

# Neighbourhood context and abuse among immigrant and non-immigrant women in Canada: findings from the Maternity Experiences Survey

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## Abstract

**Objectives** To examine the relationship between neighbourhood deprivation and concentration of immigrants, and abuse among immigrant women versus non-immigrant women.

**Methods** Using data from the Canadian Maternity Experiences Survey (un-weighted sample  $N = 5,679$  and weighted sample  $N = 68,719$ ) linked to the neighbourhoods Census data, we performed contextual analysis to compare abuse prevalence among: immigrants  $\leq 5$  years, immigrants  $> 5$  years and Canadian-born. We identified two level effect modifiers: living in high ( $\leq 15\%$  of

households at or below low-income cut-off- [LICO]) versus low-income ( $> 15\%$  below LICO) neighbourhoods and living in high ( $\geq 25\%$ ) versus low immigrant ( $< 25\%$ ) neighbourhoods. Individual socioeconomic position (SEP), family variables and neighbourhood SEP or percentage of immigrants were considered in different logistic regression models.

**Results** Immigrant women were less likely to experience abuse even upon adjustment for individual SEP, family variables and neighbourhood characteristics. The protective effect of the neighborhood was stronger among immigrant women living in low-income and high immigrant neighborhoods, irrespective of length of stay in Canada.

**Conclusion** Policies and interventions to reduce abuse among immigrant women need to consider neighbourhood's SEP and concentration of immigrants.

**Keywords** Abuse against women · Abuse during pregnancy · Violence · Immigrant women · Canada · Neighbourhood socioeconomic position · Neighbourhood immigrant concentration

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## Introduction

Over the last two decades, growing interest among health researchers in socioecological environments (Berkman and Kawachi 2003) has led to the study of neighbourhood socioeconomic position (SEP) and partner violence beyond individual SEP (Frye and O'Campo 2011). This work indicates that abuse is higher in low-income neighbourhoods (Frye and O'Campo 2011). Immigrants tend to concentrate in low-income neighbourhoods, at least upon their arrival to the host country (Alba et al. 2000). Living in

such environments might further intensify abuse against immigrant women, who are more socially vulnerable than non-immigrant women (Menjívar and Salcido 2002). Conversely, other studies have shown that the concentration of immigrants in neighbourhoods can be protective for immigrant's health (Be'cares et al. 2011; Helpren and Nazroo 1999). However, no previous studies have examined the influence of neighbourhood context on abuse among immigrant women.

Despite conflicting evidence (Taillieu and Brownridge 2010), with some studies showing high (Raj and Silverman 2002; Vives-Cases et al. 2010), and others showing low abuse among immigrant as compared to non-immigrant women (Cohen and Maclean 2003; Tjaden and Thoennes 2000), social vulnerability, especially of recent immigrant women, places them at higher risk of abuse (Midlarsky et al. 2006). A range of factors are linked to high risk of abuse among immigrant women: economic difficulties, having children and being unmarried (Vives-Cases et al. 2010); lack of social support and social networks (Menjívar and Salcido 2002); lack of knowledge and access to social services (Das Dasgupta 2000); male domination and patriarchy (Ahmad et al. 2004).

In addition to these individual level risk factors, neighbourhood context can also be relevant to the prevalence of abuse among immigrant women. However, knowledge of the mechanism by which neighbourhood context can influence abuse is unclear (Cunradi et al. 2011). The social disorganization hypothesis on abuse in neighbourhoods (Browning 2002) posits that a neighbourhood's ethnic heterogeneity, poverty and low collective efficacy are highly predictive of neighbourhood violence that could increase abuse against women. Yet, these effects might work differently for immigrant women compared to non-immigrant women, as a high concentration of immigrants in specific areas has been shown to have protective effects from crime and violence on immigrants (Feldmeyer 2009). This concentration has been associated with lower alcohol use (Be'cares et al. 2009), which is linked with abuse in neighbourhoods (Cunradi et al. 2011); it has buffering effects from discrimination and racism (Be'cares et al. 2009); and has been associated with better mental health (Helpren and Nazroo 1999).

In the current paper, we examine the following two possibilities: that high proportions of low-income households in a neighbourhood may increase abuse against immigrant women, as demonstrated in past studies for non-immigrant women (Frye and O'Campo 2011), and that, conversely, a high concentration of immigrants in a neighbourhood might be protective for immigrant women, as larger minority population neighbourhoods decrease negative attitudes toward minorities who live there (Be'cares et al. 2009; Ray and Preston

2009). These high immigrant concentration neighbourhoods have been associated with less discrimination (Hunt et al. 2007) and can provide social support through social networks, informal social institutions, vernacular information, familiar cultural practices and trust (Hou and Wu 2009). Immigrant women in low immigration neighbourhoods might feel less protected from abuse, as living in low racial composition neighbourhoods is associated with higher perceived discrimination among minority women (Hunt et al. 2007). This protective effect might differ by the length of stay in the host country (Hyman et al. 2006).

We aimed to examine the relationship between neighbourhood deprivation and abuse among immigrant women versus non-immigrant women; to explore if this association differs by length of stay in the host country; (Hyman et al. 2006) and to determine what happens to the relationship after controlling for individual socioeconomic position (SEP) and other confounders (age and marital status) (Saltzman et al. 2003). Despite the previous research suggesting strong associations between low income and percentage of immigrants in the neighbourhood (Alba et al. 2000) that might lead to effect modification for neighbourhood low income and high immigration and abuse, we stratified the neighbourhoods in our analyses by percentage below low-income cut-off (LICO) point and by percentage of immigrants in the neighbourhood to examine the influence of each of these neighbourhood characteristics separately.

## Methods

### Data

This project performed secondary analysis of data from the Canadian Maternity Experiences Survey (MES), a nationwide survey conducted in 2006–2007 that examined Canadian women's perceptions, knowledge and practices, before conception, during pregnancy, at delivery, and in the postnatal period (Dzakpasu et al. 2008). The MES study population of 8,542 women was selected from the 2006 Canadian Population Census using stratified random sampling without replacement. Of this number, an estimated 8,244 women met the eligibility criteria of being 15 years of age or older, having had a singleton live birth and living with their baby at the time of data collection (Dzakpasu et al. 2008). After applying survey weights, the 6,421 respondents (78 % response rate) represent 76,508 women in the population. Non-response was mainly due to inability to establish contact. After mailing an introductory letter and survey pamphlet to the women inviting them to participate, data were collected through a

telephone interview conducted 5–9 months after delivery and lasted 45 min. The current analysis included unweighted a sample of 5,679 (weighted sample = 68,719) immigrant and Canadian-born non-Aboriginal mothers (here after Canadian-born); this latter group was determined to be the most appropriate comparison for the immigrant women.

The MES project was presented to Health Canada's Science Advisory Board, Health Canada's Research Ethics Board and the Federal Privacy Commissioner and was approved by Statistics Canada's Policy Committee (Dzakpasu et al. 2008). Approvals for this analysis were obtained from the St. Michael's Hospital Research Ethics Board and the Research Data Centre Access Granting Committee of Statistics Canada.

Data on neighbourhood SEP were obtained from 2006 Census data on small areas called dissemination areas (DAs). A DA is composed of one or more neighbouring blocks with a population of 400–700 persons, the smallest standard geographic area for which Census data are disseminated. To connect Census tract data to the MES data, each mother's address was linked to the Postal Code Conversion File (PCCF) from 2006 using a postal code identifier that connects the postal code of each participant and the standard 2006 Census geographic areas (Statistics Canada 2011). Only one woman was interviewed for the MES in each DA.

### Measures

**Any abuse** Women were asked 10 questions adapted from the Violence Against Women Survey (Statistics Canada 1993) to determine if they had suffered abuse. The questions probed whether in the 2 years prior to the interview: “a spouse or partner or anyone else” had committed “acts of physical or sexual violence” and “if they were threatened with being hit; had something thrown at them that could have resulted in injury; were pushed, grabbed or shoved in a way that could have resulted in injury; were slapped; were kicked or bit; were hit with a weapon; were beaten; were choked; were threatened with gun or knife or had one used on her; and were forced into unwanted sexual activity.” A “yes” response to any of these items was categorized as any abuse.

### Immigration status

Mothers were asked whether they had been born in Canada. Foreign-born mothers were asked to indicate the year they had first come to live. We categorized immigrant women's length of time in Canada into two groups:  $\leq 5$  years and  $> 5$  years. We used a reference group of Canadian-born, non-Aboriginal women since the unique situation of

Aboriginal women in the MES sample might confound the associations between SEP and abuse.

### Neighbourhood characteristics

Neighbourhood SEP was determined by income and concentration of immigrants:

(a) Percentage of the population below LICO in two categories: high-income neighbourhoods ( $\leq 15\%$  of households below LICO) and low-income neighbourhoods ( $> 15\%$  of households below LICO). LICO identifies households that spend 20 % points or more of their before tax income than the average family of a given size in a given geographic area on food, shelter and clothing (Statistics Canada. Public Health Agency of Canada 2006; Statistics Canada 2006b).

(b) Percentage of immigrants in the neighbourhood, dichotomized into two categories: low immigrant ( $< 25\%$  of the population) and high immigrant (25 % or more of the population) neighbourhoods.

### Individual socioeconomic position (SEP)

The SEP variables included educational attainment (less than high school, high school, postsecondary or university diploma), employment (paid job, caring for children and household, or other), and household income ( $< 20$  K, 20–49.9 K, 50–79.9 K, 80+ K, or unknown).

### Family variables

Two family variables, social support and marital status, were used in this study. The woman's rating of social support received during pregnancy (little, none or some, most of the time) was used as a proxy for social support in general, while marital status was dichotomized into two categories: single, divorced, widowed, separated; and married and common law.

### Data analysis

We did contextual analysis (Diez Roux 2002) after combining the MES data and the Census data on the neighbourhoods from the same year (2006). The MES used a stratified sampling and unequal probabilities of selection of respondents. To obtain unbiased point estimates representative of the Canadian population, data analysis was conducted using the survey weights to account for unequal probabilities of selection of respondents. Estimates of proportions and odds ratios (with 95 % confidence intervals) of any abuse were weighted and calculated using the Taylor Series method of variance estimation (SAS Institute Inc. SAS/STAT<sup>®</sup> 9.2). The Taylor series method obtains a

linear approximation for the estimator and then uses the variance estimate for this approximation to estimate the variance of the estimate itself. When the sample's design is stratified, the procedures pool stratum variance estimates to compute the overall variance estimate (SAS Institute Inc. SAS/STAT® 9.2).

The prevalence of any abuse was examined and compared in a series of multivariable logistic regression models. We first examined associations between abuse and high ( $\leq 15\%$  below LICO) versus low- ( $> 15\%$  below LICO) income neighbourhoods. Then, stratifying by neighbourhood income, we examined several different models within each strata to study the association between immigration status (immigrant  $\leq 5$  years, immigrant  $> 5$  years and Canadian-born) and abuse. Although we present the crude model first, our three models adjust for the following variables separately: (1) individual SEP (education, household income and employment), (2) social support and marital status and (3) percent of immigrants in the neighbourhood. The final model includes all of the variables simultaneously. All regression models are adjusted for age, as it is a confounding variable (Taillieu and Brownridge 2010). These models were repeated when stratifying for percentage of immigrants in the neighbourhoods: low immigrant ( $< 25\%$  immigrants) versus high immigrant ( $\geq 25\%$  of immigrants). However, in Model 4, we accounted for percentage below LICO in the neighbourhood (instead of percentage of immigrants). The fit of models in the multivariable logistic regressions was assessed using the Hosmer–Lemeshow  $\chi^2$  test (Hosmer and Lemeshow 2000).

Data analysis was performed using Statistical Analysis System Software (SAS Institute Inc. SAS/STAT® 9.2). Missing data were not considered in the analysis, as the incidence was very low (0.12%), with the exception of income in which we created a category labeled “Unknown” to prevent a significant drop in the sample size (Statistics Canada 2006).

## Results

Immigrant women made up 23.9% of the sample, of which 8.9% were recent immigrants ( $\leq 5$  years). The distribution of the sample characteristics is presented in Table 1. There was a higher proportion of younger Canadian-born respondents ( $< 25$  years) and older respondents in the immigrants  $> 5$  years group (about 30%  $\geq 35$  years). University education was higher among immigrants  $\leq 5$  years (51.3%) compared to 41.2% among immigrants  $> 5$  years and 34.1% among the Canadian-born. However, immigrants  $\leq 5$  years had lower income than the other two groups: 54.3% had income  $< 50$  K, compared to 38.3 and

31.1% among immigrants  $> 5$  years and Canadian-born, respectively. Regarding employment, 38.4% of immigrants  $\leq 5$  years responded that they did not have paid work, compared to 27% among immigrants  $> 5$  years and 20.8% for Canadian-born.

Immigrants  $\leq 5$  years reported the lowest social support during pregnancy compared to the other two groups. Most women in the sample were married or common law. However, immigrants  $\leq 5$  years had the highest rates of marriage or common law partnerships. Most of the Canadian-born (81.4%) lived in high-income neighbourhoods ( $\leq 15\%$  below LICO) compared to 64.6% of immigrants  $> 5$  years and 45.5% of immigrants  $\leq 5$  years. Similarly, 80.7% of the Canadian-born lived in low immigrant neighbourhoods ( $< 25\%$  of immigrants) compared to 35.1% of immigrants  $> 5$  years and only 24.5% of immigrant  $\leq 5$  years.

Abuse was higher (11.7%) among Canadian-born women than among immigrant women  $> 5$  years (5.9%) and immigrant women  $\leq 5$  years (4.5%) (Fig. 1).

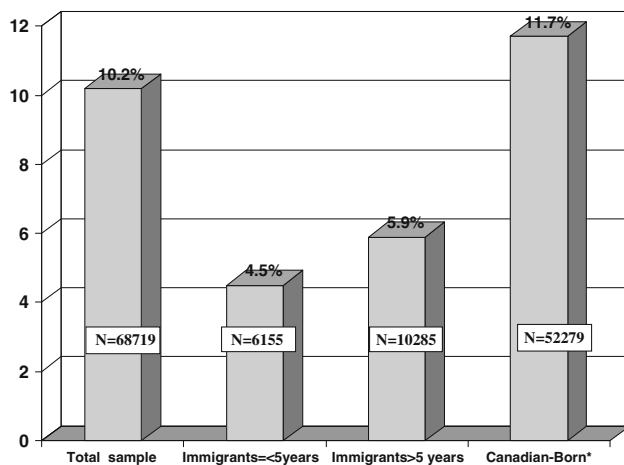
Multivariate results showed that the odds ratio (OR) of any abuse was lower among immigrant women than Canadian-born. Lower ORs of any abuse were seen among immigrants  $> 5$  years than immigrants  $\leq 5$  years (Model 1, Tables 2, 3). However, the protective effect from abuse was higher among immigrant women living in low-income neighbourhoods (Table 2). In high-income neighbourhoods, odds ratios of any abuse (OR) and 95% confidence interval (CI) were 0.43 (0.20, 0.89) among immigrants  $\leq 5$  years and OR = 0.61 (95% CI = 0.40, 0.94) among immigrants  $> 5$  years, respectively, each compared with non-immigrant women. When compared with non-immigrant women, OR of any abuse in the low-income neighbourhoods was 0.26 (95% CI = 0.13, 0.53) among immigrants  $\leq 5$  years and OR = 0.35 (95% CI = 0.20, 0.62) among immigrants  $> 5$  years (Table 2).

Adjustment for individual SEP, family variables and percentage of immigrants in the neighbourhood (Table 2, Models 2–5) did not substantially change the ORs of any abuse among the three groups of women in either high- and low-income neighbourhoods. In the unadjusted model of the high-income neighbourhoods (Table 2, Model 1), OR of any abuse for immigrant women  $\leq 5$  years was 0.43 (95% CI = 0.20, 0.89); this became 0.41 (95% CI = 0.19, 0.89) in Model 5 after adjustment for all individual level variables and percentage of immigrants in the neighbourhood. In the low-income neighbourhoods, among immigrant women  $\leq 5$  years OR of any abuse was 0.26 (95% CI = 0.13, 0.53) in Model 1 (Table 2); this changed to 0.31 (95% CI = 0.15, 0.64) in Model 5 (Table 2). For immigrant women  $> 5$  years, OR of any abuse was 0.35 (95% CI = 0.20, 0.62); this was changed to OR = 0.31 (95% CI = 0.15, 0.62) in Model 5.

**Table 1** Distribution of the study variables for the total sample, immigrant groups and Canadian-born mothers among participants of the Canadian Maternity Experiences Survey (conducted in 2006–2007)

	Total sample Weighted ( <i>N</i> = 68,719) %	Immigrant ≤5 years Weighted ( <i>N</i> = 6,155) %	Immigrant >5 years Weighted ( <i>N</i> = 10,285) %	Canadian-born non-Aboriginal Weighted ( <i>N</i> = 52,279) %
<b>Demographic variable</b>				
Age in years				
<25	14.6	11.5	8.5	16.2
25–29	33.4	38.1	23.0	34.9
30–34	34.0	34.3	39.3	33.0
35–50	17.9	16.1	29.2	15.9
	100.0	100.0	100.0	100.0
<b>Individual socioeconomic position variables</b>				
Education				
Less than HS	6.7	7.2	7.1	6.6
High school diploma	18.8	15.9	16.6	19.5
Post-secondary diploma	37.8	25.5	35.1	39.7
University diploma	36.7	51.3	41.2	34.1
	100.0	100.0	100.0	100.0
Total household income				
Less than 20 K <sup>a</sup>	7.8	12.6	10.4	6.7
20– 49.9 K	26.4	41.7	27.9	24.4
50–79.9 K	28.0	20.4	22.2	30.1
80 K and more	32.8	12.5	33.1	35.1
Unknown	4.9	12.8	6.4	3.7
	100.0	100.0	100.0	100.0
Employment				
Caring for children and household	23.3	38.4	27.0	20.8
Other	6.7	14.8	5.4	5.9
Working at a paid job or business	70.1	46.8	67.6	73.3
	100.0	100.0	100.0	100.0
<b>Family variables</b>				
Social support during pregnancy				
Little/none	4.9	9.2	7.4	3.9
Some/most of the time	95.1	90.8	92.6	96.1
	100.0	100.0	100.0	100.0
Marital status				
Single, divorced, widowed, separated	7.4	1.9	6.2	8.3
Married, common law	92.6	98.1	93.8	91.7
	100.0	100.0	100.0	100.0
<b>Neighbourhood level variables</b>				
Percentage below LICO in the neighbourhood <sup>b</sup>				
High income (≤15 % of households)	75.7	45.5	64.6	81.4
Low income (>15 % of households)	24.3	54.5	35.4	18.6
	100.0	100.0	100.0	100.0
Percentage immigrants in the neighbourhood <sup>c</sup>				
Low immigrant (<25 % of population)	68.8	24.5	35.1	80.7
High immigrant (≥25 % of population)	31.2	75.5	64.9	19.3
	100.0	100.0	100.0	100.0

<sup>a</sup> (K) one thousand Canadian Dollars<sup>b</sup> LICO low-income cut-off point. Total persons in private households—20 % sample data—prevalence of low income after tax in 2005<sup>c</sup> Total population by immigrant status and place of birth—20 % sample data—percentage of immigrants



**Fig. 1** Prevalence (%) of any abuse among participants of the Canadian Maternity Experiences Survey conducted in 2006–2007 (weighted sample). *Asterisk* Canadian-born non-Aboriginal

Table 3 compares low and high immigrant neighbourhoods. No significant differences in any abuse between immigrant and non-immigrant women were found in low immigrant neighbourhoods. However, in high immigrant neighbourhoods, controlling for the other variables significantly changed the OR of any abuse in most models. Controlling for individual level SEP increased the OR of any abuse by 35 % among immigrants  $\leq 5$  years and by 26 % for immigrants  $> 5$  years (Model 2). Family variables (family support and marital status) had a small effect on the OR of any abuse when it was adjusted for in Model 3. When percentage below LICO in the neighbourhood was considered, it increased the OR of any abuse by 25 % among recent immigrant women ( $\leq 5$  years) and by 10.5 % among immigrants  $> 5$  years (Model 4). Controlling for all variables in Model 5 increased the OR of any abuse by about 30 %.

Notably, differences between the two immigrant groups totally disappeared after adjustment for all variables in the study in the low-income and high immigrant neighbourhoods.

The Hosmer–Lemeshow test for models in Tables 2 and 3 yielded  $p$  values above 0.1 for most models, indicating that they did fit the data acceptably.

## Discussion

This is the first study that we know of to examine the influence of neighbourhood SEP and immigrant concentration on abuse among immigrant women as compared to non-immigrant women. Immigration is a transitional period that can be highly stressful for women and their families.

Immigrant women may face many circumstances that increase their social vulnerability and risk for abuse (Midlarsky et al. 2006). Concentration of immigrants upon arrival to the host country in low-income neighbourhoods (Alba et al. 2000) that have a higher prevalence of abuse (Frye and O’Campo 2011) might further intensify abuse against immigrant women.

Our findings extend existing knowledge on neighbourhood context and abuse by indicating that immigrant women experience greater protection from abuse when they live in low income and high immigration neighbourhoods, irrespective of length of stay in Canada. There is no significant difference in abuse between immigrant women and Canadian-born women in low immigration neighbourhoods.

Higher abuse was reported by Canadian-born women compared with immigrant women. We found reports of abuse in 11.7 % of Canadian-born women, compared to 5.9 % among immigrant women  $> 5$  years and 4.5 % among immigrant women  $\leq 5$  years. These findings contradict studies indicating higher abuse among immigrant women (Raj and Silverman 2002; Vives-Cases et al. 2010) ranging from 14 (Hicks 2006) to 40 % (Raj and Silverman 2002). In Spain, 23.1 % of immigrant women and 14.5 % of non-immigrant women have reported IPV (Vives-Cases et al. 2010). However, those are results from clinic-based studies, or one area sample (Raj and Silverman 2002), or that focused on one ethnic group of immigrant women without comparison with non-immigrant women. For these reasons, this evidence is hard to compare with our own. The strength of our results is that they are based on a nationwide, population-based sample of recent mothers. We also report here on any abuse, while most of the other studies on immigrant women focus on IPV.

However, abuse reported by phone for the MES may lead to underreporting (e.g., perpetrator may be listening in on the interview), especially among immigrant women who generally tend to underreport abuse due to cultural attributes (Midlarsky et al. 2006) or because of financial dependency on their husband (Menjívar and Salcido 2002), or social desirability (Hyman et al. 2011). Difficulty in obtaining a representative sample size for immigrant women (Midlarsky et al. 2006) could be another reason. Many times, immigrants are missing from studies, since they fear detection and deportation when they report IPV (Midlarsky et al. 2006). The MES weighted sample included about 24 % immigrant women; the proportion of immigrants in Canada was 19.8 % in 2006 Census (Statistics Canada 2006a). However, the MES was conducted by telephone, which might capture more affluent segments of immigrants, who usually have a lower prevalence of abuse (Yick 2000). For example, the current MES sample shows higher university education among recent immigrant

**Table 2** Multivariate analysis of any abuse among immigrants versus Canadian-born mother's participants of the Canadian Maternity Experiences Survey (conducted in 2006–2007) in low versus high-income neighbourhoods

	Model 1 (%) OR (95 % CI)	Model 2 (%) <sup>a</sup> OR (95 % CI)	Model 3 (%) <sup>a</sup> OR (95 % CI)	Model 4 (%) <sup>a</sup> OR (95 % CI)	Model 5 (%) <sup>a</sup> OR (95 % CI)
<b>High-income neighbourhoods</b>					
Weighted <i>N</i> = 52,012					
Immigrant ≤5 years	0.43 (0.20, 0.89)*	0.38 (0.18, 0.80)*	+11.6	0.44 (0.21, 0.92)*	-2.3
Immigrant >5 years	0.61 (0.40, 0.94)*	0.58 (0.38, 0.90)*	+4.9	0.63 (0.40, 0.99)*	-3.2
Canadian-born non-immigrant	1.00	1.00	1.00	1.00	1.00
<i>R</i> <sup>2</sup> of the model	0.30	0.36	0.41	0.31	0.44
<b>Low-income neighbourhoods</b>					
Weighted <i>N</i> = 16,707					
Immigrant ≤5 years	0.26 (0.13, 0.53)*	0.24 (0.12, 0.47)*	+7.6	0.30 (0.15, 0.60)*	-15.3
Immigrant >5 years	0.35 (0.20, 0.62)*	0.30 (0.17, 0.55)*	+14.3	0.31 (0.17, 0.57)*	-11.4
Canadian-born non-immigrant	1.00	1.00	1.00	1.00	1.00
<i>R</i> <sup>2</sup> of the model	0.60	0.75	0.75	0.61	0.81

High-income neighbourhoods: ≤15 % of the households below LICO (low-income cut-off point), low-income neighbourhoods: >15 % of the households below LICO

*Model 1* main association between immigration and any abuse, *Model 2* main association + individual SEP (socioeconomic position: education, household income and employment), *Model 3* main association + social support and marital status, *Model 4* main association + percentage immigrants in the neighbourhood, *Model 5* all variables, *reference group* Canadian-born mothers

All models adjusted for maternal age

<sup>a</sup> Percentage change in OR from Model 1

\* Significant associations (*P* ≤ 0.05)

**Table 3** Multivariate analysis of any abuse among immigrant versus Canadian-born mothers participants of the Canadian Maternity Experiences Survey (conducted in 2006–2007) in high and low immigration neighbourhoods

	Model 1 OR (95% CI)	Model 2 OR (95% CI)	(%) <sup>a</sup>	Model 3 OR (95% CI)	(%) <sup>a</sup>	Model 4 OR (95% CI)	(%) <sup>a</sup>	Model 5 OR (95% CI)	(%) <sup>a</sup>
<b>Low immigration neighbourhoods</b>									
Weighted $N = 47,278$									
Immigrant $\leq 5$ years	0.44 (0.17, 1.16)	0.40 (0.15, 1.05)	+9.1	0.47 (0.18, 1.24)	-6.8	0.39 (0.15, 1.02)	+11.4	0.41 (0.15, 1.10)	+6.8
Immigrant $> 5$ years	0.83 (0.52, 1.33)	0.83 (0.51, 1.33)	0	0.82 (0.51, 1.33)	+1.2	0.81 (0.51, 1.30)	+2.4	0.81 (0.50, 1.31)	+2.4
Canadian-born non-immigrant	1.00	1.00		1.00		1.00		1.00	
$R^2$ of the Model	0.31	0.40		0.44		0.35		0.48	
<b>High immigration neighbourhoods</b>									
Weighted $N = 21,441$									
Immigrant $\leq 5$ years	0.40 (0.21, 0.77)*	0.26 (0.14, 0.49)*	+35	0.41 (0.22, 0.77)*	-2.5	0.30 (0.16, 0.59)*	+25	0.27 (0.14, 0.52)*	+32.5
Immigrant $> 5$ years	0.38 (0.22, 0.65)*	0.28 (0.15, 0.51)*	+26	0.33 (0.19, 0.58)*	+13.1	0.34 (0.20, 0.59)*	+10.5	0.27 (0.15, 0.51)*	+28.9
Canadian-born non-immigrant	1.00	1.00		1.00		1.00		1.00	
$R^2$ of the Model	0.51	0.69		0.67		0.62		0.79	

Low immigrant:  $< 25$  % immigrants in the neighbourhood, high immigrant:  $\geq 25$  % immigrants in the neighbourhood

Reference group—Canadian-born mothers

*Model 1* main association between immigration and any abuse, *Model 2* main association + individual SEP (socioeconomic position: education, household income and employment), *Model 3* main association + social support and marital status, *Model 4* main association + % below LICO in the neighbourhood, *Model 5* all variables

All models adjusted for maternal age

<sup>a</sup> Percentage change in OR from Model 1

\* Significant associations ( $P \leq 0.05$ )

women as compared to the Census data on recent immigrant women (51.3 vs. 43 %, respectively) (Statistics Canada 2006c).

Regarding neighbourhood influence on risk of abuse, our data demonstrated a protective effect from abuse for immigrant women residing in low-income neighbourhoods, versus high-income neighbourhoods. This is not consistent with the previous studies of non-immigrant women, which demonstrate that living in low-income neighbourhoods is associated with higher abuse (Fox and Benson 2006; O'Campo et al. 1995). This paradox of low-income neighbourhoods being protective for immigrant women might be explained by effect modification, as most immigrant women with low incomes live in high immigrant neighbourhoods (Alba et al. 2000). In the current study, 81.4 % of immigrant women in the sample lived in low-income neighbourhoods. The non-significant interactions between immigration status and abuse that we identified in the early stages of this study might support this explanation. Our decision to conduct separate analyses for neighbourhood income and percentage of immigrants despite the non-significant interaction was theoretically done to distinguish between the influences of neighbourhood income versus concentration of immigrants on abuse.

We also demonstrated a protective effect from abuse among immigrant women in neighbourhoods with high concentrations of immigrants, which was not observed among those residing in neighbourhoods with low levels of immigrants. Those residing in neighbourhoods with high concentrations of immigrants might face less social isolation and discrimination (Hou and Wu 2009; Ray and Preston 2009). According to the spatial assimilation model (Alba et al. 2000), upon arrival immigrants seek out neighbourhoods with a high concentration of immigrants; these serve as social and economic enclaves. Once established, the new immigrants may move to areas with a lower concentration of immigrants, but they may experience greater discrimination there (Alba et al. 2000). Second generation immigrant women have reported higher discrimination and feelings of otherness than first generation women (Viruell-Fuentes 2007).

While past research on non-immigrant women has relied on social disorganization theory (Browning 2002) to explain risk of abuse in low-income neighbourhoods, it is not clear that this theory applies to the situation of immigrant women. According to this theory, concentration of immigrants negatively alters a neighbourhood's social structure and weakens cohesiveness, thereby reducing neighbourhood collective efficacy and, consequently, increasing the risk of abuse. We did not observe these patterns in our data. For immigrant women, living in neighbourhoods with high concentrations of immigrants seems to be protective from abuse. High immigration

neighbourhoods might act as an ethnic enclave, as they might provide alternative or informal social support, culturally appropriate solutions, and vernacular information, especially for recent immigrant women (Alba et al. 2000). High immigrant concentration has been associated with lower violence and crime (Feldmeyer 2009), and has been found to act as a buffer from alcohol consumption among immigrants (Be'cares et al. 2009). Alcohol outlets in the neighbourhood have been associated with higher IPV-related police calls and reported crimes (Cunradi et al. 2011).

We found that lower individual SEP significantly contributes to increasing abuse among women, but mostly in high immigrant concentration neighbourhoods, and especially for recent immigrant women (25 % more). While these findings are consistent with Fox and Benson (2006), who found that higher individual SEP can reduce abuse in a neighbourhoods, it also suggests that a more serious reduction in abuse can be achieved through improving the neighbourhood SEP.

Notably, when percentage of immigrants was adjusted for in the low-income neighbourhoods, the OR of abuse decreased among recent immigrant women and immigrant women >5 years. However, when neighbourhood SEP (percentage below LICO) was introduced in the high immigrant neighbourhoods, it increased the OR of abuse for recent immigrant and immigrants >5 years women. This might suggest that when immigrant women live in low-income neighbourhoods that have a lower percentage immigrants and they are less protected from abuse, but that when they live in neighbourhoods with higher immigrant concentration but with low-income neighbourhoods they are more protected from abuse. This result points to a complex mechanism at work between abuse among immigrant women and the neighbourhood's levels of income and immigrants, a mechanism that needs to be further investigated through larger samples of immigrant women reporting abuse, which would enable pathway analysis. The cross-sectional data in the present study and low prevalence of abuse among immigrant women combined with the reality that only one woman was interviewed in each neighbourhood did not enable this analysis.

Marital status (married or cohabitating vs. single) and social support, which has been significantly associated with lower abuse in previous research (Saltzman et al. 2003) had small effects on the different groups of immigrant women. This might relate to immigration policy in Canada, which considers women family members, "former dependents" on the man (a husband or father) when he applies for residency, at least in the first 5 years after immigration. Such categorizations expose women to men's control and therefore might make them more silent about abuse

(Hyndman 1999). Changes in these policies can help to decrease the dependency of women on men and reduce their vulnerability to abuse.

In the final models, adjustment for all variables eliminated the differences between the two immigrant groups. However, there were still significant differences in abuse between immigrant and Canadian-born women. The latter group had significantly higher abuse rates in all neighbourhoods. However, in low immigrant neighbourhoods the differences in abuse between immigrant and non-immigrant women were not significant.

Policies and interventions to reduce abuse among immigrant women need to consider concentration of immigrants and improving SEP in the neighbourhood. Policies aimed at improving SEP among immigrants, such as reducing barriers to education or employment (e.g., recognizing credentials and employment experience from native countries) are key elements for better health (Reijneveld 2010). Further research is needed on the pathways that neighbourhood contexts affect abuse among immigrant women versus non-immigrant women.

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