

Do Community Structural Characteristics Moderate the Association Between Mental Health and the Frequency and Severity of Violent-Behavioral Outcomes in Community Respondents?

Catherine S. Shaffer    Kevin S. Douglas    Erin K. Fuller    Adam J. E. Blanchard  
Jodi L. Viljoen  
Simon Fraser University

Journal of Interpersonal Violence

DOI: <https://doi.org/10.1177/0886260519888204>

Author Note:

Catherine S. Shaffer, Kevin S. Douglas, Erin K. Fuller, Adam J. E. Blanchard, and Jodi L. Viljoen, Department of Psychology, Simon Fraser University.

This research was supported by an operating grant from the Canadian Institutes of Health Research (Principal Investigator Kevin S. Douglas). The views expressed herein are those of the authors and do not necessarily reflect the views or policies of the agency that funded the research. The authors thank Michelle Collins, Alessandro Metta, Leila Wallach, Ljudmila Petrovic, and Dylan Gatner for their work on the project.

Correspondence concerning this article should be address to Catherine S. Shaffer, Department of Psychology, Simon Fraser University, Burnaby, BC V5A 1S6. Contact: [cshaffer@sfu.ca](mailto:cshaffer@sfu.ca)

## Abstract

In this prospective study, we examined the association between three types of mental health symptom clusters (i.e., psychotic, internalizing, and externalizing) and the frequency and severity of violent-behavioral outcomes, and whether community disadvantage, residential instability, and criminogenic facility density moderated these associations. Study data were derived from 258 community-dwelling adults nested in 60 postal forward sortation areas (FSAs) in a large metropolitan area in Western Canada who were assessed twice over a 6-month period. In addition, census and administrative data were obtained on the same areas. Controlling for sociodemographic characteristics (i.e., age, gender, ethnicity, relationship status, and employment status), lifetime history of violent-behavioral outcomes, and community structural characteristics, internalizing and externalizing mental health symptoms were significantly positively associated with the frequency and severity of subsequent violence perpetration and with the severity of subsequent violent victimization. Several significant interactions were observed: internalizing symptoms increased the risk of frequent and severe violence perpetration in FSAs with high but not low disadvantage, and externalizing symptoms increased the risk of frequent violent victimization in FSAs with a high but not low criminogenic facility density. Only the interactive association of internalizing symptoms and community disadvantage with the severity of violence perpetration, however, remained significant after Bonferroni correction was applied. These findings provide tentative support that associations between mental health and violent-behavioral outcomes can vary with community context. The implication of these findings for assessing and managing violent-behavioral outcomes in the community are discussed.

*Keywords:* crime pattern theory, mental disorder, social disorganization theory, violence perpetration, violent victimization

## Do Community Structural Characteristics Moderate the Association Between Mental Health and the Frequency and Severity of Violent-Behavioral Outcomes in Community Respondents?

It is well documented in the literature that mental disorders, including psychosis, depression, anxiety, personality disorder, and substance abuse, are associated with an increased likelihood of violent-behavioral outcomes (i.e., violence perpetration and violent victimization). Research has indicated modest yet significant associations between mental disorders and violence perpetration (e.g., Douglas, Guy, & Hart, 2009). In addition, there are moderate associations between mental disorders and the incidence of violent victimization (e.g., Choe, Teplin, & Abram, 2008). The mechanisms underlying the association between mental health and violent-behavioral outcomes are complex. Some symptoms of mental disorders, such as poor problem-solving skills and disorganized thought processes, can impair the ability to refrain from violence (Douglas et al. 2009) and impair the ability to perceive the risk of harm (Hiday, Swartz, Swanson, Borum, & Wagner, 1999). In addition, symptoms of mental disorders are often associated with other important risk factors, such as substance use, increasing the vulnerability to violent-behavioral outcomes (Elbogen & Johnson, 2009).

Studies on moderators of the association between mental disorder and violent-behavioral outcomes have predominantly focused on individual-level risk factors, such as age, gender, and substance use (Sirotych, 2008). However, given research demonstrating a robust association between community-level variables and violent-behavioral outcomes (Sampson, Raudenbush, & Earls, 1997), there is growing interest in understanding the potential interactive effects of broader socioeconomic and community contexts. For instance, although mental health symptoms might generally predict violent-behavioral outcomes with small to moderate effect sizes (e.g., Douglas et al., 2009), their impact may vary depending on an individual's living environment or community characteristics. That is, some symptoms may be a stronger predictor of violent-behavioral outcomes in certain communities compared to others. Indeed, several authors have argued that theoretically-driven studies examining the association between mental health and social contextual variables may help to clarify the association between mental disorder and violent-behavioral outcomes (e.g., Hiday, 1997). Moreover, an ecologically-informed approach is important for service planning and strategy development to reduce or manage violence in the community (Silver, Arsenault, Langley, Caspi, & Moffitt, 2005).

Little research has examined the role of community factors in the association between mental health and violence perpetration or violent victimization. Moreover, existing studies have applied limited operational definitions of mental disorder, community structural characteristics, and violent-behavioral outcomes. Thus, to gain a more comprehensive understanding of the potential mechanisms by which community characteristics may interact with mental health, additional research is required. Below, we describe theoretical frameworks that can be applied to understand the association between community structural characteristics and violent-behavioral outcomes. Next, we discuss potential pathways by which community structural characteristics may interact with mental health symptoms to influence violence-behavioral outcomes. Finally, we note the limitations of previous research and discuss the purpose of the current study.

### **Theoretical Frameworks of Community Structural Characteristics**

To define and measure community structural characteristics associate

ed with violent-behavioral outcomes, we drew from two well-validated theoretical frameworks in the field of criminology: social disorganization theory and crime pattern theory. These theories describe community-level risk factors that directly influence adverse outcomes beyond individual-level characteristics. Although these frameworks were originally developed to explain the association between environment characteristics and crime more broadly, they have also been applied to explain variation in rates of violence perpetration and violent victimization.

**Social Disorganization Theory.** Social disorganization theory (Shaw & McKay, 1942, 1969; Shaw, Zorbaugh, McKay, & Cottrell, 1929) is an ecological theory of crime that posits that structural characteristics of communities, such as socioeconomic deprivation, a high turnover rate in the population (i.e., residential instability), and the presence of diverse racial and ethnic groups (i.e., ethnic heterogeneity), are key contributing factors to the formation and maintenance of crime. In areas characterized by social disorganization, there is a breakdown of social bonds or collective efficacy among residents and conventional social institutions, such as the police, which operate as formal and informal controls for deviant behaviour.

Consistent with this framework, communities characterized by socioeconomic disadvantage, residential instability, and ethnic heterogeneity have been found to experience higher crime rates, including higher levels of assault, intimate partner violence, sexual violence, and robbery (Sampson et al. 1997). However, social disorganization theory may not fully account for the variation in violent-behavioral outcomes across communities. For instance, because of its focus on socioeconomic deprivation as an explanatory variable, social disorganization theory may only be applicable to impoverished inner-city areas and have limited utility in middle to high socioeconomic status areas. In addition, social disorganization theory focuses only on the influence of broader community contexts on criminal behavior, yet certain locations or “hot spots” within communities might also influence such events (Lowenkamp, Cullen, & Pratt, 2003).

**Crime Pattern Theory.** Addressing some of the criticisms of social disorganization theory, crime pattern theory (Brantingham & Brantingham, 1984) provides a framework for understanding why crime is concentrated at hot spots within communities. Crime pattern theory asserts that crime is more likely to occur in places where suitable targets and offenders come into contact. Such places include where people travel to and from (e.g., school, work), pathways between these places (e.g., bus stops, subway stations), facilities that attract many people (e.g., malls, stadiums), facilities that are frequented by offenders (e.g., half-way houses, drug markets), and facilities that increase the likelihood of offending (e.g., bars).

In line with crime pattern theory, research has shown that crime is more frequent in areas surrounding alcohol distribution outlets, halfway houses, drug treatment centers, public transportation stops, pawn shops, and high schools and colleges (Groff, & Lockwood, 2014). In addition, areas surrounding these facilities have been associated with increased rates of violence (e.g., Bernasco & Block, 2011).

## **Interactive Associations of Community Characteristics and Mental Health with Violent-Behavioral Outcomes**

Because social disorganization theory and crime pattern theory do not consider potential interactions between individual- and community-level factors, discussion thus far has centered on direct associations between community structural characteristics and violent-behavioral outcomes. However, community structural risk factors and mental health may also interact to increase the risk of violence perpetration and violent victimization. For instance, living in a socially disorganized community may exacerbate symptoms of mental disorder, such as suspicion or mistrust, which in turn may lead to violence perpetration as a means of dealing with conflictive or stressful situations (Hiday, 1997, 2006). Similarly, for persons living in high-disadvantage communities, the expression of mental health symptoms may increase vulnerability to violent victimization (Silver, Piquero, Jennings, Piquero, & Leiber, 2011). Such victimization may, in turn, lead to the misperception of others as hostile thereby increasing the risk of violence perpetration potentially to deter future assault (Hiday, 2006; Link & Stueve, 1994).

Crime pattern theory variables have also been suggested to interact with mental disorder to influence violence-behavioral outcomes. Persons with mental health symptoms may be attractive targets of violent acts in areas with motivated offenders, particularly when mental health is directly observable suggesting that a potential victim is unable or unwilling to engage in self-protective behaviors (Hiday et al., 1999). Additionally, due to restrictions in social opportunities, such as employment, housing, or social networks, persons with mental health symptoms may be more likely to frequent criminogenic facilities such as pawn shops, transportation centres, or social housing. Alternatively, as substance use disorder and other mental disorders can co-occur (Kessler et al., 1996), persons with mental health symptoms may frequent alcohol distribution outlets (e.g., liquor stores, bars) or reside in drug treatment centers, which can increase their proximity to offenders, as well as their risk for violence perpetration.

To the best of our knowledge, only two published studies have tested the proposition that the association between mental disorder and violence perpetration may vary as a function of community structural characteristics. Silver and colleagues (1999) examined the influence of concentrated poverty on violence perpetration in sample of 293 discharged psychiatric patients. The authors found that community poverty was significantly associated with an increased likelihood of violence perpetration. In a reanalysis of the same data, Silver (2000) examined the association between mental health and community social disorganization. Compared to psychiatric patients not residing in disorganized communities, discharged psychiatric patients living in socially disorganized communities were at increased risk to engage in violence. Only one study has examined the association between mental health, community-level factors, and violent victimization. Using a sample comprised of 270 discharged psychiatric patients and 477 community controls, Silver (2002) found that the association between patient status and violent victimization was no longer significant when community disadvantage was controlled for.

### **Limitations of Prior Research**

Thus far there is preliminary support that community-level characteristics may interact with mental health symptoms to influence violent-behavioral outcomes. However, there are four methodological or conceptual challenges that have remained unaddressed. First, previous studies have operationalized mental disorder by examining discharged psychiatric patients. The use of discharged psychiatric patients is likely to limit generalizability and yield different results from individuals with mental health problems that have never been hospitalized. For instance, persons

who are violent-prone may be more likely to be hospitalized or seek inpatient treatment following victimization (Swanson et al., 2000). Second, only a few dimensions of community structure (e.g., disadvantage) were considered and whether criminogenic facilities (e.g., alcohol distribution outlets) interact with mental health to influence violent-behavioral outcomes has not yet been tested. Third, research has typically defined violent-behavioral outcomes in a dichotomous manner (i.e., as absent or present). Dichotomous ratings fail to differentiate seriousness and frequency of violent-behavioral outcomes, instead treating individuals who experience minor or few violent-behavioral outcomes as equivalent to individuals who experience more severe or frequent forms. Determining which variables are predictive of a higher frequency and higher severity of violent-behavioral outcomes will allow for the identification of individuals at risk of continued and severe violent-behavioral outcomes, and whether different strategies for reducing these outcomes should be pursued. Finally, although violence perpetration and violent victimization can co-occur (Sirotych, 2008), relatively few studies have concurrently examined these outcomes in the context of community-level risk factors. As such, the unique and shared community-level risk factors for violence perpetration and violent victimization are unknown.

### **Purpose of the Current Study**

The current study examined the association between mental health symptoms and violence perpetration and violent victimization, as well as whether community structural characteristics moderated these associations. In addition to concurrently examining violence perpetration and violent victimization, this research differentiates itself from past research in three ways. First, whereas prior research has focused on samples of discharged psychiatric patients, data for this study were derived from a community-dwelling sample of adults with no history of prior mental health hospitalizations. Mental health problems were defined as the presence of any active mental health symptoms in the respondent (i.e., symptoms that do not necessarily imply the presence of a mental disorder but could warrant a more in-depth investigation by a mental health professional). Because mental health symptoms can vary along at least three dimensions corresponding to psychotic symptoms (i.e., problems characterized by hallucinations and delusions), internalizing symptoms (i.e., problems that affect an individual's internal experience) and externalizing symptoms (i.e., problems characterized by a failure to control behavior; Kotov et al., 2010), we examined these three types of mental health symptoms in our analyses. Second, whereas prior studies have only included social disorganization variables in their analytic models, in this study we examined moderating effects of both social disorganization and crime pattern theory variables. Finally, whereas prior research has used dichotomous measures of violent-behavioral outcomes, we categorized violence perpetration and violent victimization along dimensions of frequency and severity to examine if this would result in an informative distinction in the interactive associations between mental health and community structural characteristics with these outcomes.

## **Method**

### **Participants**

Participants were 258 adults residing in a large metropolitan area in Western Canada between June 2013 and January 2014. All participants were 18 years or older, English literate,

and had no history of mental health hospitalizations. Participants ranged in age from 19 to 66 years, with an average age of 35.47 years ( $SD = 9.70$  years) at the baseline assessment. Most participants were female (65.5%,  $n = 169$ ), single (51.6%,  $n = 133$ ), and employed (82.6%,  $n = 213$ ). Of the sample, 48.1% ( $n = 124$ ) identified as Caucasian, 29.5% ( $n = 76$ ) as Asian, 8.1% ( $n = 21$ ) as South Asian, 3.9% ( $n = 10$ ) as Indigenous, 1.2% ( $n = 3$ ) as African Canadian, and 8.5% ( $n = 22$ ) as another ethnic minority. The sociodemographic characteristics of the sample were fairly consistent with those reported in provincial statistics (Statistics Canada, 2013). For instance, the study sample was slightly younger (35.5 years vs. 38.3 years) and contained a greater proportion of females (65.5% vs. 51.6%). Also, the current sample contained fewer employed individuals (82.6% vs. 93.4%) or individuals who were Asian (29.5% vs. 39.0%) or Indigenous (3.9% vs. 7.0%), but more who were South Asian (8.1% vs. 2.0%) or another ethnic minority (8.5% vs. 1.0%). The proportion of African Canadians and individuals married or in a common law relationship did not differ between the current sample and the provincial population. Lifetime rates of violence perpetration and violent victimization were 28.7% ( $n = 74$ ) and 41.1% ( $n = 106$ ) respectively.

## Procedure

Participants were recruited from the community using newspaper and online advertisements and flyers posted in community locations. Flyers and advertisements invited individuals to complete a study on their life experiences, and listed eligibility criteria (i.e., 18 years or older, fluent in English, and resident of the [details redacted for blind review] Regional District) and email and telephone information so that interested individuals could contact the study authors to participate. Following informed consent, participants completed an online survey. Participants were invited to complete the survey again six months later. Each survey administration took between 15 and 20 minutes to complete.

At the baseline assessment, participants provided their sociodemographic characteristics and completed self-report measures of mental health and lifetime history of violent-behavioral outcomes. In addition, participants provided their postal forward sortation area (FSA; i.e., the first three digits of their postal code, which is roughly equivalent to four to six census tracts), which was used to match participant self-report data to census records and administrative data on community context. FSAs define a subset of stable geographical regions and have been previously used to assess community structural characteristics (e.g., Sacco, Johnson, & Arnold, 1993). Using FSAs to represent communities was appropriate because FSAs are larger than full Postal Codes, which often include a single street block, but smaller than Census Subdivisions, the next largest geographical area, which often include entire municipalities and thus are too large to represent communities. In addition, due to the sensitive nature of some of the questions being asked (e.g., history of victimization) asking for full Postal Codes might have acted as a deterrent to study participation. At the six-month follow-up, participants reported whether they had engaged in violence perpetration or experienced violent victimization since the baseline assessment.

In total, 400 individuals nested in 67 (of 99 possible) FSAs participated in the study. Consistent with other studies (e.g., Monahan et al., 2001), the retention rate at the 6-month follow-up was 79.0% ( $n = 316$ ). Of the participants with complete follow-up information, 10.1% ( $n = 32$ ) had been seen in a psychiatric emergency room or hospitalized for psychiatric reasons

and 9.3% ( $n = 37$ ) had missing or invalid postal code information (i.e., the postal code provided included one or more errors in its letters or digits) and were therefore removed from subsequent analyses. This resulted in a final sample of 258 individuals nested in 60 FSAs. Compared to participants with complete follow-up data, participants with missing up follow-up data were more likely to be single, have a history of violent-behavioral outcomes, and have higher levels of externalizing mental health symptoms ( $p = .011$  to  $.033$ ). In addition, participants with missing or invalid postal data were more likely to be younger and single ( $p < .001$  to  $.014$ ).

## Measures

**Mental health symptoms.** Composite measures of psychotic and internalizing symptoms were created using non-overlapping items from the Mental Health Screening Form III (MHSF-III; Carroll & McGinley, 2001) and Modified Mini Screen (MMS; New York State Office of Alcoholism and Substance Abuse Services, 2002), two *yes/no* self-report screening measures of mental health symptoms. The composite measure of psychotic symptoms was created by totaling *yes* responses on seven items that queried psychotic symptoms (Kuder Richardson reliability [ $r_{\text{test}}$ ]=.67, mean-interitem correlation [MIC] = .24)]. Principal components analysis (PCA) using orthogonal (varimax) rotation indicated that these seven items loaded onto a single factor that accounted for 35.5% of the variance in these variables, with an eigenvalue of 2.48 and factor loadings between .45 and .72. Sample items include “Have you ever heard voices no one else could hear or seen objects or things which others could not see? (MHSF-III) and “Have your relatives or friends ever considered any of your beliefs strange or unusual? (MMS).

The composite measure of internalizing symptoms was created by totaling *yes* responses on six items that queried internalizing disorders ( $r_{\text{test}}$ =.77, MIC = .35). Nineteen items on the MHSF-III and MMS conceptually-related to internalizing mental health symptoms were originally subjected to a PCA. However, 13 items were eliminated because they failed to have a primary factor loading of .32 or above and no cross-loading of .32 or above. The retained six items loaded onto a single factor that accounted for 46.4% of the variance in the variables, with an eigenvalue of 2.78 and factor loadings between .60 and .78. Sample items include “Have you ever been depressed for weeks at a time, lost interest or pleasure in most activities, had trouble concentrating and making decisions, or thought about killing yourself?” (MHSF-III) and “Have you ever believed that people were spying on you, or that someone was plotting against you, or trying to hurt you?” (MMS).

In line with prior work (e.g., Hundt, Kimbrel, Mitchell, & Nelson-Gray, 2008), a composite measure of externalizing mental health symptoms (i.e., antisocial personality disorder traits, substance use problems) was created using self-report data on the Personality Diagnostic Questionnaire-4<sup>th</sup> Edition (PDQ-4; Hyler, 1994) Antisocial Personality subscale, a screening measure of antisocial personality disorder, and the Drug Use Frequency Measure (DUF; O’Farrell, Fals-Stewart, & Murphy, 2003) and the MacArthur Violence Risk Assessment Study Alcohol and Drug Use Module (Monahan et al., 2001), two self-report inventories of alcohol and/or drug use. Sample items include “As of the age of 15, I don’t care if others get hurt so long as I get what I want” (PDQ-4), “Please indicate how frequently you used sedatives, hypnotics, or tranquilizers during the past two months” (DUF), and “During the past two months, did you have any alcohol to drink? (MacArthur Violence Risk Assessment Study Alcohol and

Drug Use Module). Responses to the subscales were used to create four dichotomous *yes/no* variables: use of one or more illegal drugs in the past two months; daily use of any drug or alcohol in the past two months; binge drinking (i.e., consumption of more than 10 alcohol drinks at one time) during the past two months; and the presence of one or more antisocial personality disorder traits. Scores on these items were totalled ( $r_{\text{test}} = .65$ , MIC = .33). These items loaded onto a single factor that accounted for 50.2% of their variance, with an eigenvalue of 2.01 and factor loadings between .64 and .80. Higher scores on each of three composite measures of mental health symptoms indicate a greater number of mental health symptoms.

**Community structural characteristics.** Three types of community structural characteristics were measured: community disadvantage, residential instability, and criminogenic facility density. Participant FSAs were used to derive census variables from the 2006 Canada Census, which was the most recent data available that corresponded to the time of baseline data collection (i.e., 2013). Consistent with prior work (e.g., Silver, 2000), an index of community disadvantage was developed using the following census variables: percentage of residents who belonged to a visible ethnic minority group, rate of adult unemployment, percentage of adult residents with income below the federal poverty level, percentage of households that receive public assistance, and percentage of single parent families (Cronbach's alpha [ $\alpha$ ] = .62, MIC = .58). These five variables loaded onto a single factor that accounted for 50.9% of their variance, with an eigenvalue of 3.56 and factor loadings between .75 and .92. Also consistent with Silver (2000), an index of residential instability was developed using two census variables: percentage of residents who lived in the same house for five years and percentage of homes that were owner occupied ( $\alpha = .64$ , MIC = .57), but these variables were reverse coded so that higher proportions indicated higher levels of residential instability. These two variables loaded onto a single factor that accounted for 23.4% of the variance in these variables, with an eigenvalue of 1.64 and factor loadings of .85 and .87. Total scores for each index were calculated by summing relevant variables, with higher scores indicating higher levels of community disadvantage or residential instability, respectively.

Participant FSAs were also used to derive counts of criminogenic facilities from the 2013 Canada Business Location Database and the Greater Vancouver Transportation Agency. Consistent with prior work (e.g., Groff & Lockwood, 2014), six types of criminogenic facilities were coded for each FSA: alcohol distribution outlets (e.g., liquor stores, bars), drug treatment centers, halfway houses, pawn shops, non-elementary schools (e.g., high schools, colleges), and transit stops. These variables loaded onto a single factor that accounted for 59.7% of the variance in these variables, with an eigenvalue of 2.99 and factor loadings between .63 and .90. An index of criminogenic facility density was created by totaling the number of each of the six types of criminogenic facilities in each FSA ( $\alpha = .82$ , MIC = .56), with higher scores indicating a higher criminogenic facility density.

**Outcomes.** Violence was defined as any actual, attempted, or threatened physical harm. Actual and attempted violent-behavioral outcomes at the 6-month follow-up were examined using a self-report version of the MacArthur Community Violence Interview (Monahan et al., 2001), which queried the occurrence of eight categories of actual or attempted violence-behavioral outcomes since the baseline assessment (see Supplementary Material Table S1). Three other categories of threatened violent behavioral-outcomes were also assessed. At the 6-month follow-up, rates of violence perpetration and violent victimization were 14.0% ( $n = 36$ )

and 24.0% ( $n = 62$ ), respectively. Responses to these questions were used to determine counts of violence perpetration ( $\alpha = .80$ , MIC = .42) and violent victimization ( $\alpha = .71$ , MIC = .38). To estimate the severity of violent-behavioral outcomes, we followed recommended approaches (e.g., Davis et al., 2014). First, one of the five authors (details redacted for blind review) ranked each of the 11 categories of violent-behavioral outcomes from most to least severe and assigned each category a corresponding weight (i.e., 1 to 11), with higher weights representing more severe violent-behavioral outcomes. In general, incidents were considered to constitute more serious violent-behavioral outcomes if they could have resulted in physical injury of the victim, whereas incidents not resulting in physical injury (i.e., threatened or attempted violence perpetration or violent victimization) were considered more minor forms of violent-behavioral outcomes. This approach has been used elsewhere (e.g., Coid et al., 2016). Second, each outcome was multiplied by the weight by the number of times the outcome occurred since the baseline assessment and then summed the values across all outcomes to create a severity total score.

### Data Analytic Plan

First, we computed zero-order Spearman's rho ( $r_s$ ) correlation coefficients to evaluate the association between the three mental health symptom clusters and violent-behavioral outcomes. In these analyses,  $r_s$  values of .10 represent small effects, .30 medium effects, and .50 large effects (Cohen, 1992). Second, we conducted multivariate regression analyses to examine the association between mental health symptoms and violent-behavioral outcomes, controlling for sociodemographic variables (i.e., age [in years], male gender, ethnicity [Caucasian, Asian, or other ethnic minority group], married or common law relationship status, and employment status [employed]), lifetime history of violence perpetration or violent-victimization, and community structural characteristics. Multilevel regression analysis is a recommended approach for analyzing data when individuals are clustered within groups, such as communities (Raudenbush & Bryk, 2002). Thus, we first checked if it would be feasible to conduct multilevel regression, especially as this analytic approach has strict assumptions. To yield stable estimates in multilevel regression there needs to be sufficient within-cluster variation (i.e., an adequate number of Level 1 units within each Level 2 group). Analyses indicated that within-cluster variation in the current sample was insufficient to allow for the use of multilevel regression (Kreft & de Leeuw, 1998). Specifically, the number of participants in the 60 FSAs ranged from 1 to 16, with most FSAs (91.2%,  $n = 55$ ) containing less than ten participants. Thus, standard regression was a more appropriate approach. The use of this approach is also consistent with the analytic methodology used in prior research (e.g., Silver, 2002). Although standard regression models that include individuals nested within groups can violate the assumption of independence of observations, Durbin Watson lag 1 autocorrelation test values indicated that serial correlation was not a concern in the data (i.e., the Durbin Watson lag 1 autocorrelation test value for the present analyses ranged between 2.00 and 2.09, which did not fall below the lower bound or above the upper bound critical values of 0.15 and 3.40).

Because violence perpetration and violent victimization were highly skewed count data, we employed multivariate Poisson and negative binomial regression analyses. Over-dispersion tests indicated that violence perpetration frequency, violence perpetration severity, and violent victimization severity (but not violent victimization frequency) had a high proportion of zero responses. Thus, the frequency of violent victimization was accommodated using Poisson

models, whereas negative binomial models were used for the three other outcome variables. Examination of multicollinearity diagnostics indicated that models including mental health symptoms, sociodemographic variables, lifetime history of violent-behavioral outcomes, and community-structural characteristics had tolerance, variable inflation factor, and condition index values within the acceptable ranges. In these analyses, Exp [b] values of 1.68 represent small effects, 3.47 medium effects, and 6.71 large effects (Chen, Cohen, & Chen, 2010).

Third, we tested interactions between mental health symptom clusters and community structural characteristics following the procedures recommended by Baron & Kenny (1986). In these analyses we controlled for individual-level variables (i.e., sociodemographic variables and lifetime history of violent-behavioral outcomes) significantly associated with violent-behavioral outcomes in the multivariate models. To reduce multicollinearity, continuous variables were mean centered on zero. Given limited power to test all interaction terms in one model, we examined each of the interaction terms (i.e., three mental health variables by three community-level variables for four outcome variables) in separate models. If a significant interaction was obtained, this was further probed by plotting and examining simple slopes for the interaction using one standard deviation above and below the mean to represent high and low scores of each independent and moderator variable. To control for the number of comparisons, Bonferroni correction (i.e.,  $p = .05/\text{number of interaction effects that were tested}$ ) was applied, and significant results before and after Bonferroni correction were reported.

## Results

Descriptive statistics of the major study variables are presented in Table 1. Mean scores on the indices of mental health symptoms were lower than those in other studies with clinical samples (e.g., Choe et al., 2008; Douglas, et al., 2009; Elbogen & Johnson, 2009). However, this was expected because the focus of the current study was on non-referred community respondents with no prior psychiatric treatment or mental health hospitalizations. Zero-order  $r_s$  correlations between mental health symptoms and the violent-behavioral outcomes are also displayed in Table 1. Psychotic, internalizing, and externalizing symptoms were significantly associated with the frequency and severity of violence perpetration and violent victimization at the 6-month follow-up with small to moderate effect sizes ( $r_s = .21$  to  $.35$ ,  $p < .001$  to  $.001$ ). Table 1 also presents the association between community structural characteristics and violent-behavioral outcomes, and the intercorrelations among variables. The association between residential instability and the frequency ( $r_s = .16$ ,  $p = .012$ ) and severity ( $r_s = .19$ ,  $p = .003$ ) of violent victimization was significant, although effect sizes were small. Moderate and significant associations were also found among the three composite measures of mental health symptoms ( $r_s = .30$  to  $.44$ ,  $p < .001$ ), as well as between community disadvantage and criminogenic facility density ( $r_s = -.32$ ,  $p < .001$ ) and between residential instability and criminogenic facility density ( $r_s = .40$ ,  $p < .001$ ). No other associations were significant.

**--Insert Table 1 about here--**

As shown in Tables 2 and 3, when sociodemographic variables, lifetime history of violent-behavioral outcomes, and community structural characteristics were controlled for in multivariate models, some of the associations between mental health symptoms and violent-behavioral outcomes found in Table 1 were no longer significant. Of the associations significant

in bivariate models, only associations between internalizing and externalizing symptoms and the frequency and severity of subsequent violence perpetration and the severity of subsequent violent victimization remained significant (Exp [B] = 1.23 to 1.53,  $p = .002$  to  $.034$ ). However, effect sizes were small.

**--Insert Tables 2 and 3 about here--**

In our final set of analyses, we evaluated whether mental health symptoms and community structural characteristics interacted in the prediction of violent-behavioral outcomes controlling for sociodemographic variables and lifetime history of violent-behavioral outcomes that were significantly associated with violence perpetration (Table 2) or violent victimization (Table 3) in multivariate models.

When the *frequency of violence perpetration* served as the dependent variable, results indicated a significant interaction between internalizing symptoms and community disadvantage (Exp [B] = 0.41, 95% CI [0.18, 0.86],  $p = .025$ ). Participants with high internalizing symptoms in FSAs with high disadvantage reported more frequent violence perpetration compared to participants in FSAs with low disadvantage, but internalizing symptoms were not related to the frequency of violence perpetration in FSAs with low disadvantage (see Supplementary Material Figure S1).

When the *severity of violence perpetration* served as the dependent variable, there was a significant interaction between internalizing symptoms and community disadvantage (Exp [B] = 0.41, 95% CI [0.18, 0.86],  $p < .001$ ). Participants with high internalizing symptoms in FSAs with high community disadvantage reported more severe violence perpetration compared to participants in FSAs with low disadvantage, but internalizing symptoms were not related to the severity of violence perpetration in FSAs with low disadvantage (see Supplementary Material Figure S2).

When the *frequency of violent victimization* served as the dependent variable, significant interaction effects between externalizing symptoms and criminogenic facilities were observed (Exp [B] = 1.01, 95% CI [1.00, 1.02],  $p = .012$ ). Participants with high externalizing symptoms in FSAs with a high number of criminogenic facilities reported more frequent violent victimization than participants in FSAs with a low number of criminogenic facilities, but externalizing symptoms were not related to the frequency of violent victimization in FSAs with a low number of criminogenic facilities (see Supplementary Material Figure S3). No other moderation effects were significant.

### **Bonferroni Correction**

When  $p$  values were corrected for family wise error using a Bonferroni correction ( $p = .05/nine$  interaction effects for each outcome =  $.005$ ), only the moderating effect of community disadvantage on the association between internalizing symptoms and the severity of violence perpetration remained significant.

## **Discussion**

This study examined the association between mental health symptoms and violence perpetration and violent victimization, and the moderating effects of community structural characteristics on these associations. Consistent with prior work (e.g., Choe et al., 2008; Douglas, et al., 2009; Elbogen & Johnson, 2009), the presence of any psychotic, internalizing, and externalizing symptoms were associated with the frequency and severity of violence perpetration and violent victimization at 6-month follow-up in bivariate analyses with small to moderate effect sizes. However, these associations were attenuated when sociodemographic variables, lifetime history of violent-behavioral outcomes, and community structural characteristics were controlled for. Specifically, internalizing and externalizing symptoms remained significantly associated with violence perpetration and violent victimization in multivariate analyses with small effects.

Although the primary focus of bivariate and multivariate analyses was on the association between mental health symptoms and violent-behavioral outcomes, several associations among the other variables were found that contradict our guiding theoretical frameworks or that warrant comment. First, residential instability has traditionally been viewed as a source of community disorganization (Shaw & McKay, 1942, 1969; Shaw et al., 1929), yet the association between residential instability and community disadvantage was small and non-significant. Recent research has indicated that disadvantaged communities can have little population turnover due to economic barriers that prevent residents from leaving (Wilson, 1987). As such, high levels of community residential mobility may no longer be closely tied to high levels of community economic disadvantage and social disorganization theory would benefit from revision.

Second, because criminogenic facilities can be found in communities characterized by both low and high levels of socioeconomic disadvantage, one would expect community disadvantage to be unrelated to criminogenic facility density. However, community disadvantage was significantly negatively associated with criminogenic facility density with small effect sizes. One possible explanation for this finding is that communities with high socioeconomic status may have a higher proportion of certain types of criminogenic facilities, such as alcohol distribution outlets (e.g., restaurants, bars) or non-elementary schools (e.g., high schools, colleges), than communities with lower socioeconomic status due to the greater availability of funding in these communities to develop infrastructure.

Third, bivariate analyses suggest that violent-behavioral outcomes were not more common in communities with high levels of community disadvantage or a criminogenic facility density. However, community disadvantage and criminogenic facilities were significantly associated with violent-behavioral outcomes when all three community structural characteristics were included in the model. This pattern of findings could indicate the presence of an interaction effect among these variables. For example, Taniguchi and Salvatore (2012) found that in census blocks with high socioeconomic status, a high concentration of some types of criminogenic facilities (e.g., drug treatment centers) was associated with high counts of violent crime, whereas the opposite was true for census tracts with low levels of socioeconomic status. Thus, the current results lend some support to the assertion that combining social disorganization theory and crime pattern theory can improve the predictive power of models to explain variations in violent-behavioral outcomes.

Fourth, community disadvantage and externalizing symptoms were negatively correlated in bivariate analyses. Although rates of externalizing problems, such as substance abuse, are expected to be higher in disadvantaged communities, some studies have found that community affluence is associated with increased substance use (Karraker-Jaffe, 2011). As such, the relationship between externalizing problems and community disadvantage may vary depending on the communities under focus.

In line with prior work on the interactive effects of mental health and social disorganization variables on any violence perpetration (Silver et al., 1999; Silver, 2000), frequent and severe violence perpetration was more likely to occur when internalizing symptoms were high in communities with high disadvantage. One possibility is that the presence of internalizing symptoms (e.g., anger, irritability, hyper-vigilance, emotional regulation difficulties) heightens sensitivity to social stressors and conflict in disadvantaged communities, which in turn leads to violence as a means of coping with stressful or conflictive situations (Hiday, 1995). It is also possible that high community disadvantage increases vulnerability to internalizing symptoms which in turn influences violence perpetration risk. For instance, prior research has found that individuals residing in disadvantaged communities exhibited higher rates of depression compared to more advantaged communities (Ross, 2000).

Frequent violent victimization was more likely to occur in communities with a higher number of criminogenic facilities when externalizing symptoms (e.g., antisocial personality traits, substance use difficulties) were high. Thus, findings from the current study lend some support to the argument that persons with mental health symptoms may be more vulnerable to experience violent-behavioral outcomes when they are exposed to criminogenic facilities. Individuals with antisocial personality traits may attend criminogenic facilities (e.g., pawn shops, transit stops) to engage in criminal behavior and be victimized in retaliation or self-defence. Similarly, individuals with substance use difficulties who frequent criminogenic facilities such as bars, nightclubs, or pubs may be at an increased risk for alcohol-related incidents of violence, but also reducing their ability to be alert to signs of risk.

One important finding from significant moderation models was that mental health symptoms were unrelated to violent-behavioral outcomes when community disadvantage and criminogenic facility density were low. The absence of effects of mental health problems in these types of communities suggest that mental health symptoms per se are not associated with violent-behavioral outcomes and that mental health symptoms may lead to violent-behavioral outcomes only when individuals reside in communities with high levels of structural risk factors. However, only one interaction effect was significant after a Bonferroni correction was made for the number of effects that were tested (i.e., the interactive effect of internalizing symptoms and community disadvantage with the severity of violence perpetration), which suggests that the relationship between mental health symptoms and violent-behavioral outcomes, for the most part, operated similarly across different community contexts.

Findings should also be interpreted within the context of the study's limitations. First, the sample used in the current study was relatively small and non-random. Violation of the assumption of random sampling could have introduced bias in the analyses (Tryfos, 1996). Furthermore, there is some evidence that self-selected samples systematically differ from samples drawn using other procedures and findings may not be generalizable to the larger

population (e.g., Mayr et al., 2012). For instance, research has found that women are more likely to self-select themselves for research participation compared to men (Moore & Tarnai, 2002). In addition, more affluent individuals are more likely to participate in research than their less affluent peers (Goyder, Warriner, & Miller, 2002).

Although the sociodemographic characteristics of the sample were fairly consistent with those reported in provincial statistics (Statistics Canada, 2013), men were underrepresented in the sample. As such, our study could misestimate the rate of violent-behavioral outcomes in the wider population. Furthermore, a different pattern of findings may be obtained in a predominantly male sample. For instance, gender was found to be related to violent victimization but not violence perpetration in multivariate analyses, but the converse may be found if there are more men than women. In addition, communities with more extreme levels of socioeconomic deprivation were not included. The restriction of range in community disadvantage could have resulted in attenuated associations with other theoretically-related variables. As such, adjustment weights may be needed to account for potential selection bias.

Second, our results may be biased because of missing data. Individuals with missing postal code information may have experienced recent changes in accommodation or had a temporary housing status compared to individuals who provided complete postal code information and thus conclusions drawn involving the residential instability variable may be limited. In addition, individuals with missing follow-up data were more likely to have a history of violent-behavioral outcomes. Consequently, our study may provide conservative estimates of violent-behavioral outcomes at the 6-month follow-up.

Third, our measures of mental health symptoms would benefit from additional efforts to assess their validity and reliability. For instance, our index of externalizing symptoms predominantly captured substance use problems and may need revision to capture a wider range of externalizing problems found in the general population (e.g., hyperactivity). Similarly, only 6 of 19 conceptually-related items from the MHSF-III and MMS loaded together on the PCA of internalizing symptoms. Given that internalizing but not externalizing symptoms interacted with community structure in the prediction of violence perpetration, and externalizing but not internalizing symptoms interacted with community structural characteristics in the prediction of violent victimization, it is possible that a different pattern of findings may be obtained when a more comprehensive range of internalizing or externalizing symptoms are examined.

Fourth, other factors related to community structural characteristics, such as how often participants attended criminogenic facilities, or whether participants spent a majority of their time in an FSA other than where they resided (e.g., when attending work or school), were not measured. Fifth, indices of community disadvantage and residential instability were drawn from the 2006 census, which was the most recent census data available. However, this data was 8 years out of date at the time of data collection in 2013. The examined FSAs may have changed in the degree of disadvantage or residential instability during that time. For instance, as result of the global financial crisis that began in 2007, between 2008 and 2009, Canada experienced sharp declines in employment and economic activity (Gordon, 2017).

Finally, although the focus of this paper was on the potential moderating effects of community structural characteristics, there may be different pathways by which mental health

symptoms and community structural characteristics interact to influence violent-behavioral outcomes. For instance, research has indicated that individuals with mental health problems may be more likely to reside in disadvantaged communities due to limited employment and residential opportunities. In addition, the adverse life events and difficulties common in disadvantaged areas (e.g., poor access to health care, lack of material or social resources) can cause psychological stress which contributes to the occurrence of mental health problems (Faris & Dunham, 1939; Silver, Mulvey & Swanson, 2002). Future research should address the aforementioned limitations and further explore the results found in this study, including the various mechanisms that contribute to interactive effects of mental health and community structural characteristics on violent-behavioral outcomes.

Results from the present study provide tentative empirical evidence of interactive associations of community disadvantage, criminogenic facility density, and mental health symptoms with violent-behavioral outcomes. The current results extend the research in this area in three major ways. First, previous studies have provided some evidence of interactive associations of social disorganization variables and mental health with violence perpetration and violent victimization, but, to the best of our knowledge, no previous research has examined whether the association between mental disorder and violent-behavioral outcomes can be moderated by criminogenic facilities. Second, meaningful distinctions in the influence of community structural characteristics on mental health symptoms arose depending on the type of violent-behavioral outcome under focus. These differences point to the need to conduct analyses that go beyond the simple approach of categorizing individuals based on the absence or presence of a violent-behavioral outcome at follow-up. Third, violence perpetration and violent victimization were found to be associated with unique environmental risk factors, suggesting that these behaviors may occur in different contexts and under different circumstances. For instance, criminogenic facility density may be less relevant in explaining violence perpetration, but instead play a greater role in determining violence perpetration.

The major implication of the current findings is that concurrently examining mental health and community-level risk factors might improve predictions of risk for violence perpetration and violent victimization and might assist in the identification of opportunities for intervention and management strategies. For instance, how relevant or important an individual's mental health symptoms is to risk for violent-behavioral outcomes may depend on their community-level risk factors. When presented with an individual with mental health symptoms general practitioners in the community can ask questions regarding the individuals living situation and daily activities to ascertain potential risk. Although community structural characteristics may be difficult to influence and require long-term policy solutions, one short-term solution is to improve and increase mental health services and professional supports in high-risk areas in the community. The presence of mental health professions in the community is associated with a reduced risk of violent-behavioral outcomes (Estroff, Swanson, Lachicotte, Swartz, & Bolduc, 1998). Further, increased community education and health promotion may reduce the stigma related to mental illness and increase help-seeking behaviors to mitigate risk (Kelly, Jorm, & Wright, 2007).

## References

- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182. doi:10.1037/0022-3514.51.6.1173
- Bernasco, W., & Block, R. (2011). Robberies in Chicago: A block-level analysis of the influence of crime generators, crime attractors, and offender anchor points. *Journal of Research in Crime and Delinquency*, *48*, 33-57. doi:10.1177/0022427810384135
- Brantingham, P. J. & Brantingham, P. L. (1984). *Patterns in Crime*. New York, NY: Macmillan Press.
- Carroll, J. F. X., & McGinley, J. J. (2001). A screening form for identifying mental health problems in alcohol/other drug dependent persons. *Alcoholism Treatment Quarterly*, *19*, 33-47. doi:10.1300/j020v19n04\_02
- Chen, H., Cohen, P., & Chen, S. (2010). How big is a big odds ratio? Interpreting the magnitudes of odds ratios in epidemiological studies. *Communications in Statistics - Simulation and Computation*, *39*, 860-864. <https://doi.org/10.1080/03610911003650383>
- Choe, J. Y., Teplin, L. A., & Abram, K. M. (2008). Perpetration of violence, violent victimization, and severe mental illness: Balancing public health concerns. *Psychiatric Services*, *59*, 153-164. doi:10.1176/ps.2008.59.2.153
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155-159. <https://doi.org/10.1037/0033-2909.112.1.155>
- Coid, J. W., Ullrich, S., Kallis, C., Freestone, M., Gonzalez, R., Bui, L., ... & Yang, M. (2016). Improving risk management for violence in mental health services: A multimethods approach. *Programme Grants for Applied Research*, *4*.
- Davis, K. C., Gilmore, A. K., Stappenbeck, C. A., Balsan, M. J., George, W. H., & Norris, J. (2014). How to score the Sexual Experiences Survey? A comparison of nine methods. *Psychology of Violence*, *4*, 445-461. doi:10.1037/a0037494
- Douglas, K.S., Guy, L.S., & Hart, S.D. (2009). Psychosis as a risk factor for violence to others: A meta-analysis. *Psychological Bulletin*, *135*, 679-706. doi:10.1037/a0016311
- Elbogen, E. B., & Johnson, S. C. (2009). The intricate link between violence and mental disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of General Psychiatry*, *66*, 152-161.
- Estroff, S. E., Swanson, J. W., Lachicotte, W. S., Swartz, M., & Bolduc, M. (1998). Risk reconsidered: Targets of violence in the social networks of people with serious psychiatric disorders. *Social Psychiatry and Psychiatric Epidemiology*, *33*, S95-S101. doi:10.1007/s001270050216

- Faris, R. E. L., & Dunham, H. W. (1939). *Mental disorders in urban areas: An ecological study of schizophrenia and other psychoses*. Oxford: University Chicago Press.
- Gordon, S. (2019). *Recession of 2008–09 in Canada*. Retrieved from <https://www.thecanadianencyclopedia.ca/en/article/recession-of-200809-in-canada>
- Goyder, J., Warriner, K., & Miller, S. (2002). Evaluating socio-economic status (SES) bias in survey nonresponse. *Journal of Official Statistics - Stockholm*, 18, 1-12. Retrieved from <https://www.scb.se/>
- Groff, E. R., & Lockwood, B. (2014). Criminogenic facilities and crime across street segments in Philadelphia: Uncovering evidence about the spatial extent of facility influence. *Journal of Research in Crime and Delinquency*, 51, 277-314. doi:10.1177/0022427813512494
- Hiday, V. A. (1997). Understanding the connection between mental illness and violence. *International Journal of Law and Psychiatry*, 20, 399-417. doi:10.1016/s0160-2527(97)00028-9
- Hiday, V. A. (2006). Putting community risk in perspective: A look at correlations, causes and controls. *International Journal of Law and Psychiatry*, 29, 316-331. doi:10.1016/j.ijlp.2004.08.010
- Hiday, V. A., Swartz, M. S., Swanson, J. W., Borum, R., & Wagner, H. R. (1999). Criminal victimization of persons with severe mental illness. *Psychiatric Services*, 50, 62-68. doi:10.1176/ps.50.1.62
- Hiday, V.A. (1995). The social context of mental illness and violence. *Journal of Health and Social Behavior*, 36, 122-137. doi:10.2307/2137220
- Hundt, N. E., Kimbrel, N. A., Mitchell, J. T., & Nelson-Gray, R. O. (2008). High BAS, but not low BIS, predicts externalizing symptoms in adults. *Personality and Individual Differences*, 44, 565-575. <https://doi.org/10.1016/j.paid.2007.09.018>
- Hyer, S. E. (1994). *The Personality Diagnostic Questionnaire*. New York, NY: New York State Psychiatric Institute.
- Karriker-Jaffe, K. J. (2011). Areas of disadvantage: A systematic review of effects of area-level socioeconomic status on substance use outcomes. *Drug and Alcohol Review*, 30, 84-95. <https://doi.org/10.1111/j.1465-3362.2010.00191.x>
- Kelly, C. M., Jorm, A. F., & Wright, A. (2007). Improving mental health literacy as a strategy to facilitate early intervention for mental disorders. *Medical Journal of Australia*, 187, S26-S30.
- Kessler, R. C., Nelson, C. B., McGonagle, K. A., Edlund, M. J., Frank, R. G., & Leaf, P. J. (1996). The epidemiology of co-occurring addictive and mental disorders: Implications for prevention and service utilization. *American Journal of Orthopsychiatry*, 66, 17-31. doi:10.1037/h0080151

- Kotov, R., Chang, S. W., Fochtmann, L. J., Mojtabai, R., Carlson, G. A., Sedler, M. J., & Bromet, E. J. (2010). Schizophrenia in the internalizing-externalizing framework: A third dimension? *Schizophrenia Bulletin*, *37*, 1168-1178. doi:10.1093/schbul/sbq024
- Kreft, I. G. & de Leeuw, J. (1998). *Introducing multilevel modeling*. Thousand Oaks, CA: Sage.
- Link, B. G., & Stueve, A. (1994). Psychotic symptoms and the violent/illegal behavior of mental patients compared to community controls. In J. Monahan & H. J. Steadman (Eds.), *Violence and mental disorder* (pp.137-160). Chicago, IL: University Chicago Press.
- Lowenkamp, C. T., Cullen, F. T., & Pratt, T. C. (2003). Replicating Sampson and Groves's test of Social Disorganization Theory: Revisiting a criminological classic. *Journal of Research in Crime and Delinquency*, *40*, 351-373. doi:10.1177/0022427803256077
- Mayr, A., Gefeller, O., Prokosch, H.U., Pirkl, A., Fröhlich, A., de Zwaan M. (2012). Web-based data collection yielded an additional response bias – but had no direct effect on outcome scales. *Journal of Clinical Epidemiology*, *65*, 970–977.
- Monahan, J., Steadman, H. J., Silver, E., Appelbaum, P. S., Robbins, P. C., Mulvey, E.P., ... Banks, S. (2001). *Rethinking risk assessment: The MacArthur study of mental disorder and violence*. New York, NY: Oxford University Press, Inc.
- Moore, D. L., & Tarnai, J. (2002). Evaluating nonresponse error in mail surveys. In R.M. Groves, D.A. Dillman, J.L. Eltinge, & R.J.A. Little (Eds.), *Survey Nonresponse* (pp. 197-211). New York: Wiley
- New York State Office of Alcoholism and Substance Abuse Services. (2002). *Screening for co-occurring disorders: User guide for the Modified Mini Screen*. Albany, NY: NYS Practice Improvement Collaborative.
- O'Farrell, T.J., Fals-Stewart, W., Murphy, M. (2003). Concurrent validity of a brief self-report Drug Use Frequency Measure. *Addictive Behaviors*, *28*, 327-337.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. New York, NY: Sage Publications.
- Sacco, V. F., Johnson, H., & Arnold, R. (1993). Urban-rural residence and criminal victimization. *The Canadian Journal of Sociology/Cahiers canadiens de sociologie*, *18*, 431-451. doi:10.2307/3340899
- Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, *277*, 918-924.
- Shaw, C. R., & McKay, H. D. (1942). *Juvenile delinquency and urban areas*. Chicago, IL: University Chicago Press.
- Shaw, C. R., & McKay, H. D. (1969). *Juvenile delinquency and urban areas* (2<sup>nd</sup> ed.). Chicago, IL: University of Chicago Press.

- Shaw, C. R., Zorbaugh, F. M., McKay, H. D., & Cottrell, L. S. (1929). *Delinquent areas*. Chicago, IL: University of Chicago Press.
- Silver, E. (2000). Extending Social Disorganization Theory: A multilevel approach to the study of violence among persons with mental illnesses. *Criminology*, 38, 1043-1074. doi:10.1111/j.1745-9125.2000.tb01414.x
- Silver, E. (2002). Mental disorder and violent victimization: The mediating role of involvement in conflicted social relationships. *Criminology*, 40, 191- 212.
- Silver, E., Arseneault, L., Langley, J., Caspi, A., & Moffitt, T. E. (2005). Mental disorder and violent victimization in a total birth cohort. *American Journal of Public Health*, 95, 2015-2021. doi:10.2105/AJPH.2003.021436
- Silver, E., Mulvey, E. P., & Swanson, J. W. (2002). Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social Science & Medicine*, 55, 1457-1470. [https://doi.org/10.1016/S0277-9536\(01\)00266-0](https://doi.org/10.1016/S0277-9536(01)00266-0)
- Silver, E., Mulvey, E.P., & Monahan, J. (1999). Assessing violence risk among discharged psychiatric patients: Toward an ecological approach. *Law and Human Behavior*, 23, 237-255. doi:10.1023/A:1022377003150
- Silver, E., Piquero, A. R., Jennings, W. G., Piquero, N. L., & Leiber, M. (2011). Assessing the violent offending and violent victimization overlap among discharged psychiatric patients. *Law and Human Behavior*, 35, 49-59. doi:10.1007/s10979-009-9206-8
- Sirotych, F. (2008). Correlates of crime and violence among persons with mental disorder: An evidence-based review. *Brief Treatment and Crisis Intervention*, 8, 171-194. doi:10.1093/brief-treatment/mhn006
- Statistics Canada. (2013). Report on the demographic situation in Canada. Statistics Canada Catalogue no. 91-215-x. Ottawa, Ontario: Statistics Canada.
- Swanson, J. W., Swartz, M. S., Borum, R., Hiday, V. A., Wagner, H. R., & Burns, B. J. (2000). Involuntary out-patient commitment and reduction of violent behaviour in persons with severe mental illness. *The British Journal of Psychiatry*, 176, 324-331. doi:10.1192/bjp.176.4.324
- Taniguchi, T. A., & Salvatore, C. (2012). Exploring the relationship between drug and alcohol treatment facilities and violent and property crime: A socioeconomic contingent relationship. *Security Journal*, 25, 95-115. <https://doi.org/10.1057/sj.2011.8>
- Tryfos, P. (1996). *Sampling methods for applied research: Text and cases*. New York: John Wiley & Sons.
- Wilson, W. J. (1987). *The truly disadvantaged*. Chicago: University of Chicago Press.

## Tables

Table 1

*Descriptive Statistics and Zero-Order Correlations between Major Study Variables*

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<b>Mental Health</b>										
1. Psychotic symptoms	--									
2. Internalizing symptoms	.44***	--								
3. Externalizing symptoms	.35***	.30***	--							
<b>Community Structure</b>										
4. Disadvantage	-.06	-.00	-.14*	--						
5. Residential instability	-.06	.08	.01	.01	--					
6. Criminogenic facilities	.11	.06	.10	-.32***	.40***	--				
<b>Violence Perpetration</b>										
7. Frequency	.21**	.24***	.35***	-.05	-.07	.12	--			
8. Severity	.22**	.24***	.35***	-.05	-.08	.12	.94***	--		
<b>Violent Victimization</b>										
9. Frequency	.22***	.23***	.24***	.02	.16*	.03	.38***	.38***	--	
10. Severity	.22**	.24***	.25***	.01	.19**	.03	.39***	.39***	.91***	--
<b>Descriptive Statistics</b>										
<i>M</i>	0.61	1.88	0.77	1.18	0.87	23.09	0.30	1.38	0.42	1.51
<i>SD</i>	1.03	1.74	1.07	0.27	0.23	21.08	1.00	5.44	0.93	4.57
Possible Range	0-7	0-6	0-4	0-5	0-2	0-∞	0-∞	0-∞	0-∞	0-∞
Observed Minimum	0-6	0	0	0.66	0.55	2	0	0	0	0
Observed Maximum	6	6	4	1.75	1.47	118	8	42	6	35

Note. Mean, *SD* = Standard Deviation, \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$  (two-tailed test).

Table 2

*Effect of Individual- and Community-Level Predictors on the Frequency and Severity of Violence Perpetration at 6-Month Follow-Up*

	Frequency of Violence Perpetration				Severity of Violence Perpetration				
	<i>b</i> (SE)	Exp ( <i>b</i> ) [95% CI]	Wald	<i>P</i>	<i>b</i> (SE)	Exp ( <i>b</i> ) [95% CI]	Wald	<i>p</i>	
<b>Control Variables</b>									
Age	-0.02 (0.02)	0.98 [0.95, 1.02]	0.79	.373	-0.05 (0.01)	0.96 [0.93, 0.98]	12.15	<.001	
Male	-0.04 (0.37)	0.97 [0.47, 2.01]	0.01	.925	0.44 (0.28)	1.55 [0.90, 2.65]	2.51	.113	
Asian <sup>1</sup>	-0.10 (0.45)	0.90 [0.38, 2.17]	0.05	.820	-0.38 (0.33)	0.69 [0.36, 1.30]	1.33	.249	
Other ethnicity <sup>1</sup>	0.08 (0.44)	1.09 [0.46, 2.54]	0.04	.851	0.46 (0.34)	1.59 [0.82, 3.09]	1.96	.173	
Married/common law	0.18 (0.34)	1.20 [0.62, 2.34]	0.29	.591	0.23 (0.25)	1.26 [0.77, 2.07]	0.83	.364	
Employed	0.57 (0.46)	1.78 [0.72, 4.41]	1.54	.215	0.88 (0.33)	2.47 [1.26, 4.66]	6.97	.008	
Prior violence	1.44 (0.38)	4.21 [2.01, 8.85]	14.45	<.001	1.90 (0.28)	6.68 [3.88, 11.50]	46.95	<.001	
<b>Mental Health</b>									
Psychotic Symptoms	-0.03 (0.15)	0.97 [0.72, 1.30]	0.04	.842	0.01 (0.11)	1.10 [0.88, 1.38]	2.36	.387	
Internalizing Symptoms	0.21 (0.10)	1.23 [1.01, 1.49]	4.48	.034	0.22 (0.07)	1.24 [1.08, 1.43]	3.85	.003	
Externalizing Symptoms	0.43 (0.16)	1.53 [1.11, 2.11]	6.83	.009	0.37 (0.50)	1.45 [1.12, 1.88]	6.13	.005	
<b>Community Structure</b>									
Disadvantage	0.58 (0.68)	1.78 [0.47, 6.78]	0.72	.398	1.46 (0.50)	4.28 [1.62, 11.32]	3.78	.003	
Residential instability	-2.32 (0.98)	0.01 [0.01, 0.67]	5.57	.018	-2.90 (0.69)	0.06 [0.01, 0.21]	0.09	<.001	
Criminogenic facilities	0.03 (0.01)	1.03 [1.01, 1.04]	10.78	.001	0.04 (0.01)	1.04 [1.02, 1.05]	3.94	<.001	
				$\chi^2(13) = 92.40, p = .000$					$\chi^2(13) = 267.60, p = .000$

*Note.* *b* = Unstandardized coefficient. *SE* = Standard error. Exp (*b*) = Standardized coefficient. 95% CI = 95% confidence intervals.

<sup>1</sup> Caucasian ethnicity reference category.

Table 3

*Effect of Individual- and Community-Level Predictors on the Frequency and Severity of Violent Victimization at 6-Month Follow-Up*

	Frequency of Violent Victimization				Severity of Violent Victimization			
	<i>b</i> (SE)	Exp (b) [95% CI]	Wald	<i>P</i>	<i>b</i> (SE)	Exp (b) [95% CI]	Wald	<i>p</i>
<b>Control Variables</b>								
Age	-0.02 (0.01)	0.98 [0.96, 1.00]	2.38	.123	-0.02 (0.01)	0.98 [0.96, 1.00]	2.04	.153
Male	0.15 (0.22)	1.16 [0.76, 1.79]	0.46	.498	0.70 (0.23)	2.01 [1.27, 3.17]	9.00	.003
Asian <sup>1</sup>	-0.82 (0.32)	0.44 [0.23, 0.84]	6.33	.012	-1.02 (0.30)	0.36 [0.20, 0.65]	11.30	.001
Other ethnicity <sup>1</sup>	-0.32 (0.27)	0.72 [0.43, 1.22]	1.46	.227	-0.79 (0.30)	0.46 [0.25, 0.81]	7.14	.008
Married/common law	0.11 (0.22)	1.20 [0.72, 1.73]	0.26	.613	0.22 (0.20)	1.25 [0.84, 1.86]	1.20	.273
Employed	0.35 (0.30)	1.42 [0.79, 2.54]	1.36	.244	0.75 (0.32)	2.12 [1.13, 3.96]	5.46	.019
Prior victimization	0.98 (0.24)	2.67 [1.67, 4.28]	16.63	<.001	1.08 (0.23)	2.95 [1.87, 4.68]	21.52	<.001
<b>Mental Health</b>								
Psychotic Symptoms	0.05 (0.10)	1.05 [0.87, 1.27]	0.25	.620	0.03 (0.11)	1.03 [0.83, 1.28]	0.07	.786
Internalizing Symptoms	0.11 (0.06)	1.12 [0.99, 1.27]	3.02	.082	0.20 (0.06)	1.22 [1.08, 1.38]	9.58	.002
Externalizing Symptoms	0.16 (0.09)	1.17 [0.98, 1.40]	2.92	.087	0.29 (0.11)	1.33 [1.07, 1.66]	6.72	.010
<b>Community Structure</b>								
Disadvantage	1.08 (0.43)	2.96 [1.27, 6.89]	6.29	.012	1.53 (0.46)	4.62 [1.88, 11.37]	11.09	.001
Residential instability	1.47 (0.47)	4.35 [1.73, 10.92]	9.82	.002	2.34 (0.47)	10.32 [4.12, 25.91]	24.74	<.001
Criminogenic facilities	0.00 (0.00)	1.00 [0.99, 1.01]	0.31	.580	-0.01 (0.00)	0.99 [0.98, 1.00]	1.73	.188
		$\chi^2(13) = 80.12, p = .000$				$\chi^2(13) = 178.51, p = .000$		

*Note.* *b* = Unstandardized coefficient. *SE* = Standard error. Exp (b) = Standardized coefficient. 95% CI = 95% confidence intervals.

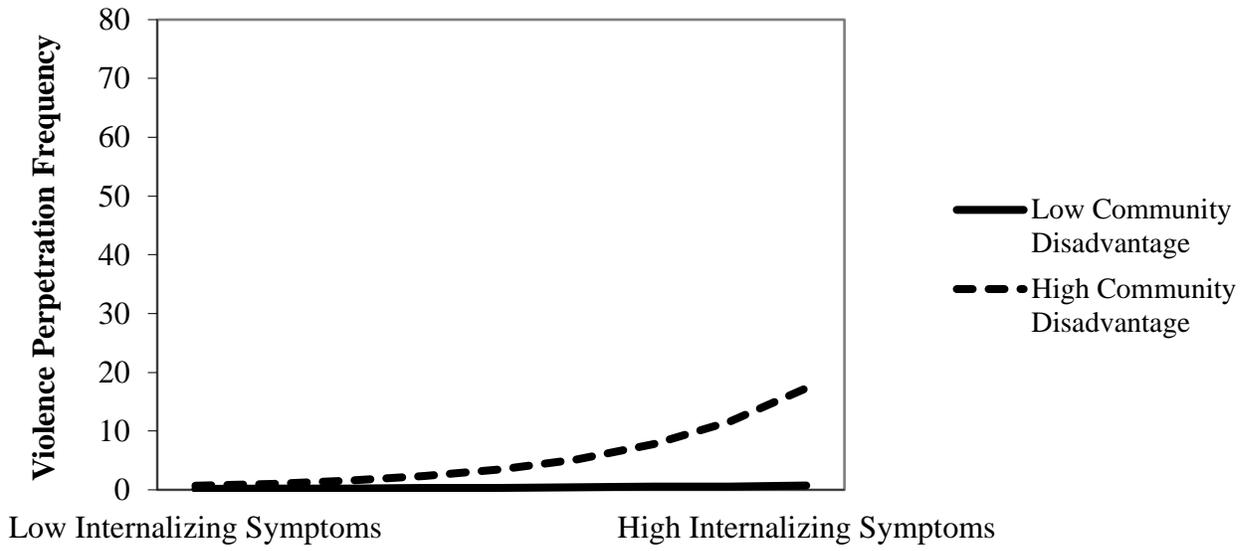
<sup>1</sup> Caucasian ethnicity reference category.

## Supplementary Material

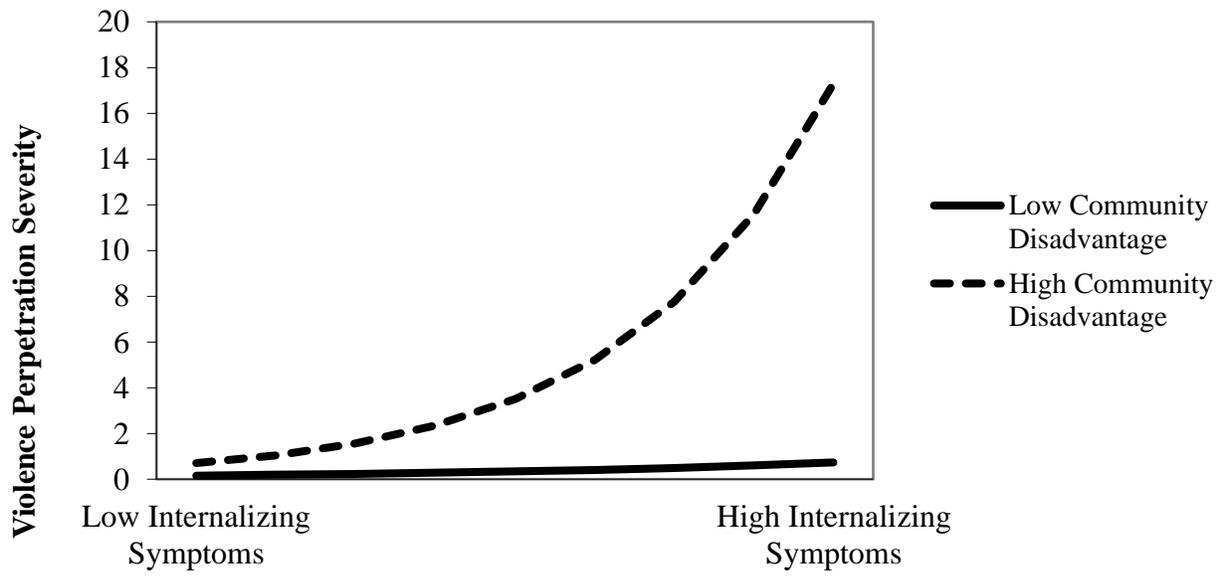
Table S1

*Severity Ranking Scheme for 11 Types of Violent-Behavioral Outcomes*

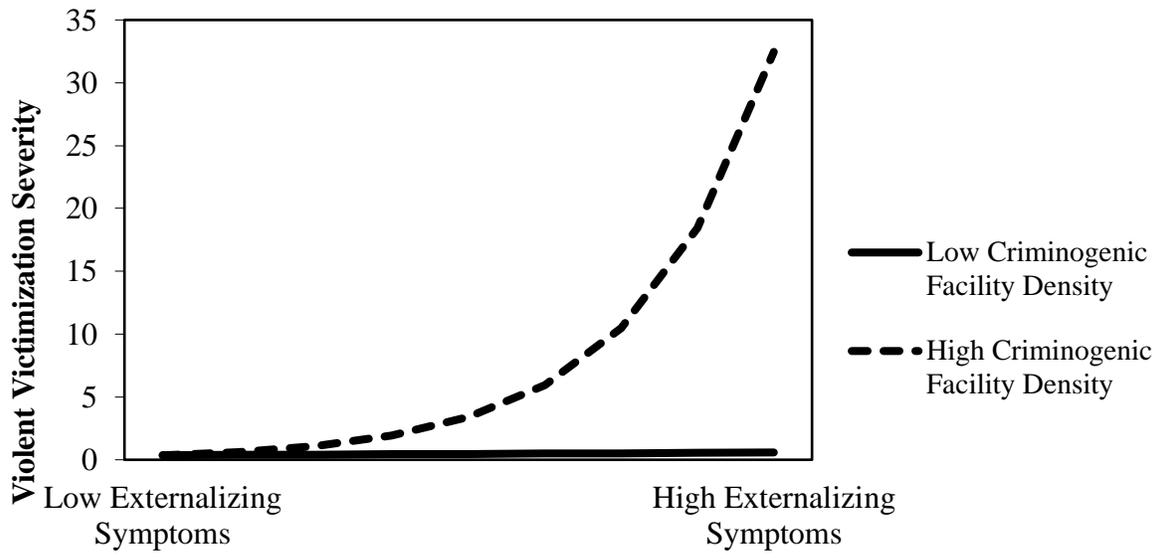
<b>Severity Rank</b>	<b>Violence Perpetration</b>	<b>Violent Victimization</b>
11	I used a knife or gun on someone	Someone used a knife or gun on me
10	I hit someone with a fist or object, or beat them up	Someone hit me with a fist or object, or beat me up
9	I kicked, bit, or choked someone	Someone kicked, bit, or choked me
8	I slapped someone	Someone slapped me
7	I pushed, grabbed, or shoved some	Someone pushed, grabbed, or shoved me
6	I threw an object at someone	Someone threw an object at me
5	I tried to physically force someone to have sex	Someone tried to physically force me to have sex
4	I threatened someone with a knife, gun, or other weapon	Someone threatened me with a knife, gun, or other weapon
3	I threatened to harm someone, without any kind of weapon	Someone threatened to harm me, without any kind of weapon
2	I yelled or screamed at someone in a frightening way	Someone yelled or scream at me in a frightening way
1	I did something made someone feel afraid for their safety	Someone did something made me feel afraid for my safety
0	No violence perpetration	No violent victimization



*Figure S1.* Plot of Significant Internalizing Symptoms x Community Disadvantage Interaction. Frequency of violence perpetration is plotted at low (-1 SD) and high (+1 SD) values of internalizing symptoms and community disadvantage.



*Figure S2.* Plot of Significant Internalizing Symptoms x Community Disadvantage Interaction. Severity of violence perpetration is plotted at low (-1 SD) and high (+1 SD) values of internalizing symptoms and community disadvantage.



*Figure S3.* Plot of Significant Externalizing Symptoms x Criminogenic Facility Density Interaction. Frequency of violent victimization is plotted at low (-1 SD) and high (+1 SD) values of externalizing symptoms and criminogenic facility density.