model (individual-level and city-level) was fitted. For each type of
169 victimization, three sequential models were built. The first model included only the random effect (Model
170 1); the second model included the random-effect and the individual-level variables (Model 2); and in the
171 third model we added the city- and country-level variables (Model 3). In the third model we included only
172 contextual covariates that were associated with victimization in bivariate models (each contextual variable
173 at each time plus random effect and individual-level variables, Model 0 not shown). Odds ratios (OR) and
174 their respective 95% confidence intervals (CI) were computed to measure the association between each
175 type of victimization and the different variables measured at contextual and individual-level. The presence
176 of interactions was evaluated by including interaction terms between sex, education and contextual
177 variables. No interactions were observed.

178 This three-model approach allowed us to quantify the amount of between-city variability in each
179 outcome (Model 1), and how much of this variation was explained by individual-level (Model 2) and
180 country or city-level variables (Model 3). For this quantification, we computed the proportional change in

181 variance from Model 1 to Model 3. The median odds ratio (MOR) and the corresponding bootstrap 95% CI
182 (Austin and Leckie 2020) were also calculated to quantify the magnitude of variability between cities. When
183 the MOR is equal to one it means there are no differences between cities. The MOR can be conceptualised
184 as the increased risk that (in median) would have if moving to another area with a higher risk (Larsen and
185 Merlo 2005; Merlo, Chaix, Ohlsson et al. 2006). Statistical analysis was performed using R version 3.3.3
186 and the package ‘lme3’.

187

188

189 RESULTS

190

191 Table 1 shows the characteristics of participants and contextual indicators. Among the 3496
192 participants from one town in each of six European countries, 58% were women, the average age was 42.2
193 years and 62.3% of participants reported being a victim of IPV in the previous year. There were no
194 significant differences in the prevalence of IPV victimization by genders.

195 Prevalence of victimization varied according to the city of residence and form of violence. Athens
196 (72.4%) and London (68.6%) were the cities with the highest prevalence of IPV victimization while
197 Östersund (55.8%) and Budapest (53.9%) had the lowest prevalence. Psychological aggression was the
198 more prevalent type of IPV across the six European cities, with an overall prevalence of 58.1%, ranging
199 from 71.5% in Athens to 49.8% in Porto.

200 Tables 2a and 2b present the results from the multilevel logistic regression according to each type
201 of IPV. Model 1 (first column in tables 2a and 2b), corresponds to the empty model with the random-effect
202 but without covariates. The MOR, higher than 1 (1.34 for any type; 1.34 for psychological aggression; 1.51
203 for physical assault and 1.75 for sexual coercion), shows that there are substantial between-city differences
204 in IPV.

205 Model 2 includes the random-effect and the individual-level variables. As depicted in Tables 2a
206 and 2b, overall, married and cohabiting participants were more likely to be victim of psychological and any
207 form of IPV. People with primary education and blue-collars were also more likely to be victims of physical
208 violence. On the other hand, high scores of social support were associated with less victimization
209 prevalence of all types of violence.

210 In the final model (Model 3 in tables 2a and 2b) we expanded Model 2 by incorporating country-
211 level variables such as the GINI coefficient and city-level variables such as unemployment rate. Participants
212 from cities with higher income inequality, expressed by the GINI coefficient, presented significantly higher
213 odds of victimization of any type of IPV (OR = 1.06, 95% CI 1.01-1.11) and of sexual coercion (1.13, 1.01-
214 1.25). Those from cities with higher unemployment rates presented higher odds of victimization of
215 psychological (1.05, 1.01-1.08) and physical IPV (1.07, 1.01-1.13). Social Support Index, calculated at a
216 country-level, was unrelated with IPV victimization, regardless the form (results not shown). Similarly, no
217 significant associations were observed with the gender equality index and the percentage of residents with
218 tertiary education (results not shown).

219 Incorporating contextual variables describing the city and country environment led to a decrease
220 in the between-city variance in IPV for any type of IPV (-55.6%), psychological aggression (-67.7%),
221 physical assault (-50.4%) and sexual coercion (-40.1%), respectively.

222

223

224 DISCUSSION

225

226 Our study showed a significant association between some contextual determinants and the
227 likelihood of being victim of IPV in six European cities. City-level unemployment rate was related with
228 higher odds of being a victim of psychological aggression and physical assault in the past year. And the
229 GINI coefficient, a well-known measure of economic inequality, was associated with increased risk of
230 overall IPV and sexual coercion.

231 Our results confirm previous findings on the association between city-level unemployment rates
232 and the risk of psychological aggression and physical assault. Living in neighbourhoods with higher
233 unemployment rates has been associated with higher IPV risk (Gage 2005; O'Campo, Gielen, Faden et al.
234 1995; Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015; VanderEnde, Yount, Dynes et al. 2012; Vyas
235 and Heise 2016). In Spain, the likelihood of IPV was shown to be 81% higher among women living in a
236 region with a high male unemployment (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015). Several
237 mechanisms may explain this association. High levels of unemployment may increase stress and frustration
238 (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015) due to the inability to get a job and to meet social

239 expectations, and may lead to unhealthy coping behaviours, such as alcohol consumption, which have been
240 associated with IPV (Caetano, Ramisetty-Mikler and Harris 2010).

241 Additionally, we observed a positive and significant association between the country's GINI
242 coefficient and IPV (any type and sexual coercion), i.e., living in countries with high levels of income
243 inequality was associated with increased odds of IPV. This result is also in accordance with the published
244 literature (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015). In Spain, it was also found that women
245 living in regions with higher Gini Index have higher odds of IPV (Sanz-Barbero, Vives-Cases, Otero-Garcia
246 et al. 2015). Income inequality has been linked with numerous health outcomes. Indeed, previous work has
247 identified associations between income inequality and homicides and child abuse (Wilkinson and Pickett
248 2008). The unequal distribution of material resources may lead to feelings of distrust, stress and social
249 defragmentation, which, in turn, may increase IPV and other forms of violent behaviour (Wilkinson and
250 Pickett 2006). A plausible mechanism that link income inequality and violence is psychosocial stress:
251 inequality generates stress when individuals become aware of their social position, which, in turn, may
252 increase violence (Wilkinson 2004).

253 There are several theoretical frameworks to explain IPV, but there is limited research describing
254 the theoretical frameworks underscoring epidemiological investigation on IPV determinants. Our results
255 find support in the ecosocial theory (Krieger 2012), whose central focus is on the embodiment of exposures
256 arising from societal and ecological context, and in the social disorganization theory according to which
257 social disadvantage diminishes the community's capacity to regulate the occurrence of crime (Shaw and
258 McKay 1942; Wickes 2017).

259 The observed relation between IPV and structural socioeconomic indicators also has important
260 policy implications. These indicators explained a considerable amount of the between-city differences in
261 IPV, which suggests European and state governments should develop policies towards the reduction of the
262 gap between the most and the least disadvantaged, especially since income inequality persist in Europe and
263 some regions did even show an increase in the income gap over the last decade. Similarly, labour market
264 policies must tackle unemployment and support those in need with adequate financial aid and training
265 programs (Silva-Martínez, Stylianou, Hoge et al. 2016).

266 Regarding individual-level determinants, we identified that characteristics, such as age, marital
267 status, occupation, education and social support were related with victimization. Those who were younger,
268 married or cohabiting, occupied in blue-collar professions, and with no university degree presented higher

269 risk of victimization. We did not find gender differences in IPV victimization. While most studies suggest
270 that women are more likely to suffer from IPV, this finding is consistent with prior studies on the topic
271 (Straus 2012). Costa and co-authors found few significant sex-differences within European cities (Costa,
272 Soares, Lindert et al. 2015). Likewise, a Swedish study demonstrated that past-year IPV exposure rates
273 were similar in women and men (Nybergh, Taft, Enander et al. 2013). The same is true for older adults,
274 with male abuse being under-recognized, under-detected and under-reported (Melchiorre, Di Rosa, Lamura
275 et al. 2016). These findings are in accordance with theories of social roles that explain similarities in male
276 and female IPV as a result of the evolving gender equality of western societies (Archer 2009). Yet it is
277 important to refer that, while we did not study such outcomes, it is possible that gender differences in IPV
278 severity and type of acts exist. We found that people experiencing higher levels of social support presented
279 a lower risk of being victim of IPV. Social support has been shown to prompt people to make a firm decision
280 to leave an abusive relationship (Rose, Campbell and Kub 2000). While at individual level high education
281 levels were significantly associated with reduced risk of IPV victimization, as found in previous studies
282 (Dias, Costa, Soares et al. 2018), at the city-level, tertiary education did not seem to influence IPV. This
283 contrasts with Fraga et al. study (Fraga, Lindert, Barros et al. 2014), which observed that the proportion of
284 residents with tertiary education influenced the risk of psychological abuse among European elderly. Yet,
285 this comparison is not straightforward, as the influence of education and other socioeconomic variables
286 may be different with ageing or interact with a different set of cohort and period effects.

287 Although individuals experiencing higher levels of social support seem to be at lower risk of
288 victimization and more likely to seek adequate help and to leave abusive relationships (Dias, Costa, Soares
289 et al. 2018), our results showed no significant association between contextual-level social support and IPV
290 victimization. It is possible that social support operates at a different geographical or social level (Poortinga
291 2006), such as the neighbourhood, and not so much at the national level. As stated by Poortinga (Poortinga
292 2006), even if a country has high levels of social capital (a broader construct that includes social support),
293 not all citizens benefit from it; beneficial effects of social capital may only apply to more trusting and
294 socially active individuals. To distinguish between compositional (individual-level) and contextual
295 (city/country-level) effects, we used a multi-level analysis. Yet, it is important to refer that, although
296 contextual factors may impact IPV, they still need to be experienced by the individuals for IPV to occur.
297 Individual and contextual level variables are not mutually exclusive; rather they interact with each other in
298 order to influence the outcome (Macintyre, Ellaway and Cummins 2002).

299 The present study has a number of limitations that must be discussed. Firstly, due to its cross-
300 sectional nature it precludes direct causal inferences. Second, ideally all contextual indicators should have
301 been measured at the city-level. Yet, due to data unavailability, the GINI coefficient and other covariates
302 were measured at country-level. It is possible that these measures may not accurately represent participants'
303 context. Specifically, because levels of gender/income inequality and social support may vary within
304 countries and between cultures, results must be interpreted with cautious. Third, we did not analyse other
305 potential contextual correlates of IPV, such as those related with violence-protection policies, which could
306 contribute to further explain between-city differences in IPV. Fourth, due to the statistical power limitations
307 caused by the number of injury victims and subsequent problems with model convergence, injury was
308 excluded from our analysis. Yet, we acknowledge that it is a very relevant outcome, associated with well-
309 known psychosocial and physical consequences. Finally, one important methodological consideration is
310 that IPV data was self-reported using the CTS2 questionnaire. Although this scale has been validated for
311 the use in cross-cultural and cross-national studies and is one of the most widely used to measure of IPV,
312 the CTS2 has been criticized for not measuring context related features of IPV and only counting acts of
313 violence (Straus 2012). Therefore, it is possible that interpretation of the questions differs between countries
314 despite all efforts for cultural validation and that can, in part, explain some of the between-country
315 differences that we observed.

316 Our study has several strengths as well. It contributes to the understanding of the ecological
317 determinants of IPV, and to highlight the importance of macro-level socioeconomic circumstances as
318 drivers of IPV. And, we considered several European cities, representing various geographic regions and
319 cultures, maximizing our capacity to generalize our findings.

320 In conclusion, and as theorized in the introduction, our findings highlight the importance of
321 adopting an ecosocial framework to better understand IPV, as we found that both individual- and
322 contextual-level factors influence IPV victimization. Our results showed that much of the between-country
323 differences in the prevalence of IPV can be attributed to the contextual determinants, suggesting that
324 changing individual aspects may not be enough to prevent IPV especially if individuals remain in
325 environments characterized by poor socioeconomic conditions as such unemployment and income
326 inequality. To understand IPV victimization, it is important to look beyond individual-level drivers of
327 violence and to adopt an ecosocial approach that acknowledged the influence of personal, situational and

328 macro-level factors. Besides, our findings convey an important political message and suggest that policies
329 could help to reduce IPV by addressing and improving structural economic variables.

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460 Figures

461 Fig 1 – Correlation matrix of the ecological variables (Spearman correlation coefficients) (Domestic

462 Violence Against women/men in Europe, 6 European cities, 2010-2011).

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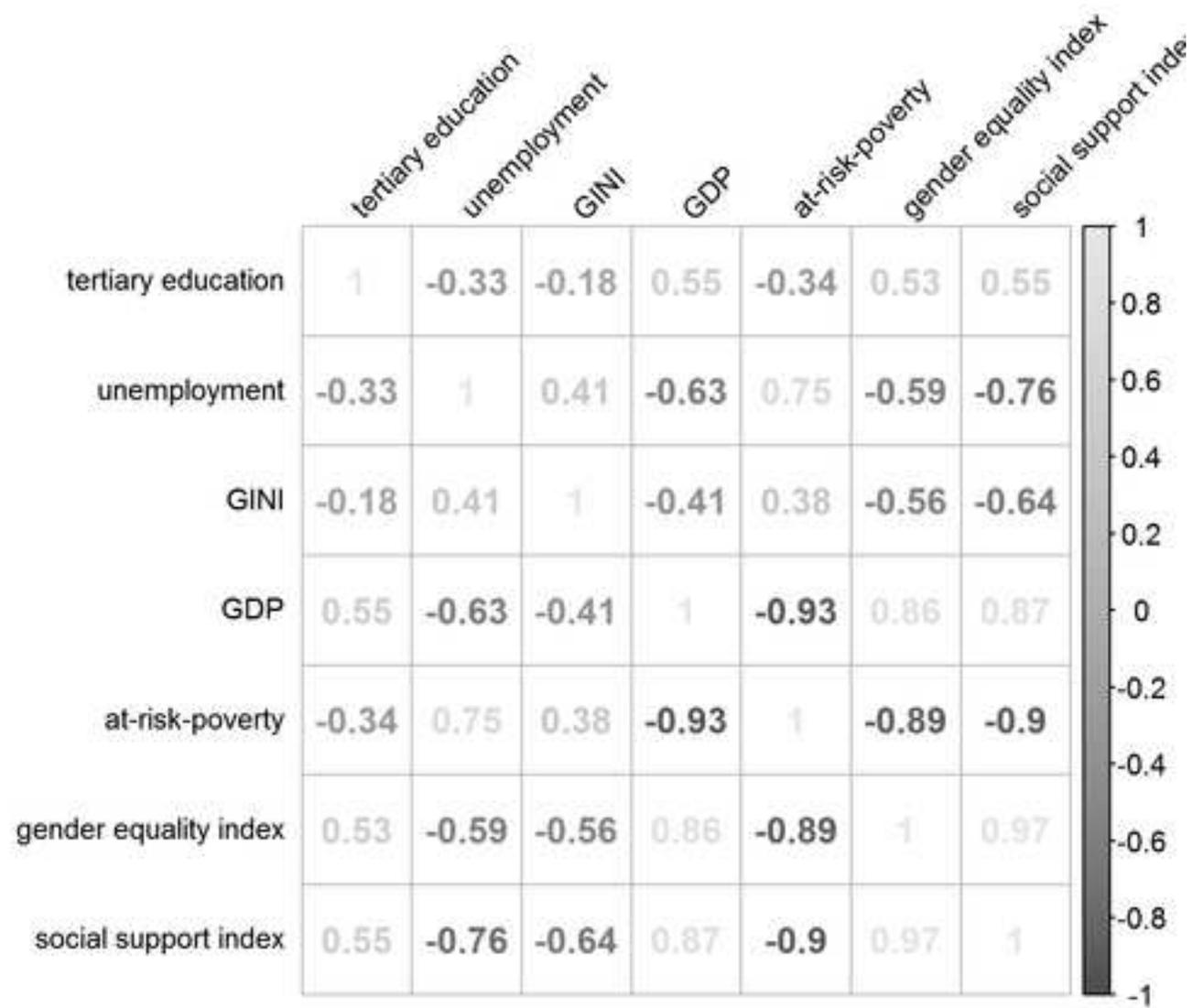


Table 1. Characteristics of the participants and contextual indicators (Domestic Violence Against women/men in Europe, 6 European cities, 2010-2011).

Variables	All n=3496	Athens n=548	Budapest n=604	London n=571	Östersund n=592	Porto n=635	Stuttgart n=546
Individual-level							
Women (%)	58.0	50.4	58.9	52.2	62.5	64.3	58.2
Mean age (years) (SD)	42.2 (13.4)	38.8 (12.6)	40.8 (13.7)	38.5 (12.6)	44.5 (13.2)	47.9 (13.0)	41.9 (12.8)
Education (%)							
Primary or less	7.4	3.8	10.6	0.5	11.3	13.9	2.6
Secondary	50.8	65.0	64.2	44.7	39.9	45.0	46.5
University	41.9	31.1	25.2	54.7	48.8	41.1	50.9
Occupation (%)							
Upper white collar	42.6	23.1	23.1	50.8	50.6	58.5	56.6
Lower white collar	36.4	50.7	34.1	37.7	36.9	21.6	35.0
Blue collar	20.9	26.2	42.8	11.5	12.5	19.8	8.5
Marital Status (%)							
Cohabiting	15.3	5.5	14.2	15.4	37.5	4.7	14.3
Married	43.1	47.4	36.8	35.3	39.7	50.9	48.7
Divorced/Separated/Widowed	13.3	7.3	23.0	17.7	6.8	15.6	8.2
Single	28.3	39.8	26.0	31.6	16.1	28.7	28.8
Past year IPV (%)							
Psychological	58.1	71.5	51.9	64.9	54.3	49.8	57.9
Physical	14.8	27.8	13.1	16.3	9.9	9.0	13.4
Sexual	17.2	19.6	7.6	21.9	7.7	20.7	27.9
Any type	62.3	72.4	53.9	68.6	55.8	56.8	68.2
Mean social support (score)	46.8	48.2	46.3	42.0	49.2	46.2	48.8
City-level							
Unemployment rate (%)	10.7	20.4	11.6	10.0	7.9	9.0	5.5
Tertiary education (%)	34.9	28.8	34.1	49.7	34.9	22.3	40.9

Country-level							
GDP per capita (EU=100)	95	75	64	105	126	77	123
At risk-of-poverty (%)	24.3	31.0	31.5	22.7	16.1	24.4	19.9
GINI Coefficient	30.2	33.5	26.9	33.0	24.4	34.2	29.0
Social Support Index	5.1	4.6	5.4	6.1	6.9	5.3	6.1
Gender Equality Index	61.0	48.6	52.4	68.7	80.1	53.7	62.6

*EU=European Union 27 countries; IPV=Intimate partner violence.

Table 2a. Associations (Odds Ratio and 95% Confidence Intervals) between intimate partner violence (any type of violence and psychological aggression) and individual and city- and country-level covariates (Domestic Violence Against women/men in Europe, 6 European cities, 2010-2011).

	Any type of violence			Psychological aggression		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
<i>Fixed effects</i>						
Individual-level						
Gender (Ref: males)		1.03 (0.86-1.23)	1.03 (0.86-1.23)		1.01 (0.84-1.20)	1.01 (0.84-1.20)
Age		0.97 (0.96-0.98)	0.97 (0.96-0.98)		0.97 (0.96-0.98)	0.97 (0.96-0.98)
Marital status (Ref: single)						
Cohabiting		2.03 (1.51-2.72)	2.06 (1.54-2.76)		2.07 (1.56-2.75)	2.09 (1.57-2.78)
Married		2.46 (1.92-3.16)	2.46 (1.92-3.16)		2.40 (1.88-3.07)	2.41 (1.89-3.08)
Divorced/Separated/Widowed		0.90 (0.66-1.23)	0.90 (0.66-1.23)		0.84 (0.62-1.14)	0.84 (0.62-1.14)
Occupation (Ref : Upper white collar)						
Lower white collar		1.08 (0.85-1.37)	1.09 (0.86-1.38)		1.10 (0.87-1.38)	1.08 (0.86-1.36)
Blue collar		1.06 (0.79-1.43)	1.06 (0.79-1.42)		1.12 (0.84-1.50)	1.09 (0.81-1.45)
Education (Ref : University or similar)						
Secondary		0.78 (0.62-0.97)	0.78 (0.62-0.97)		0.85 (0.68-1.05)	0.85 (0.68-1.05)
Primary or less		1.09 (0.71-1.68)	1.09 (0.71-1.67)		1.23 (0.81-1.88)	1.23 (0.81-1.88)
Social support score		0.98 (0.97-0.99)	0.98 (0.97-0.99)		0.98 (0.97-0.99)	0.98 (0.97-0.99)

City-level						
Unemployment rate (%)						1.05 (1.01-1.08)
Tertiary education (%)						
Country-level						
GINI Coefficient			1.06 (1.01-1.11)			
Social Support Index						
Gender Equality Index						
<i>Random effects</i>						
Between city variance	0.09	0.09	0.04	0.10	0.08	0.03
Proportional change in variance ^a	Ref	-6.1%	-55.6%	Ref	-22.5%	-67.7%
Median Odds Ratio	1.34	1.32	1.21	1.34	1.30	1.18
	<u>(1.16-1.40)</u>	<u>(1.14-1.36)</u>	<u>(1.00-1.26)</u>	<u>(1.05-1.46)</u>	<u>(1.00-1.40)</u>	<u>(1.00-1.21)</u>

Model 1 = null model (only random effects).

Model 2 = Model 1 + individual-level variables.

Model 3 = Model 2 + country and city-level variables.

^ain relation to Model 1

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Table 2b. Associations (Odds Ratio and 95% Confidence Intervals) between intimate partner violence (physical assault and sexual coercion) and individual, city- and country-level covariates (Domestic Violence Against women/men in Europe, 6 European cities, 2010-2011).

	Physical Assault			Sexual Coercion		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
<i>Fixed effects</i>						
Individual-level						
Gender (Ref: males)		0.94 (0.74-1.21)	0.95 (0.74-1.21)		1.16 (0.91-1.47)	1.16 (0.91-1.47)
Age		0.97 (0.96-0.99)	0.97 (0.96-0.99)		0.97 (0.96-0.98)	0.97 (0.96-0.98)
Marital status (Ref: single)						
Cohabiting		1.13 (0.76-1.69)	1.15 (0.77-1.71)		1.03 (0.70-1.53)	1.05 (0.71-1.55)
Married		1.31 (0.94-1.82)	1.31 (0.94-1.83)		1.56 (1.14-2.14)	1.56 (1.14-2.15)
Divorced/Separated/Widowed		1.34 (0.87-2.05)	1.33 (0.87-2.05)		0.93 (0.59-1.45)	0.93 (0.59-1.45)
Occupation (Ref : Upper white collar)						
Lower white collar		1.32 (0.95-1.84)	1.31 (0.94-1.82)		1.05 (0.77-1.43)	1.04 (0.76-1.42)
Blue collar		1.61 (1.08-2.40)	1.56 (1.05-2.33)		1.10 (0.73-1.66)	1.09 (0.72-1.64)
Education (Ref: University or similar)						
Secondary		1.10 (0.81-1.49)	1.09 (0.81-1.49)		0.90 (0.67-1.21)	0.90 (0.67-1.21)
Primary or less		1.84 (1.05-3.20)	1.83 (1.05-3.19)		0.76 (0.39-1.49)	0.76 (0.39-1.50)
Social support score		0.96 (0.95-0.98)	0.97 (0.95-0.98)		0.98 (0.96-0.99)	0.98 (0.96-0.99)

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City-level							
Unemployment rate (%)			1.07 (1.01-1.13)				
Tertiary education (%)							
Country-level							
GINI Coefficient						1.13 (1.01-1.25)	
Social Support Index							
Gender Equality Index							
<i>Random effects</i>							
Between city variance	0.19	0.21	0.09	0.35	0.38	0.21	
Proportional change in variance ^a	Ref	10.6%	-50.4%	Ref	10.6%	-40.1%	
Median Odds Ratio	1.51	1.55	1.34	1.75	1.80	1.54	
	<u>(1.07-1.76)</u>	<u>(1.00-1.82)</u>	<u>(1.00-1.43)</u>	<u>(1.12-1.96)</u>	<u>(1.23-2.08)</u>	<u>(1.00-1.71)</u>	

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Model 1= null model (only random effects).

Model 2=Model 1 + individual-level variables.

Model 3=Model 2 + country and city-level variables.

^ain relation to Model 1

1 Contextual determinants of Intimate Partner Violence: a multi-level analysis in six European cities.

2

3 **ABSTRACT**

4 Objectives: To assess whether city-level characteristics influence the risk of intimate partner violence (IPV)
5 victimization across six European cities. Methods: The DOVE Study included 3496 participants from
6 Athens-Greece, Budapest-Hungary, London-UK, Östersund-Sweden, Porto-Portugal and Stuttgart-
7 Germany. IPV victimization was assessed using the Revised Conflict Tactics Scales and several contextual
8 variables were included: GINI coefficient, gender equality index, an index of social support, unemployment
9 rate and proportion of residents with tertiary education. Multilevel models were fitted to estimate the
10 associations (Odds ratio, 95% Confidence Intervals) between each type of victimization and contextual and
11 individual-level variables. Results: 62.3% of the participants reported being a victim of IPV during the
12 previous year, with large between-city differences (53.9%-72.4%). Contextual variables accounted for a
13 substantial amount of this heterogeneity. Unemployment rates were associated with psychological (1.05,
14 1.01-1.08) and physical IPV (1.07, 1.01-1.13). GINI coefficient showed a positive association with any
15 form of IPV (1.06, 1.01-1.11) and sexual coercion (1.13, 1.01-1.25). Conclusions: We found significant
16 associations between contextual determinants and IPV, which emphasizes the importance of considering
17 contextual socioeconomic conditions when policy measures are designed to address IPV.

18 **Keywords:** Intimate Partner Violence; Inequalities; Multilevel analysis; Socioeconomic factors; Social
19 Support.

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31 INTRODUCTION

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33 Intimate Partner Violence (IPV) is a major public health problem placed by the Global Burden of
34 Disease Study in the 16th position among risk factors for Disability Adjusted Life Years. According to
35 WHO estimates (Organization. 2013), there are, ~~among other factors,~~ geographical and cultural differences
36 in IPV victimization, with prevalence rates ranging from 23.2% in high-income countries to 37.7% in low-
37 and middle-income countries. Similarly, in Europe, a large between-city variation in the prevalence of
38 victimization has been reported (Costa, Soares, Lindert et al. 2015). These differences may be partially
39 explained by individual-level determinants, although the importance of the context is increasingly
40 recognized (Capaldi, Knoble, Shortt et al. 2012). Thus, an ecosocial model that conceptualizes violence as
41 a multifaceted phenomenon grounded in an interplay among personal, situational, and sociocultural factors
42 would contribute to better understand IPV (Heise and Kotsadam 2015; VanderEnde, Yount, Dynes et al.
43 2012).

44 Theories explaining geographical and other contextual variation in violence are mostly grounded
45 in social disorganization theory. Accordingly, communities characterized by socioeconomic deprivation
46 (high levels of unemployment, poverty, low levels of education) are constrained to organize for the common
47 good, which diminishes the community's capacity to regulate crime (Shaw and McKay 1942; Wickes
48 2017). Deprived communities are also less likely to ~~have informal and formal~~ have social support networks
49 to help regulate intimate partner violence occurrence (Shaw and McKay 1942; Wickes 2017). Besides,
50 community social structure was shown to be a marker of social processes that accompany socioeconomic
51 development, namely those related with income and gender-equity, ~~-including erosion of social norms~~
52 supporting male authority and higher social/economic participation among women, and a more equitable
53 income distribution (Heise and Kotsadam 2015).

54 Some of these theoretical models were transported to IPV research and were confirmed by
55 empirical investigations. For instance, community and regional-level poverty and unemployment rates were
56 found to be positively associated with ~~neighbourhood IPV prevalence and individual~~ IPV risk (Bonomi,
57 Trabert, Anderson et al. 2014; Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015; VanderEnde, Yount,
58 Dynes et al. 2012; Vyas and Heise 2016). -Similarly, lower city-levels of education were also linked with
59 increased risk of psychological abuse among ~~European elderly from seven European cities,~~ although no
60 association was observed with income inequality (Fraga, Lindert, Barros et al. 2014). High gender

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61 inequality, including societal norms supporting male authority ~~over women~~ and discriminatory ownership
 62 rights, has also been related with increased ~~population-levels of IPV across countries~~ (Heise and Kotsadam
 63 2015) and reduced the ability of the victims leave abusive relations and/or seek support (Etienne G. Krug
 64 2002). And, finally, the idea that community levels of interpersonal trust, cohesion and strong social ties
 65 may protect citizens against IPV was supported by US studies that showed neighbourhood collective
 66 efficacy (social cohesion among neighbors) ~~measured at neighbourhood level~~ was associated with lesser
 67 violent crime (Sampson, Raudenbush and Earls 1997).

68 Despite this accumulated knowledge, it is important to highlight that research on IPV still
 69 overlooks the role of contextual factors (Heise and Kotsadam 2015), paying much more attention to the
 70 role of personal and relational factors. -Addressing the role of community- and macro-level determinants is
 71 helpful for improving our explanatory models about IPV and ~~utterly important~~ for planning and
 72 implementing public health programs (Heise and Kotsadam 2015).

73 Using data from the multicenter European project Domestic Violence Against women/men in
 74 Europe—prevalence, determinants, effects, and policies/practices (DOVE), the present study aimed to
 75 assess whether country- and city-level characteristics, namely socioeconomic circumstances, gender and
 76 income inequality as well as levels of social support, influence the risk of victimization across six European
 77 cities.

78

79 METHODS

80

81 *Study design and ~~p~~Participants*

82 This study used data from the DOVE Project, funded by the European Commission, with the
 83 Contract Number 20081310 (Costa, Soares, Lindert et al. 2013). The DOVE Project collected data from
 84 3496 non-institutionalized adults (18–64 years) sampled from the general population of six European cities:
 85 Athens–Greece, Budapest–Hungary, London–United Kingdom, Östersund–Sweden, Porto-Portugal and
 86 Stuttgart–Germany. Sites were selected based on previous collaboration, and to represent geographical and
 87 cultural diversity across Europe (Costa, Soares, Lindert et al. 2015; Lindert, de Luna, Torres-Gonzales et
 88 al. 2013; Matanov, Tulloch, Priebe et al. 2012).

89 ———Samples were proportionally stratified according to age and sex. ~~The sampling strategies included~~
 90 ~~registry based and random digit dialing (Porto), random route (Athens and Budapest), registry based~~

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91 ~~(Stuttgart and Östersund) and registry-based and via public approach (London).~~ The study design and
92 sampling strategy has been described in detail elsewhere (Costa, Soares, Lindert et al. 2015; Costa, Soares,
93 Lindert et al. 2013).

94 Information related to socio-demographic and lifestyle factors, health care use, intimate partner
95 violence and social support was collected through structured questionnaires. Data collection was carried
96 out between September 2010 and May 2011 ~~after ethical approval in each country.~~

97 The study protocol was approved by the local Institutional Research Ethics Committees. The
98 World Health Organization (WHO) ethical and safety guidelines ~~(Ehlsberg and Heise 2002)~~ were followed
99 to ensure privacy and safety of the participants and interviewers.

101 *Victimization outcomes*

102 IPV victimization was assessed using the Revised Conflict Tactics Scales (CTS2) (Straus, Hamby,
103 Boney-McCoy et al. 1996), ~~originally developed in English, and available in German, Portuguese and~~
104 ~~Swedish validated versions. Translations to Greek and Hungarian followed a standard protocol including~~
105 ~~forward translation, expert panel revision, back translation, new expert panel revision and piloting.~~ Four
106 subscales of the ~~CTS2 Revised Conflict Tactics Scales~~ were used to assess victimization in past year,
107 considering a current or former intimate partner: psychological aggression (8 items – e.g. "My partner called
108 me fat or ugly"), physical assault (12 items – e.g. "My partner twisted my arm or hair"), sexual coercion (7
109 items - e.g. "My partner insisted on have sex with me when I did not want to") and injury (6 items – e.g. "I
110 had a broken bone from a fight with my partner"). ~~—~~ Ever-partnered included those in a dating,
111 cohabiting/marital relationship that lasted more than one month. Cronbach alpha ~~(internal consistency of~~
112 ~~the CTS2)~~ in the global sample was 0.90 (from 0.83 in Budapest to 0.96 in London). Respondents who
113 have referred at least one act of violence were considered a victim. In the present study we only considered
114 psychological aggression, physical assault and sexual coercion. Injury was excluded from our analysis
115 because the number of injury victims (n=155) did not allow multilevel models to converge, thus preventing
116 this type of inference.

118 *Individual-level variables*

119 We have considered the following variables in the analysis: sex, age, education, marital status,
120 occupation and social support. Education levels were categorized as primary education or less (equal or

121 less than 9 years of schooling), secondary education (10-12 years of schooling) and university (more than
 122 12 years of schooling). Occupations were classified as upper white collar, lower white collar and blue collar
 123 following the International Standard Classification of Occupations. Marital status was classified as
 124 cohabiting, married, divorced/separated/widowed and single.

125 Social support was assessed with the Multidimensional Scale of Perceived Social Support (Zimet,
 126 Dahlem, Zimet et al. 1988). The scale encompasses 12 questions (graded 1-7) with components of support
 127 from family, friends and others. High scores correspond to high perceived social support. The
 128 Multidimensional Scale of Perceived Social Support was translated, culturally adapted, and validated for
 129 the countries under study (Dambi, Corten, Chiwaridzo et al. 2018). Cronbach alpha for this scale was 0.94.

130

131 *Contextual variables*

132 The selection of the contextual variables was made after a literature review of the contextual
 133 determinants of violence (Bonomi, Trabert, Anderson et al. 2014; Fraga, Lindert, Barros et al. 2014; Heise
 134 and Kotsadam 2015; Sampson, Raudenbush and Earls 1997; Sanz-Barbero, Vives-Cases, Otero-Garcia et
 135 al. 2015; VanderEnde, Yount, Dynes et al. 2012; Vyas and Heise 2016). ~~All variables report to the year of~~
 136 ~~2010, the year when DOVE data were collected.~~ Based on that review, we selected the following variables
 137 at city-level, from 2010, obtained from the national statistics offices: proportion of unemployed individuals
 138 and proportion of individuals with tertiary education. Although we acknowledge that substantial variation
 139 between communities in the same country or culture may exist, due to the lack of official and harmonized
 140 information at city-level, we used the following indicators at country-level: the GINI coefficient (from the
 141 year 2010; range: 0-1); the gender equality index (year 2010) and a summary index of contextual social
 142 support that was created specifically for this study (based on 2010 data from the European Social Survey,
 143 ESS, round 5).

144 The GINI coefficient is a measure of income inequality, and it was retrieved from the EUROSTAT.
 145 The greater the coefficient, the greater the income inequality. Although GINI index at city-level was
 146 previously calculated for London (www.centreforcities.org) and for Athens (www.athenssocialatlas.gr), we
 147 opted to use nationwide measures of GINI to guarantee cross-national comparability and to avoid having a
 148 combination of city and country-level GINI estimates.

149 The gender equality index was extracted from the European Institute for Gender Equality (EIGE
 150 2015). This index covers several domains – work, power, violence, money, time, knowledge and health –

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151 and measures the gender gap between women and men in the European Union, ranging from 1 for total
152 inequality to 100 for full equality.

153 The summary index of contextual social support was computed using ~~data~~ the following variables
154 from ~~the European Social Survey (ESS) more specifically the following variables~~: ‘most people can be
155 trusted or you can’t be too careful’, ‘most people try to take advantage of you, or try to be fair’, ‘most of
156 the time people helpful or mostly looking out for themselves’, ‘trust in the legal system’, ‘trust in the police’,
157 ‘trust in the politicians’, ‘how often socially meet with friends, relatives or colleagues’, ‘anyone to discuss
158 intimate and personal matters with’, ‘how much time during past week you felt lonely’. These ESS variables
159 were selected because these were related with the concept of social support, presented in the introduction.

160 ———In most ~~eases~~ of these variables (‘most people can be trusted or you can’t be too careful’, ‘most
161 people try to take advantage of you, or try to be fair’, ‘most of the time people helpful or mostly looking
162 out for themselves’, ‘trust in the legal system’, ‘trust in the police’, ‘trust in the politicians’), the respondents
163 could select one value in an ordinal 0-10 scale, where the first category was the worst option and the last
164 the best. For instance, in the question ‘most people can be trusted or you can’t be too careful’, 0
165 corresponded to ‘you can’t be too careful’ and 10 to ‘most people can be trusted’. To obtain a summary
166 score for each variable, we multiplied each value (0-10) by the proportion of the respondents and then we
167 summed the products, leading to a weighted score.

168 ———In the case of the last three variables (‘how often socially meet with friends, relatives or
169 colleagues’, ‘anyone to discuss intimate and personal matters with’, ‘how much time during past week you
170 felt lonely’), we converted them into a 0-10 scale, grading the possible options from the worst (0) to the
171 best options (10) and giving intermediate values to the remaining answers. The summary score was then
172 computed as before. Finally, the social support index for each country was derived by calculating the
173 arithmetic average of all the previously obtained weighted summary scores.

174

175 *Statistical analysis*

176 Firstly, a correlation matrix was created to investigate the presence of multicollinearity between
177 contextual variables (Figure 1). The variables measuring the same dimension that showed strong and
178 significant autocorrelation (Spearman's ρ larger than 0.8) were excluded from the analysis: GDP per
179 capita and proportion of population at-risk-of-poverty.

180 Then, a two-level multilevel model (individual-level and city-level) was fitted ~~as in other studies~~
181 ~~(Fraga et al 2014; Costa et al 2018)~~. For each type of victimization, three sequential models were built. The
182 first model included only the random effect (Model 1); the second model included the random-effect and
183 the individual-level variables (Model 2); and in the third model we added the city- and country-level
184 variables (Model 3). In the third model we included only contextual covariates that were associated with
185 victimization in bivariate models (each contextual variable at each time plus random effect and individual-
186 level variables, Model 0 not shown). Odds ratios (OR) and their respective 95% confidence intervals (CI)
187 were computed to measure the association between each type of victimization and the different variables
188 measured at contextual and individual-level. The presence of interactions was evaluated by including
189 interaction terms between sex, education and contextual variables. No interactions ~~effects~~ were observed.

190 This three-model approach allowed us to quantify the amount of between-city variability in each
191 outcome (Model 1), and how much of this variation was explained by individual-level (Model 2) and
192 country or city-level variables (Model 3). For this quantification, we computed the proportional change in
193 variance from Model 1 to Model 3. The median odds ratio (MOR) [and the corresponding bootstrap 95% CI](#)
194 (Austin and Leckie 2020) ~~were~~ also calculated to quantify the magnitude of variability between cities. ~~It~~
195 ~~can be conceptually described as quantifying the variation between clusters (second level variation) by~~
196 ~~comparing two individuals from two randomly chosen different clusters (Larsen and Merlo 2005; Merlo,~~
197 ~~Chaix, Ohlsson et al. 2006). In other words, considering two participants with the same characteristics,~~
198 ~~chosen randomly from two different cities, the MOR denotes the median value of the OR between someone~~
199 ~~in the city with the highest risk of IPV and someone in a city with the lowest risk.~~ When the MOR is equal
200 to one it means there are no differences between cities. The MOR can be conceptualised as the increased
201 risk that (in median) would have if moving to another area with a higher risk (Larsen and Merlo 2005;
202 Merlo, Chaix, Ohlsson et al. 2006).

203 ———Statistical analysis was performed using R version 3.3.3 and the package ‘lme3’.

206 RESULTS

207
208 Table 1 shows the characteristics of participants and contextual indicators. Among the 3496
209 participants from one town in each of six European countries, 58% were women, the average age was 42.2

210 years and 62.3% of participants reported being a victim of IPV in the previous year. There were no
211 significant differences in the prevalence of IPV victimization by genders.

212 Prevalence of victimization varied according to the city of residence and form of violence. Athens
213 (72.4%) and London (68.6%) were the cities with the highest prevalence of IPV victimization while
214 Östersund (55.8%) and Budapest (53.9%) had the lowest prevalence. Psychological aggression was the
215 more prevalent type of IPV across the six European cities, with an overall prevalence of 58.1%, ranging
216 from 71.5% in Athens to 49.8% in Porto.

217 Tables 2a and 2b present the results from the multilevel logistic regression according to each type
218 of IPV. Model 1 (first column in tables 2a and 2b), corresponds to the empty model with the random-effect
219 but without covariates. The MOR, higher than 1 (1.34 for any type; 1.34 for psychological aggression; 1.51
220 for physical assault and 1.75 for sexual coercion), shows that there are substantial between-city differences
221 in IPV.

222 Model 2 includes the random-effect and the individual-level variables. As depicted in Tables 2a
223 and 2b, overall, married and cohabiting participants were more likely to be victim of psychological and any
224 form of IPV. People with primary education and blue-collars were also more likely to be victims of physical
225 violence. On the other hand, high scores of social support were associated with less victimization
226 prevalence of all types of violence.

227 In the final model (Model 3 in tables 2a and 2b) we expanded Model 2 by incorporating country-
228 level variables such as the GINI coefficient and city-level variables such as unemployment rate. Participants
229 from cities with higher income inequality, expressed by the GINI coefficient, presented significantly higher
230 odds of victimization of any type of IPV (OR = 1.06, 95% CI 1.01-1.11) and of sexual coercion (~~OR=~~1.13,
231 ~~95% CI~~ 1.01-1.25). Those from cities with higher unemployment rates presented higher odds of
232 victimization of psychological (~~OR=~~1.05, ~~95% CI~~ 1.01-1.08) and physical IPV (~~OR=~~1.07, ~~95% CI~~ 1.01-
233 1.13). Social Support Index, calculated at a country-level, was unrelated with IPV victimization, regardless
234 the form (results not shown). Similarly, no significant associations were observed with the gender equality
235 index and the percentage of residents with tertiary education (results not shown).

236 Incorporating contextual variables describing the city and country environment led to a decrease
237 in the between-city variance in IPV for any type of IPV (-55.6%), psychological aggression (-67.7%),
238 physical assault (-50.4%) and sexual coercion (-40.1%), respectively.

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248 DISCUSSION

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250 Our study showed a significant association between some contextual determinants and the
251 likelihood of being victim of IPV in six European cities, ~~even after accounting for well-known individual-~~
252 ~~level factors, such as age, gender, social and economic factors.~~ City-level unemployment rate was related
253 with higher odds of being a victim of psychological aggression and physical assault in the past year. And
254 the GINI coefficient, a well-known measure of economic inequality, was associated with increased risk of
255 overall IPV and sexual coercion.

256 Our results confirm previous findings on the association between city-level unemployment rates
257 and the risk of psychological aggression and physical assault. Living in neighbourhoods with higher
258 unemployment rates has been associated with higher ~~neighbourhood IPV prevalence and individual-IPV~~
259 risk (Gage 2005; O'Campo, Gielen, Faden et al. 1995; Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015;
260 VanderEnde, Yount, Dynes et al. 2012; Vyas and Heise 2016). In Spain, the likelihood of IPV was shown
261 to be 81% higher among women living in a region with a high male unemployment ~~than their counterparts~~
262 ~~living in a region with low unemployment~~ (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015). Several
263 mechanisms may explain this association. High levels of unemployment may increase stress and frustration
264 (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015) due to the inability to get a job and to meet social
265 expectations, and may lead to unhealthy coping behaviours, such as alcohol consumption, which have been
266 associated with IPV (Caetano, Ramisetty-Mikler and Harris 2010).

267 Additionally, we observed a positive and significant association between the country's GINI
268 coefficient and IPV (any type and sexual coercion), i.e., living in countries with high levels of income
269 inequality was associated with increased ~~risk-odds~~ of IPV. This result is also in accordance with the

270 published literature (Sanz-Barbero, Vives-Cases, Otero-Garcia et al. 2015). In Spain, it was also found that
271 women living in regions with higher Gini Index have higher odds of IPV (Sanz-Barbero, Vives-Cases,
272 Otero-Garcia et al. 2015). Income inequality has been linked with numerous health outcomes. Indeed,
273 previous work has identified associations between income inequality and homicides –and child abuse
274 (Wilkinson and Pickett 2008). The unequal distribution of material resources may lead to feelings of
275 distrust, stress and social defragmentation, which, in turn, may increase IPV and other forms of violent
276 behaviour (Wilkinson and Pickett 2006). –A plausible mechanism that link income inequality and violence
277 is psychosocial stress: inequality generates stress when individuals become aware of their social position,
278 which, in turn, may increase violence (Wilkinson 2004).

279 There are several theoretical frameworks to explain IPV, but there is limited research describing
280 the theoretical frameworks underscoring epidemiological investigation on IPV determinants. Our results
281 find support in the ecosocial theory (Krieger 2012), whose central focus is on the embodiment of exposures
282 arising from societal and ecological context, and in the social disorganization theory according to which
283 social disadvantage diminishes the community’s capacity to regulate the occurrence of crime (Shaw and
284 McKay 1942; Wickes 2017).

285 The observed relation between IPV and structural socioeconomic indicators also has important
286 policy implications. These indicators explained a considerable amount of the between-city differences in
287 IPV, which suggests European and state governments should develop policies towards the reduction of the
288 gap between the most and the least disadvantaged, especially since income inequality persist in Europe and
289 some regions did even show an increase in the income gap –over the last decade. Similarly, labour market
290 policies must tackle unemployment and support those in need with adequate financial aid and training
291 programs (Silva-Martínez, Stylianou, Hoge et al. 2016).

292 Regarding individual-level determinants, we identified that characteristics, such as age, marital
293 status, occupation, education and social support were related with victimization. Those who were younger,
294 married or cohabiting, occupied in blue-collar professions, and with no university degree presented higher
295 risk of victimization. We did not find gender differences in IPV victimization. While most studies suggest
296 that women are more likely to suffer from IPV, this finding is consistent with prior studies on the topic
297 (Straus 2012). Costa and co-authors found few significant sex-differences within European cities (Costa,
298 Soares, Lindert et al. 2015). Likewise, a Swedish study demonstrated that past-year IPV exposure rates
299 were similar in women and men (Nybergh, Taft, Enander et al. 2013). The same is true for older adults,

300 with male abuse being under-recognized, under-detected and under-reported (Melchiorre, Di Rosa, Lamura
301 et al. 2016). These findings are in accordance with theories of social roles that explain similarities in male
302 and female IPV as a result of the evolving gender equality of western societies (Archer 2009). Yet it is
303 important to refer that, while we did not study such outcomes, it is possible that gender differences in IPV
304 severity and type of acts exist. We found that people experiencing higher levels of social support presented
305 a lower risk of being victim of IPV. Social support has been shown to prompt people to make a firm decision
306 to leave an abusive relationship (Rose, Campbell and Kub 2000). While at individual level high education
307 levels were significantly associated with reduced risk of IPV victimization, as found in previous studies
308 (Dias, Costa, Soares et al. 2018), at the city-level, tertiary education did not seem to influence IPV. This
309 contrasts with Fraga et al. study (Fraga, Lindert, Barros et al. 2014), which observed that the proportion of
310 residents with tertiary education influenced the risk of psychological abuse among European elderly ~~from~~
311 ~~seven European cities~~. Yet, this comparison is not straightforward, as the influence of education and other
312 socioeconomic variables may be different with ageing or interact with a different set of cohort and period
313 effects.

314 Although individuals experiencing higher levels of social support seem to be at lower risk of
315 victimization and more likely to seek adequate help and to leave abusive relationships (Dias, Costa, Soares
316 et al. 2018), our results showed no significant association between contextual-level social support and IPV
317 victimization. It is possible that social support operates at a different geographical or social level (Poortinga
318 2006), such as the neighbourhood, and not so much at the state-national level ~~as the variable we used~~. As
319 stated by Poortinga (Poortinga 2006), even if a country has high levels of social capital (a broader construct
320 that includes social support), not all citizens benefit from it; beneficial effects of social capital may only
321 apply to more trusting and socially active individuals. To distinguish between compositional (individual-
322 level) and contextual (city/country-level) effects, we used a multi-level analysis. Yet, it is important to refer
323 that, although contextual factors may impact IPV, they still need to be experienced by the individuals for
324 IPV to occur. Individual and contextual level variables are not mutually exclusive; rather they interact with
325 each other in order to influence the outcome (Macintyre, Ellaway and Cummins 2002).

326 The present study has a number of limitations that must be discussed. Firstly, due to its cross-
327 sectional nature it precludes direct causal inferences. Second, ideally all contextual indicators should have
328 been measured at the city-level. Yet, due to data unavailability, the GINI coefficient and other covariates
329 were measured at country-level. It is possible that these measures may not accurately represent participants'

330 context. Specifically, because levels of gender/income inequality and social support may vary within
331 countries and between cultures, results must be interpreted with cautious. Third, we did not analyse other
332 potential contextual correlates of IPV, such as those related with violence-protection policies, which could
333 contribute to further explain between-city differences in IPV. Fourth, due to the statistical power limitations
334 caused by the number of injury victims and subsequent problems with model convergence, injury was
335 excluded from our analysis. Yet, we acknowledge that it is a very relevant outcome, associated with well-
336 known psychosocial and physical consequences. ~~Forthcoming multilevel studies, with larger samples sizes,~~
337 ~~should address contextual determinants of injury victimization.~~ Finally, one important methodological
338 consideration is that IPV data was self-reported using the ~~Revised Conflict Tactics Scale questionnaire~~
339 ~~(CTS2 questionnaire)~~. Although this scale has been validated for the use in cross-cultural and cross-national
340 studies and is one of the most widely used to measure of IPV, the CTS2 has been criticized for not
341 measuring context related features of IPV and only counting acts of violence (Straus 2012). Therefore, it is
342 possible that interpretation of the questions differs between countries despite all efforts for cultural
343 validation and that can, in part, explain some of the between-country differences that we observed.

344 ~~Despite these limitations,~~ Our study has several strengths as well. It contributes to the
345 understanding of the ecological determinants of IPV, and to highlight the importance of macro-level
346 socioeconomic circumstances, ~~such as unemployment and income inequality,~~ as drivers of IPV. And, we
347 considered several European cities, representing various geographic regions and cultures, maximizing our
348 capacity to generalize our findings.

349 In conclusion, and as theorized in the introduction, our findings highlight the importance of
350 adopting an ecosocial framework to better understand IPV, as we found that both individual- and
351 contextual-level factors influence IPV victimization. Our results showed that much of the between-country
352 differences in the prevalence of IPV can be attributed to the contextual determinants, suggesting that
353 changing individual aspects may not be enough to prevent IPV especially if individuals remain in
354 environments characterized by poor socioeconomic conditions as such unemployment and income
355 inequality. To understand IPV victimization, it is important to look beyond individual-level drivers of
356 violence and to adopt an ecosocial approach that acknowledged the influence of personal, situational and
357 macro-level factors. Besides, our findings convey an important political message and suggest that policies
358 could help to reduce IPV by addressing and improving structural economic variables.

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482 Figures

483 Fig 1 – Correlation matrix of the ecological variables (Spearman correlation coefficients) (Domestic
484 Violence Against women/men in Europe, 6 European cities, 2010-2011).

485

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ABSTRACT

Objectives: To assess whether city-level characteristics influence the risk of intimate partner violence (IPV) victimization across six European cities. Methods: The DOVE Study included 3496 participants from Athens-Greece, Budapest-Hungary, London-UK, Östersund-Sweden, Porto-Portugal and Stuttgart-Germany. IPV victimization was assessed using the Revised Conflict Tactics Scales and several contextual variables were included: GINI coefficient, gender equality index, an index of social support, unemployment rate and proportion of residents with tertiary education. Multilevel models were fitted to estimate the associations (Odds ratio, 95% Confidence Intervals) between each type of victimization and contextual and individual-level variables. Results: 62.3% of the participants reported being a victim of IPV during the previous year, with large between-city differences (53.9%-72.4%). Contextual variables accounted for a substantial amount of this heterogeneity. Unemployment rates were associated with psychological (1.05, 1.01-1.08) and physical IPV (1.07, 1.01-1.13). GINI coefficient showed a positive association with any form of IPV (1.06, 1.01-1.11) and sexual coercion (1.13, 1.01-1.25). Conclusions: We found significant associations between contextual determinants and IPV, which emphasizes the importance of considering contextual socioeconomic conditions when policy measures are designed to address IPV.