The Spatial Distribution and Social Ecology of "Public" and "Private" Homicide Types in Toronto: A Case for Data Disaggregation

Sara K. Thompson[1]

Abstract

The core assumption underlying the disaggregation of homicide by type is that a singular focus on the monolithic category "homicide" obscures the multidimensional nature of lethal violence. The goal of this article is to contribute to the emerging literature on neighborhoods and different homicide types by examining the spatial distribution and ecological correlates of young male homicide and intimate femicide in Toronto, Canada, for the period 1988-2003. Findings suggest that there is a significant difference across homicide types in the effect of only one of the independent variables under examination: an index of socioeconomic disadvantage. The discussion of this finding highlights the problems that small numbers associated with disaggregated homicide types may pose for detecting neighborhood effects in social ecological research.

Keywords

homicide types, urban neighborhoods, spatial distribution, social ecology, intimate partner homicide

Researchers in the social ecological tradition have long studied the question of why urban neighborhoods differ in their rates of violent crime, including homicide. This question has stimulated a body of work that examines the relevance of neighborhood characteristics for understanding the spatial distribution and social ecology of

[1]Ryerson University, Toronto, Ontario, Canada

Corresponding Author:
Sara K. Thompson, Department of Criminal Justice and Criminology, Ryerson University, 350 Victoria St., JOR 832, Toronto, Ontario M5B 2K3, Canada.
Email: skthompson@ryerson.ca

homicide in and across the cityscape. A large literature, grounded almost exclusively in the American context, has established a set of empirical generalizations in this regard: urban neighborhoods characterized by high levels of economic disadvantage, racial isolation/concentration, lone-parent families, residential instability, and low levels of home ownership tend also to experience higher aggregate rates of homicide than do their more advantaged counterparts (Hannon, 2005; Morenoff & Sampson, 1997; Parker, McCall, & Land, 1999).[1] These characteristics are argued to influence aggregate homicide levels through a number of processes outlined in mainstream criminological theories, including (a) contemporary versions of social disorganization theory, which highlight the relevance of social structural barriers that impede a neighborhood's ability to solve common problems and maintain effective social control (Kubrin & Weitzer, 2003; Sampson, Raudenbush, & Earls, 1997); (b) (sub)cultural perspectives, which argue that social norms among some residents of some inner-city neighborhoods—usually developed in response to conditions of structural disadvantage—lead directly or indirectly to the violent resolution of interpersonal conflicts (Matsueda, Drakulich, & Kubrin, 2006; Sampson & Bean, 2006); (c) strain/deprivation perspectives, which emphasize individuals' limited or blocked economic opportunities as the source of feelings of anger, frustration, and resentment that can lead to violent behavior (Mears & Bhati, 2006; Nieuwbeerta, McCall, Elffers, & Wittebrood, 2008); and (d) the routine activities perspective, which holds that crime and violence are a function of the routine activities of urban life and can be concentrated in particular neighborhoods because of the presence of targets that are not protected by capable guardians (Messner & Tardiff, 1985; Tita & Griffiths, 2005). As a consequence of the varying processes outlined by each of these perspectives, some urban American neighborhoods are assumed to be vulnerable to high levels of homicide generally, rather than specializing in particular forms of lethal violence.

Comparatively less is known about whether and how neighborhood structural characteristics may also influence the *quality* of lethal violence that neighborhoods experience, and the extent to which mainstream criminological perspectives may be relevant for understanding the ecological etiology of different types of homicide. In response to recent charges that aggregate analyses of homicide may not capture the complexity of the mechanisms that link neighborhood context to different forms of lethal violence (see, for example, Kubrin, 2003), a body of research that examines the significance of neighborhood characteristics for understanding the spatial distribution and social ecology of different types of homicide is beginning to emerge.

The core assumption underlying the disaggregation of homicide by type is that a singular focus on the category "homicide" obscures the multidimensional nature of lethal violence (Block, 1993; Kubrin, 2003). Differences in the quality of lethal violence are perhaps best exemplified when distinguishing homicides that tend to take place in public spaces, which are typically committed by and against males, from more "private" forms of homicide, including much lethal violence against women. For example, a homicide in which a young male is shot and killed by another young male in a dispute over drugs differs on a number of important dimensions from a homicide in which a man kills his female intimate partner at the point of separation. To date,

much of the work that has disaggregated and examined public and private forms of homicide has focused on individual-level and situational characteristics; only recently have scholars begun to systematically examine the extent to which the spatial distribution and social ecology of these forms of lethal violence may (or may not) also be distinct.

The goal of this article is therefore to advance neighborhood-level criminological research on the social ecology of disaggregated homicide types by examining the spatial distribution and social ecology of two very different types of lethal violence in Toronto, Canada, for the period 1988-2003. This will be accomplished by examining a typically public form of homicide, the killings of young men, and one that tends to be more private in nature, the killings of women by their male intimate partners. If the spatial distributions and neighborhood characteristics associated with young male homicide are similar to those associated with a qualitatively different, and typically private form of lethal violence, this would lend support to mainstream criminological perspectives that posit a more or less generalized effect of neighborhood structure on levels of lethal violence, regardless of type. If, however, differences emerge in the spatial distributions and ecological predictors of different types of homicide, this might suggest that specific neighborhood characteristics and context may not only be related to variation in the quantity of homicide a given neighborhood experiences, but also to the quality of that violence.

Individual- and Case-Level Correlates: Clear Distinctions

Research that has examined the individual-level and situational characteristics of intimate partner and other forms of homicide has consistently identified important differences between lethal violence against women and other, more public forms of homicide in terms of victim and offender characteristics, motive, circumstance, method of killing, and the extent/degree of violence. For example, victims and offenders of public forms of homicide tend to be young, often racialized males (DeJong, Pizarro, & McGarrell, 2011; Fox & Zawitz, 2006; Galabuzi, 2009; Khenti, 2013), whereas victims and offenders of intimate femicide are, on average, older—though female victims do tend to be younger than male perpetrators, often significantly (Daly & Wilson, 1988; Gartner, Dawson, & Crawford, 1998). Studies have also demonstrated that public forms of homicide are disproportionately motivated by trivial disputes and involve guns (Fox & Zawitz, 2006; Rosenfeld, Bray, & Egley, 1999), whereas men tend to kill their female intimate partners in response to actual or impending estrangement and/or actual or suspected infidelity, often with an excessive amount of ante- and postmortem violence (Daly & Wilson, 1988; Dawson, Pottie Bunge, & Balde, 2009; Gartner et al., 1998). The findings from this body of research at these levels of analysis speak to the multidimensional nature of lethal violence, and have provided support for a conviction among many scholars and practitioners that the etiology of violence against women, including homicide, is sufficiently distinct from other forms of criminal violence that it requires the development of separate theoretical frameworks, research strategies, and social and legal responses and interventions.

Neighborhood-Level Correlates: Incongruent Findings

When the empirical focus shifts to the neighborhood-level, however, some recent research suggests that the disaggregation of total homicide rates may not be central to understanding their spatial distribution and ecological correlates. This is because some studies have found that different types of homicide share similar ecological distributions and are associated with similar community-level characteristics; they tend to be concentrated in inner-city neighborhoods characterized by high rates of poverty, family disruption, and residential mobility (Fagan, Medina, & Wilt, 2003; Lauritsen & Schaum, 2004; Miles-Doan, 1998).

At the same time, however, other studies have suggested a more complex relationship between neighborhood characteristics and homicide type. Some have found that while there appears to be "persistent covariation" of some neighborhood characteristics across public and private homicide types, there is also specificity in the correlates (and/or in the strength of the correlates) associated with each (Benson, Fox, DeMaris, & Wan Wyk, 2003; Kubrin, 2003; Kubrin & Wadsworth, 2003). More specifically, these studies tend to find positive and significant relationships for some neighborhood characteristics and public forms of homicide, and weaker or no relationships for the same neighborhood characteristics and more private forms of lethal violence. The tie that binds this work is the assertion that the private nature of much violence against women may attenuate—or altogether block—so-called "neighborhood effects" from suffusing more intimate settings.

To date, then, the small body of work that has examined disaggregated public and private homicide types at the neighborhood-level has produced a set of mixed findings. Studies that have found that the spatial distribution and social ecology of public and private forms of lethal violence are more alike than they are different have prompted the suggestion that social ecological research on violence against women be better integrated with the literature on criminal violence more generally (National Research Council, 2004). This body of research necessarily implies that the disaggregation of lethal violence into specific types may not be useful at the neighborhood-level. Other studies, however, suggest that important differences distinguish public from more private forms of homicide at the neighborhood-level, which implies that the intellectual separation of violence against women from other forms of criminal violence should continue, thereby highlighting the value of data disaggregation.

Data Sources and Description

Two types of data were used in this research: homicide data, collected from police and coroner's files and newspaper reports, and tract-level census data for the years 1986, 1991, 1996, and 2001. Each of these data sources are described below.

The Dependent Variable: Homicide

The homicide data used in this research contain information on the 965 homicides in Toronto between 1988 and 2003, for which a location of the killing was known, and

was collected from police files, coroner's records, and newspaper articles (over the period of examination, there were 979 homicides in Toronto; however, in 14 cases no information on the location of the killing was available, reducing the number of homicides in this analysis to 965).[2] For each case, I collected demographic information on the victim and accused person(s) (including sex, age, employment status, job type, number of children, marital status, etc.), situational characteristics of the homicide (including the motive, method, circumstances surrounding the killing, weapon type, etc.), and wrote a short narrative that summarized the incident description that was included in these reports.[3] My data set, where possible, also includes information on the racial/ethnic background of victims and accused persons. These data were *not*, however, collected from the Toronto Police Service or the Office of the Chief Coroner of Ontario's files; the research agreement with each organization prohibited the collection of this information. As such, I relied on newspaper reports and photographs of victims that were printed as part of those reports. I readily acknowledge that classifying "race" in this way is fraught with the potential for misclassification and missing data, but given institutional policies that essentially ban the release of race-based statistics in Canada, there was no other alternative. (For a discussion of the "unofficial official" ban on the release of race-based criminal justice statistics, and the methods that some scholars in Canada have used to examine issues related to race and lethal violence, see Thompson, 2013).

The homicide data were then pooled for the 16-year period of examination to have a sufficient number of homicides with which to perform multivariate analyses at the neighborhood level.[4] Each of the 965 homicides was geocoded to one of 140 "neighborhood clusters" based on the location of the killing (the location of the killing was geocoded to the census tract level and then aggregated to the neighborhood cluster in which the particular census tract is located). The neighborhood delineations used in this research were aggregations of census tracts constructed by Toronto's Social Policy and Research Unit, based on social service areas and defined by main streets, former municipal boundaries, and/or natural and man-made boundaries such as rivers or highways. They were also chosen as they reduced the city's 531 census tracts to 140 neighborhoods. From this larger data set, I selected out killings involving young male (15-34 years)[5] victims (*n* = 389) and intimate femicides (*n* = 118).

Table 1 provides descriptive statistics for select individual-level and situational characteristics of young male homicides and intimate femicides in Toronto's neighborhoods between 1988 and 2003. I present these individual-level data to illustrate the distinct nature of each type of homicide. An important issue when examining individual-level and situational characteristics of homicide involves the problem of missing data, which, as discussed above, is largely a function of the police reports to which I was granted access. The issue of missing data is particularly pronounced for offenders, in large part because offenders—particularly those involved with public forms of homicide—are often not immediately arrested, resulting in less information about the offenders. The data in Table 1 should thus be interpreted with this caveat in mind.[6]

The majority of the young male victims were Black (55%), unmarried (72%), and either unemployed (43%) or attending school (18%). In contrast to young male

Table 1. Characteristics of Young Male (15-34 Years) Homicides and Intimate Femicides in Toronto's Neighborhoods, 1988-2003.

	Young male homicide (n = 389)	Intimate femicide (n = 118)
Victim age years	n = 389	n = 118
Mean victim age	25	38
1-15	2%	0%
16-24	48%	13%
25-34	50%	36%
35-44		31%
45 and over		20%
Victim race	n = 285	n = 83
Black	55%	19%
White	14%	29%
Asian	13%	14%
Other[a]	18%	38%
Victim marital status	n = 337	
Single	72%	
Married/common-law	20%	
Separated/divorced	6%	
Other[b]	2%	
Victim employment status	n = 333	n = 105
Employed	36%	58%
Unemployed[c]	46%	23%
Student	18%	13%
Houseworker (unpaid)		6%
Victim–offender relationship	n = 241	n = 118
Friends/acquaintances	39%	0%
Strangers	32%	0%
Illegal relationships	16%	
Family	5%	
Intimate partners	3%	
Spouse		56%
Ex-spouse		10%
Common-law		9%
Lovers, ex-lovers		25%
Other[d]	5%	
Offender sex	n = 263	n = 118
Male	95%	100%
Female	5%	0%
Offender age years	n = 253	n = 117
0-15	1%	
16-24	53%	11%
25-34	39%	29%

(continued)

Table 1. (continued)

	Young male homicide (n = 389)	Intimate femicide (n = 118)
35-44	5%	26%
45 and over	2%	34%
Offender race	n = 141	n = 74
Black	51%	14%
White	20%	15%
Other	29%	71%
Offender employment status	n = 199	n = 106
Employed	23%	48%
Unemployed	63%	35%
Other[e]	14%	17%
Location of killing	n = 389	n = 117
Residence	23%	85%
Public	59%	6%
Semi-public	9%	2%
Car	6%	3%
Other	3%	4%
Method of killing	n = 389	n = 117
Shot	60%	16%
Stabbed	28%	47%
Beaten	9%	17%
Strangled/suffocated	2%	15%
Other[f]	1%	5%

[a]This includes Northern, Southern and Eastern European, South and Latin American, Middle Eastern, and Aboriginal Victims.
[b]This category includes widowed, living together for a short time (less than 1 month), or off and on for short periods.
[c]This includes those on welfare/disability, those who were periodically or seasonally employed but not currently working, and those out of the workforce (retired).
[d]This category includes housemates/roommates, neighbors, legal business relationships, coworkers, lovers' triangles, and foster children.
[e]This includes students and those on welfare/disability.
[f]This category includes death by poisoning, arson, drowning, thrown or pushed from a height, scalding, neglect, hit by car, overdose, and unspecified means.

homicide, intimate femicides in Toronto involved smaller proportions of Black (19%) and unemployed (17%) victims. Of the 241 cases with young male victims in which the relationship between the victim and the offender was known, approximately 47% were known to one another: 39% of these killings involved friends/acquaintances, 5% involved family members, and 3% involved intimate partners. An additional 32% and 16% of these homicides involved strangers and illegal business relationships, respectively. As such, the killings of young men in Toronto are more likely to involve friends,

strangers, and illegal relationships, and less likely to involve family members and intimate partners.

In terms of location, 23% of young male homicide occurred in a private residence, 31% occurred in streets, parks, or parking lots (including in vehicles parked in parking lots), 34% occurred in stores and places of leisure, such as bars, taverns, and restaurants, while an additional 12% occurred in "other," often semi-public spaces (in building stairwells and hallways). Young male homicides in Toronto are, therefore, largely "public" phenomena in that over three quarters of them occurred in public (or semi-public) spaces. The use of firearms also figures prominently in young male homicides, with 60% of all victims killed with a firearm, typically a handgun. By comparison, the overwhelming majority of intimate femicides (85%) took place in a private residence, and stabbing was the most common cause of death (47%).

My ability to document characteristics of the offenders in young male homicides is constrained by missing data, which is, in part, due to the fact that 32% of these homicides were not solved. With this caveat in mind, I can provide some information on offender sex, age, race, and employment status. The majority of known offenders in these cases were male (95%), under 34 (the *M* age was 27), Black (51%), and either unemployed (63%) or students (11%) at the time of the killing. In other words, the overwhelming majority of known offenders in the killings of young males were themselves young males, and very often they were young, Black males.[7] Unlike perpetrators of young male homicides, the majority of perpetrators of intimate femicides in Toronto were aged 35 years or older. Compared with killers of young males, a smaller proportion of offenders in cases of intimate femicides were unemployed at the time of the killing.

Consistent with previous research, then, the individual-level and situational characteristics of these "public" and "private" forms of lethal violence differ in important respects. I now turn to an examination of the key question that guides this research: Does the more public nature of young male homicide in Toronto influence their spatial distributions and neighborhood correlates in ways that are distinct from the killings of women by their male intimate partners, a comparatively private form of homicide?

The Independent Variables: Neighborhood Characteristics

My independent variables encompass the key correlates of neighborhood homicide rates discussed in the literature on neighborhood effects and homicide, either on their own, or as a composite index. Given that this analysis is not investigating change over time in either homicide victimization (the small number of homicides relative to neighborhoods in Toronto precludes such analysis) or neighborhood characteristics, average scores were produced for each of these variables across the four censuses (1986, 1991, 1996, and 2001). To measure socioeconomic disadvantage, I use five variables often included in neighborhood-level homicide research in the United States: (a) median family income, (b) the percentage of the neighborhood's total income that was composed of government transfer payments, (c) the percentage of neighborhood residents defined as low income by Statistics Canada, (d) the percentage of

Table 2. Characteristics of 140 Neighborhoods in Toronto Averaged Across Four Censuses (1986, 1991, 1996, 2001).

	M	Minimum	Maximum	SD
Low income	21.2%	4.5%	69.6%	9.43
Government transfers	10.9%	2.4%	37.1%	7.92
Average household income	$56,484	$22,637	$223,232	$24,245
Unemployed	7.2%	3.6%	17.2%	2.02
Lone parents	17.5%	7.3%	44.8%	5.24
Black	5.7%	0.4%	19.8%	4.63
Recent immigrant	16.4%	2.6%	37.1%	7.92
Young residents	16.0%	10.7%	25.6%	2.58
Owners	51.0%	1.4%	94.6%	18.30
Movers	54.6%	25.6%	71.8%	8.35
Disadvantage index	0.000	−0.467	18.19	3.07
Residential stability scale	105.64	42.48	160.01	24.83
Young male homicide rate	1.21	0.00	7.78 (n = 17)	1.50
Intimate femicide rate	0.85	0.00	6.69 (n = 5)	0.943
Average population (nonlogged)	16,610	6,330	45,559	7,243

neighborhood residents aged 15 years and older who were unemployed, and (e) the percentage of households in the neighborhood headed by either a male or female lone parent. Measures of the other independent variables that I include in the analyses are as follows: the percentage of neighborhood residents who immigrated to Canada within the last 10 years, the percentage of neighborhood residents aged 5 years and older who had not changed residences in the past 5 years, the percentage of neighborhood residents who were aged 15 to 24 years, and the percentage of neighborhood residents who identified their ethnic origin as "Black." I also included the logged population of the neighborhood as an offset variable in each model.

Table 2 presents descriptive data on the independent variables. Over the period of examination, there is substantial variability among neighborhoods in Toronto in the economic and demographic characteristics I have measured, which is consistent with research that demonstrates Toronto's neighborhoods have become increasingly stratified into distinct areas of great wealth and great poverty (Hulchanski, 2007).

In Table 3, I report the bivariate correlations between my measures of neighborhood characteristics, young male homicide, and intimate femicide rates in Toronto's neighborhoods for the period 1988-2003. The five measures of economic disadvantage are all highly correlated with each other. Including each of these separately in my multivariate models could create problems due to multicollinearity and so I conducted a principal components factor analysis on them; all measures of economic disadvantage load on a single factor, with factor loadings ranging between .85 and .94. I therefore created an "economic disadvantage index" by summing standardized scores for

Table 3. Bivariate Correlations for Intimate Femicide, Young Male Homicide, and Neighborhood Characteristics in Toronto Neighborhood, 1988 to 2003.

|	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Intimate femicide counts	1.00	.325**	.352**	.374**	-.291**	.339**	.209*	.298**	.370**	-.284**	-.263**	.258**	-.009
2. Young male counts		1.00	.618**	.629**	-.376**	.603**	.463**	.560**	.455**	-.342**	-.326**	.431**	.022
3. % low income			1.00	.930**	-.694**	.882**	.768**	.582**	.658**	-.519**	-.672**	.567**	-.022
4. % unemployed				1.00	-.683**	.861**	.814**	.688**	.690**	-.385**	-.510**	.516**	.003
5. % average household income					1.00	-.637**	-.734**	-.445**	-.518**	.316**	.450**	-.505**	.047
6. % lone parent						1.00	.697**	.730**	.512**	-.413**	-.566**	.407**	.011
7. % government transfers							1.00	.527**	.487**	.033	-.300**	.223**	-.046
8. % Black								1.00	.522**	-.253**	-.262**	.255**	-.062
9. % immigrant									1.00	-.465**	-.388**	.356**	.000
10. % nonmovers										1.00	.692**	-.614**	-.005
11. % owners											1.00	-.526**	-.005
12. % aged 15-24 years												1.00	-.040
13. Logged population													1.00
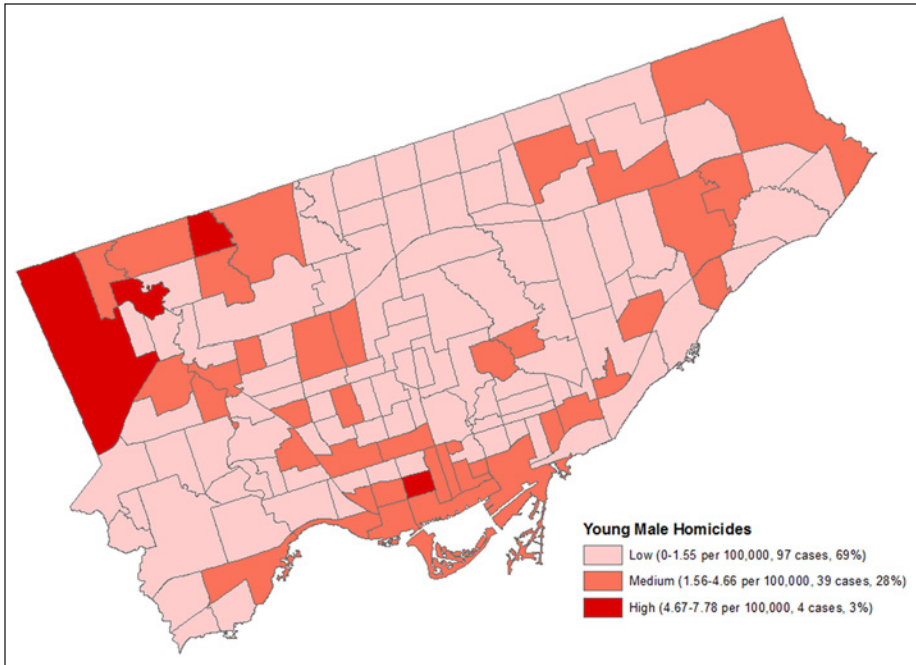
Figure 1. The spatial distribution of young male homicide rates in Toronto.

each of these five variables; the correlations between this index and young male homicide and intimate femicide counts are .63 and .32, respectively.[8] To be consistent with other studies of neighborhoods and homicide, I also constructed a residential stability index—coded such that higher levels represent greater stability—by combining the percentage of residents who had not moved in the past 5 years and the percentage of residents who owned their own homes. These two variables also load on a single factor and their factor loadings are each .90; the correlations between this index of young male homicide and intimate femicide counts are −.29 and −.36, respectively.

Analysis: The Spatial Distribution of Young Male Homicide and Intimate Femicide in Toronto's Neighborhoods

Figures 1 and 2 map the rates of young male homicide and intimate femicide in Toronto's 140 neighborhoods between 1988 and 2003. For illustrative purposes, I created three groups of neighborhoods (low, medium, and high) for each homicide type, based on their homicide rate. Based on my categorization, a large proportion of neighborhoods experienced low levels of these homicide types (69% and 63%, respectively), a smaller proportion of neighborhoods experienced medium levels (28% and
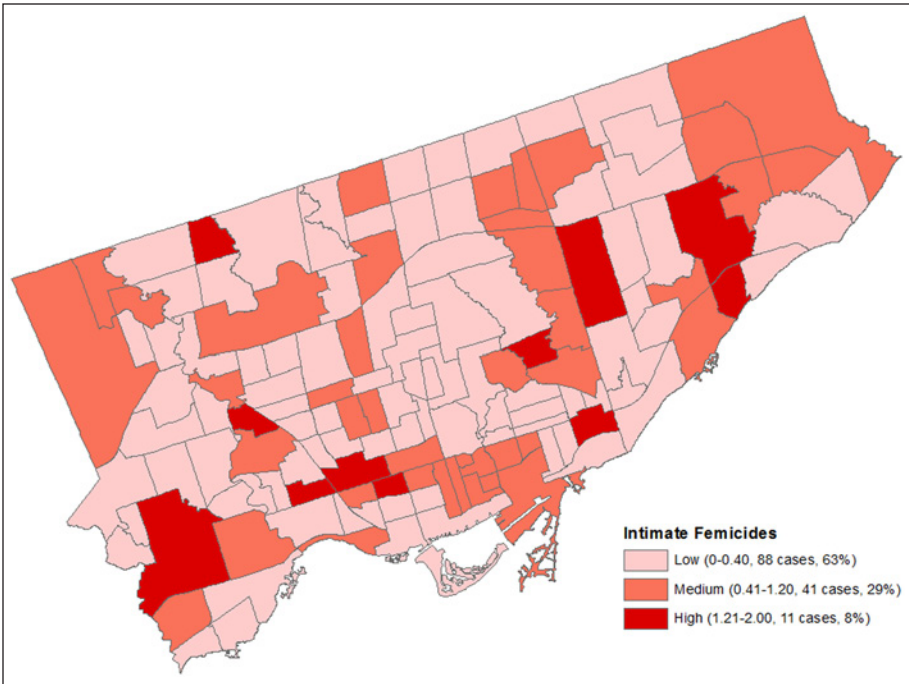
Figure 2. The spatial distribution of intimate femicide rates in Toronto.

29%, respectively), and an even smaller proportion experienced the highest levels of young male homicide and intimate femicide (3% and 8%, respectively). This is consistent with the larger literature on the social ecology of lethal violence, which consistently demonstrates that the risk of homicide is not evenly distributed across the cityscape, and that a small number of urban neighborhoods experience a disproportionate amount of this violence. It is important to note that the number of intimate femicides—particularly when disaggregated across Toronto's neighborhoods—is quite small, and the rates may not be sufficiently stable to meaningfully distinguish among neighborhoods. This should be kept in mind when interpreting the multivariate results.

Figure 3 maps neighborhoods that experience medium to high levels of both young male homicide and intimate femicide and shows that there are important similarities and important differences in the spatial distribution of both homicide types. More specifically, some neighborhoods in Toronto experience high levels of both types of homicide (these are the neighborhoods that are highlighted using a checkered pattern), which is consistent with criminological theory that implies that the spatial distribution of lethal violence will be more similar than it is different (i.e., neighborhoods are expected to experience high levels of lethal violence in general, rather than high levels of particular types of homicide). At the same time, however, there are a number of
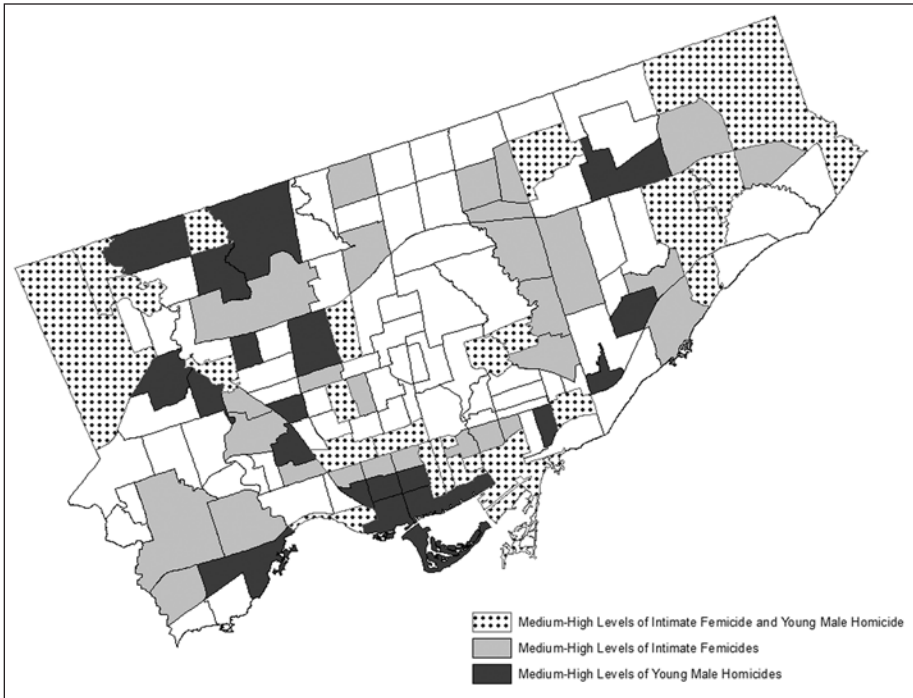
Figure 3. Toronto neighborhoods with medium/high levels of intimate femicide and young male homicide, 1988-2003.

neighborhoods in Toronto that are characterized by medium to high levels of intimate femicide (highlighted using light gray shading), which are altogether different from those that are characterized by medium to high levels of young male homicide (highlighted using dark gray shading). These results are consistent with theory that implies that the spatial distribution of different homicide types will be relatively distinct. I now turn to an examination of whether, and the extent to which, neighborhood characteristics matter for the killings of young men in Toronto, and if they do, whether they are the same as those that are associated with intimate femicides.

Neighborhood Characteristics and Disaggregated Homicide Counts: Analysis

Homicide is (fortunately) a rare event in Toronto and most neighborhoods have few homicides, and even fewer of the homicide subtypes examined in this analysis, even when data are pooled over 16 years. When analyzing counts for rare events, assumptions of ordinary least squares (OLS) regression are likely to be violated, resulting in biased estimates (Long, 1997; Osgood, 2000). Following past research on the social ecology of disaggregated homicide types, I estimate two types of regression models in

Table 4. Negative Binomial and Poisson Regressions of Young Male Homicide and Intimate Femicide Counts in Toronto, 1988 to 2003.

	Model 1: Young male homicide (negative binomial)	Model 2: Intimate femicide (Poisson)
% Black	.054** (.017)	.035 (.024)
Disadvantage index	.067** (.024)	−.007 (.037)
% population 15-24 years	.160*** (.045)	.069 (.046)
% immigrants	.026** (.010)	.037** (.014)
Residential stability index	.006 (.005)	−.004 (.005)
Spatial autocorrelation coefficient	.041 (.045)	
Intercept	−7.499	−6.022
Log likelihood	−259.356	−162.596
Pseudo R^2	.155	.090

Note. Standard errors in parentheses. Unstandardized parameter estimates presented.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.

my multivariate analyses that are appropriate for modeling rare events: Poisson and negative binomial models (Land, Cantor, & Russell, 1995). Poisson regression assumes equidispersion (i.e., that the variance of the response is equal to the mean). However, the Poisson model is appropriate only if the data are statistically independent and not overdispersed. When the data are overdispersed, the best-known and most widely available tool is the negative binomial regression model (for a complete description, see Osgood, 2000). An examination of the goodness-of-fit statistics for a Poisson model of young male homicide counts revealed evidence of overdispersion; I therefore estimate a negative binomial model for the multivariate analyses discussed below. An examination of the goodness-of-fit statistics for a Poisson model of intimate femicide counts, however, did not reveal evidence of overdispersion. I therefore estimate a Poisson model to determine the relationship between neighborhood characteristics and intimate femicide in Toronto.

Spatial autocorrelation is common in the residuals of regression models in neighborhood-level analyses of homicide, which can inflate the parameter estimates in some regions and underestimate them in others. The model will also produce unrealistic values for the significance levels and confidence limits for the coefficients (Messner et al., 1999). As such, regression analyses using spatial data must test for spatial dependence in the model. The program ArcGIS 902 was used to calculate the Moran's I test for spatial autocorrelation. My analysis indicates the presence of spatial dependency in the young male homicide data, which suggests that the characteristics of adjacent neighborhoods matter for understanding the social ecology of this form of lethal violence. I therefore include a spatial lag to the regression model for young male homicide. By contrast, the results indicate a random distribution of intimate femicide in Toronto's neighborhoods (i.e., no spatial autocorrelation).

Multivariate Results

I begin by estimating a negative binomial model for young male homicide counts. The results of this analysis, presented in Model 1 of Table 4, indicate that the disadvantage index, the percentage of the population aged 15 to 24 years, percent Blacks, and percent recent immigrant variables are positively and significantly associated with young male homicide in Toronto's neighborhoods. In other words, economically disadvantaged neighborhoods with larger proportions of young, Black, and recent immigrant residents tend to have higher levels of young male homicide. By contrast, the residential stability index is not significantly associated with this form of lethal violence in Toronto's neighborhoods.

I next estimate a Poisson model to examine the distribution of intimate femicide counts in Toronto's neighborhoods as a function of the set of independent variables. The results of this analysis, presented in Table 4, Model 2, indicate that only the percent recent immigrant measure is positively and significantly associated with intimate femicide; none of the other neighborhood measures in this model is significantly associated with this form of lethal violence.

Tests to determine whether the observed relationships differed between the two models found that only the coefficients for the disadvantage index were significantly different. In other words, economic disadvantage is a significantly stronger predictor of young male homicide than it is of intimate femicide. I now turn to a discussion of possible explanations for the presence and absence of effects in these analyses.

Discussion

Significant Effects

In Toronto, the disadvantage index, along with the percentage of neighborhood residents who are young, Black, and recent immigrants are positively and significantly associated with the killings of young men. To some extent, this is likely a function of a compositional effect and suggestive of the social interactional mechanisms outlined in the routine activities perspective. In other words, in disadvantaged neighborhoods with a preponderance of young and Black residents, one would expect that a larger proportion of victims would also be young, Black males, because this is a segment of the population that tends to converge in time and (public) space.

Yet, there are also contextual reasons to expect a relationship between economic disadvantage, neighborhood age structure, racial composition, and lethal violence. Recent efforts to account for this relationship in disadvantaged American neighborhoods have emphasized the dual and reciprocal role of structural and cultural factors. For example, some scholars argue that so-called disorganized conditions in some urban neighborhoods may give rise to cultural adaptations that include norms that tolerate, or even encourage the use of violence, particularly among young, Black males (Anderson, 1999; Bruce, Roscigno, & McCall, 1998; Sampson & Wilson, 1995). In turn, these "ecologically structured tolerances" (Sampson & Bean, 2006)

may influence rates of violent crime at the neighborhood level. The ecological concentration of race in impoverished neighborhoods is well documented in the American context (Jarkowsky, 1994; Sampson & Wilson, 1995; Wilson, 1987). Given that Toronto also experiences substantial levels of neighborhood segregation by income and race/ethnicity (Fong & Wilkes, 2003; Hulchanski, 2007; White, Fong, & Cai, 2003; White, Kim, & Glick, 2005), and that Blacks in Canada's inner-city neighborhoods are the most segregated of all racial/ethnic groups (Fong & Shibuya, 2000; Fong & Wilkes, 1999), it is perhaps not surprising that economic disadvantage and the proportion of neighborhood residents who are young and Black are positively related to rates of young male homicide in Toronto's neighborhoods.

That the percent recent immigrant variable is positively and significantly associated with young male homicide stands in contrast to some recent studies in the United States that show that immigration has negative or no effects on patterns of violent crime, even in those immigrant neighborhoods that are extremely economically disadvantaged (Lee et al., 2001; Martinez, 2002; Reid et al., 2005; Sampson, 2008). These findings are, however, consistent with other research conducted in Canada and the Netherlands that has found a positive and significant relationship between the proportion of immigrants and neighborhood homicide (Nieuwbeerta et al., 2008; Thompson & Gartner, 2014). As demonstrated in Table 3, the percent recent immigrant variable is correlated very strongly with measures of economic disadvantage, along with percent Black, and measures of residential stability. This suggests that the relationship between immigration and young male homicide is likely because neighborhoods with a large percentage of recent immigrants experience a variety of socioeconomic and other forms of disadvantage not captured by the measures in the model. For example, these neighborhoods may be lacking in resources and settlement services geared toward the social and economic integration of new immigrants into Canadian society. Taken together, multiple forms of disadvantage and deficits in local supports may create conditions that render newcomers to Toronto vulnerable to a host of negative outcomes, including higher levels of violent victimization.

The multivariate analyses also demonstrate that intimate femicide in Toronto's neighborhoods is positively and significantly associated with only one independent variable, the percent recent immigrant measure.[9] Research (see, for example, Alaggia, Regehr, & Rishchynski, 2009; Chin, 1994; Hondagneu-Sotelo, 1994) suggests that some immigrant communities are characterized by traditional gender arrangements, and that immigrating to a new country, particularly a Western one, can introduce fundamental shifts in gender and family relations. In a context where traditional gender expectations predominate but are being challenged (e.g., by exposure to more egalitarian gender roles and expectations), men may resort to violence against their female intimate partners as a means of maintaining their status within the relationship and preserving the traditional gender status quo (Giddens, 1992). Research also suggests that, due to often tenuous relationships with formal agencies of social control, women—particularly immigrant women and women of color—in these neighborhoods may be reluctant to report their victimization to the police (Crenshaw, 1991; Hyman, Forte, Du Mont, Romans, & Cohen, 2009; Martin & Mosher, 1995; Menjivar

& Salcido, 2002; Shirwadkar, 2004; Wachholz & Miedema, 2000). There are several possible reasons for this: (a) the nature of the police in their country of origin may lead them to be distrustful of police organizations in the host country (Crenshaw, 1991; Shirwadkar, 2004; Wachholz & Miedema, 2000), (b) reporting their victimization may be perceived as bringing shame on the larger immigrant community (Crenshaw, 1991; Du Mont & Forte, 2012; Menjivar & Salcido, 2002; Shirwadkar, 2004), and (c) abused immigrant women may be sponsored by their male intimate partners and/or entirely economically dependent upon them. As such, reporting their victimization may risk the removal of their sole source of sponsorship and/or economic support (Alaggia et al., 2009; Du Mont & Forte, 2012; Martin & Mosher, 1995; Wachholz & Miedema, 2000). Another reason is language barriers: Immigrant women may feel they cannot communicate with agents of the formal legal system (Martin & Mosher, 1995). Finally, services for immigrants, especially for immigrant women who are abused, may not be widely available. In addition, even when resources and services for abused women are locally available, there can be significant barriers to help-seeking behaviors, particularly among immigrant women (Alaggia et al., 2009; Ali, Massaquoi, Brown, & Women's Health in Women's Hands Community Health Centre, 2003; Bhugra, Harding, & Lippett, 2004). These and other "insurmountable barriers" (Alaggia et al., 2009) may mean immigrant women in Toronto are less likely to report their victimization to legal authorities and/or service providers, which could serve to embolden their male intimate partners, and in some cases, violence in the relationship may escalate to the point that it becomes lethal.

The Absence of Significant Effects

What might explain the absence of effects between the neighborhood-level measures, young male homicide and intimate femicide? It should first be noted that issues related to construct validity, measurement error, and/or unrefined measures may account for the absence of effects in the multivariate analyses. Recall that the residential stability index was not significantly associated with the killing of young men in Toronto's neighborhoods. Consistent with bivariate results, this is likely because Toronto neighborhoods with high levels of residential instability are also characterized by high levels of economic disadvantage and a large percentage of immigrant residents, which themselves are positively and significantly associated with young male homicide.

What factors might account for the absence of effects with respect to neighborhood characteristics and intimate femicide in Toronto's neighborhoods? As discussed above, there are theoretical and empirical reasons to expect weak or no neighborhood-level associations with this homicide type. Some scholars have suggested that the distinctly "private" nature of much lethal violence against women means that the victim and offender may be less apt to be influenced by the overall structure of the community or broader neighborhood-level conditions and processes (Browning, 2002; Kubrin, 2003; Sampson & Raudenbush, 1999).

At the same time, other scholars have argued that the "culturally pervasive conceptions of the private nature of intimate relationships should not obscure the potentially

consequential embeddedness of these relationships in broader communities" (Browning, 2002, p. 849). In other words, it may be that there are indeed "neighborhood effects" associated with intimate femicide, but because of the limited set of neighborhood-level variables examined in the literature to date, potential effects have not yet emerged. In their article on neighborhood effects and intimate partner violence (excluding homicide), O'Campo, Burke, Peak, McDonnell, and Gielen (2005) argue that "the breadth of neighborhood characteristics examined in relation to IPV [intimate partner violence] is rather narrow and cannot begin to contribute to a comprehensive understanding of how neighborhoods affect the risk of partner violence"[10] (p. 603).

Perhaps the most plausible explanation for the absence of "neighborhood effects," however, has to do with the smaller number of intimate femicides (compared with young male homicides), and related lack of spatial clustering by neighborhood, an argument recently advanced by Beyer, Layde, Hamberger, and Laud (2013). That is, the small number of intimate femicides, when distributed across 140 neighborhoods, is likely not sufficient to distinguish among neighborhoods. This is a problem not easily overcome in neighborhood-level social ecological research, but is one that must be seriously considered, particularly with respect to disaggregated homicide types.

Concluding Remarks

The goal of this study was to examine the extent to which young male homicide and intimate femicide in Toronto are spatially distributed across Toronto's neighborhoods in similar ways, and whether they are associated with similar neighborhood-level characteristics. Findings suggest that while there are similarities in the spatial distribution of these homicide types, there are also important differences. In addition, there is a significant difference in the effect of only one of the independent variables under examination: an index of socioeconomic disadvantage. Taken together, these findings underscore the argument that homicide should not be treated as a homogeneous phenomenon, and highlights the utility of disaggregating homicide data in at least some types of analyses. Finally, and of particular note, is the possibility that the small number of intimate femicides analyzed in much social ecological research, including this study, likely confounds efforts to detect true neighborhood effects.

The results are also relevant for evaluating the role that public policy may play in shaping the quantity and quality of lethal violence in urban neighborhoods. Violence prevention and reduction initiatives in Toronto, as in many other North American and European cities, have increasingly recognized the importance of "place" in shaping the risk of violent victimization. Consequently, the concept and language of neighborhoods has come to pervade much of the discourse on violence prevention and control—both in terms of identifying so-called "at risk" neighborhoods, and in designating a variety of area-based interventions that are intended to be "tailored" to fit a given neighborhood's specific needs. To date, however, many of the strategies implemented in the name of violence prevention and control tend to treat homicide as a monolithic category, rather than as a set of multidimensional behaviors that may be characterized by distinct (or a least varying) patterns, causes, and correlates. This is problematic in

light of the findings presented here, which suggest that though some neighborhoods are vulnerable to high levels of both young male homicide and intimate femicide, others are instead vulnerable to specific forms of this violence. As such, it is crucial that neighborhood-specific violence control policies and initiatives be implemented with a solid empirical understanding of the problems they are designed to prevent and/or control. Research that examines the social ecology and spatial distribution of disaggregated homicide types would provide a useful starting point. So, too, would research that compiles and examines data on the organizational and institutional capacity of neighborhoods that experience high levels of lethal violence. For example, it may be that neighborhoods in Toronto that experience high levels of young male homicide are also lacking in supports and services designed to assist so-called "at risk" youth. Research that identifies such deficits could play a key role in helping policy makers bolster the quantity and quality of local resources and services available to residents.

Research that examines local organizational capacity may also be helpful in understanding and addressing neighborhood-level variation in the risk of intimate femicide. A number of scholars have suggested that the proliferation of resources and services for abused women have served an important "exposure reduction" function, reducing levels of lethal violence among intimate partners (Dawson et al., 2009; Dugan, Nagin, & Rosenfeld, 1999, 2003). Yet, the protective advantage that "exposure reduction" resources confer may not be evenly distributed across the cityscape; some neighborhoods may be "resource rich" in this regard, and others lacking. In addition, even when resources and services for abused women are locally available, there can be significant barriers to help-seeking behaviors, particularly among immigrant women (Alaggia et al., 2009; Ali et al., 2003; Bhugra et al., 2004). As such, social ecological research that examines community organizational context and capacity should be coupled with studies that examine immigrant women's perceptions of local organizations, barriers to help-seeking behavior, and preferences for disclosure and social service provision (Alaggia et al., 2009; Hyman et al., 2009). This will assist policy makers in providing accessible and culturally appropriate spaces for immigrant women to disclose their abuse and seek help.

A final comment on the implementation of targeted resources and services that are designed to address neighborhood-specific issues is warranted. Criminological research has consistently highlighted the importance of evaluating and monitoring the effects of social programs and services to ensure that they are having the desired impact. This is, in part, because some well-intentioned interventions have been shown to have negative or harmful effects in the past (Doob, 2004; McCord, 1978, 2002). As such, it is imperative that policy makers not assume that the mere implementation of a program will necessarily lead to a reduction in local levels of violent crime. Careful program evaluation and monitoring are also important in light of the limited resources that are available for investment in neighborhood-based resources and services. Given these considerations, and to shift neighborhoods on to healthier trajectories, policy makers should give preference to empirically supported interventions that acknowledge and attend to the multidimensional nature of lethal violence.

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Declaration of Conflicting Interests

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Notes

1. The small number of studies on the social ecology of homicide conducted outside of the United States have found similar correlates (see, for example, Nieuwbeerta, McCall, Elffers, & Wittebrood, 2008; Sampson & Wikström, 2008; Thompson & Gartner, 2014).
2. These data were collected as part of a larger research project conducted by Rosemary Gartner and Bill McCarthy; I supplemented this data set with data on all homicides that occurred over the period of examination.
3. These data were collected from the Chief's Reports, which provide the Chief of Police with a synopsis of the first 24 to 48 hr of the homicide investigation. Given that these reports are preliminary accounts of the circumstances surrounding the killing, they are often missing information, particularly with respect to characteristics of the accused person(s). The Chief's Reports are, however, updated as new information is discovered, and as such, the catalog typically includes between one and six reports for any given case. The Chief's Reports remain, however, preliminary accounts of the homicide incident; thus, the data triangulation approach, using coroner's files and newspaper reports, was used to cross-check and supplement police data.
4. Given the rarity of homicide, the pooling of data over a number of years is common practice (Parker, McCall, & Land, 1999; Parker & Pruitt, 2000), particularly when examining disaggregated counts/rates across census tracts (Thompson, 2009; Thompson, 2013; Thompson & Gartner, 2014; Kubrin, 2003). To assess the potential that my results might be affected if young male homicide or intimate femicide became more or less prevalent over time, I examined counts for each year over the period of examination. The counts for each subtype remained stable over this 16-year period, which is to be expected given the very small numbers of the two types of homicide, especially intimate femicide.
5. There are several reasons for my choice of this age range (15-34 years) for young male homicides. First, research (see, for example, Loeber & Farrington, 2011; Perreault, 2012) on the age and sex distribution of homicide risk demonstrates that homicide victimization among males is rare under the age of 15 years, increases and peaks in the mid-teens through the mid-20s, and subsequently declines, with the most precipitous drop in the early-to-mid-30s. As such, I wanted to focus on that age bracket that research suggests captures the largest portion of male victims (teens to mid-30s). Given that my focus is on a form of homicide that tends to be public in nature (particularly when compared with the more private nature of intimate femicide), and not on the age of the victim per se, I also chose the

age bracket of 15 to 34 years because the overwhelming majority of these killings occurred in public spaces.

6. It is important to note, however, that while the issue of missing data necessarily affects what we know about the individual-level and situational characteristics of homicide in Toronto over the period under examination, it does not affect the multivariate analyses. There are two reasons for this: First, there were no missing data for those individual-level variables required to identify young male victims (i.e., victim sex and age), the dependent variable for one of the multivariate analyses. Similarly, and with respect to intimate femicide victims—there were no missing data with respect to the sex of victims of this form of homicide (or on the sex of any of the victims in the data set, for that matter). To classify an intimate femicide as such, data on the victim–offender relationship were required. This information was gleaned from police reports, coroner's files, and newspaper accounts of the killings. For all 118 cases, an offender and a victim–offender relationship were identified. In addition, for all 118 cases, each of these three sources classified the victim–offender relationship as some form of an intimate relationship. In three cases where there was a discrepancy, the discrepancy involved the nature of the intimate relationship. More specifically, in two cases, the newspaper reports indicated that the victim and the offender were married, whereas the police and/or coroner's reports indicated that they were, in fact, divorced. Both relationship designations, however, fell under the "intimate partner relationship" typology used in this study—which means that such discrepancies did not affect counts of intimate femicides over the period of examination. The second reason that missing individual-level data do not affect my multivariate results in any significant way is that the location of the killing (which was subsequently aggregated to the neighborhood-level) is the unit of analysis for these analyses.

7. To determine the relationship between victims of intimate femicide and their killers, the identity of the offender (obviously) is known. Therefore, I have information on a much larger proportion of offenders of intimate femicide than I do for young male homicide.

8. I did not include all variables that are strongly correlated with measures of socio-economic disadvantage. For example, the percent Black measure, which figures prominently in prior research on neighborhood effects and lethal violence, was excluded from the factor analysis of neighborhood disadvantage, despite its strong correlations with the other measures of economic disadvantage, which range from −.445 to .730. U.S. research that has included this measure has found that it loads heavily on factors reflecting high levels of economic deprivation (Land et al., 1990; Messner & Golden, 1992. This is not surprising given the strong correlation between percent Black and measures of disadvantage in the American literature. However, as Rosenfeld et al. (1999) have noted, "[r]ace is conceptually distinct from 'disadvantage', and treating them as attributes of the same dimension confounds attempts at untangling their distinct influence on levels of violence in a community" (p. 502). Therefore, I have retained the racial composition of Toronto's neighborhoods as a separate indicator in my analyses.

9. This finding stands in contrast to a number of studies that suggest that immigration has a null or negative effect on patterns of lethal violence. To date, only a handful of studies have examined the relationship between neighborhood-level immigrant concentration and the risk of intimate femicide, and with mixed results. For example, Frye et al. (2008) found that immigrant concentration was not significantly related to the risk of intimate femicide in New York City neighborhoods, whereas Vives-Cases, Alvarez-Dardet, Torrubiano-Dominguez, and Gil-Gonzalez (2008) found that foreign-born women in Spain were five

times more likely to be victims of intimate femicide than native-born women. Further research is required to clarify this relationship.

10. Admittedly, my data set is limited in terms of the neighborhood-level characteristics under examination. Future research that incorporates a wider array of neighborhood characteristics such as those that tap into local levels of social cohesion and informal social control capacity—that is, collective efficacy—may provide important insights into community-level processes that influence the prevalence of intimate femicide. As is discussed in the "Concluding Remarks" section, data on local institutions and organizations that provide resources and services for abused women may also enrich our understanding of variation in levels of intimate femicide across urban neighborhoods.

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Author Biography

Sara K. Thompson is an Assistant Professor in the Criminology Department at Ryerson University, Toronto, Canada. Her research interests fall in the areas of social inequality, exclusion and marginalization, the social and spatial distribution of urban violence, community resilience, 'pathways' to radicalization/violent extremism, and the negative effects that state-based policies and practices may have on those directly affected by them.