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<ABS>Research on traumatic stress has focused largely on individual risk factors. A more thorough understanding of risk factors may require investigation of the contribution of neighborhood context, such as the associations between perceived neighbourhood disorder and social cohesion with reported trauma exposure (yes/no) and posttraumatic stress disorder (PTSD) diagnostic status (past-year PTSD, remitted). To examine these associations, we used a cross-sectional analysis of an epidemiological catchment area survey ($N = 2,433$). Visible cues, indicating a lack of order and social control in the community (neighbourhood disorder), were associated with increased trauma exposure (adjusted odds ratio [AOR] = 1.21, 95% confidence interval [CI] [1.12, 1.31]). For trauma-exposed individuals, neighbourhood disorder was associated with greater odds of lifetime PTSD (AOR = 1.38, 95% CI [1.10, 1.75]), and the willingness of residents who realize common values to intervene for the common good (social cohesion), was associated with lower likelihood of past-year PTSD (AOR = 0.64, 95% CI [0.42, 0.97]). For participants with a lifetime diagnosis of PTSD (including past-year), increased social cohesion was associated with higher odds of remission (AOR = 2.59, 95% CI [1.55, 4.30]). Environmental contexts play a role in the development and progression of PTSD. As such, traumatic stress outcomes may be better understood through a perspective that integrates individual and contextual risk factors.</ABS>

<P>Posttraumatic stress disorder (PTSD) presents a significant burden to those who suffer it, their loved ones, and society as a whole (Freed, Goldberg, Gore, & Engel, 2010). PTSD is among the most common of mental disorders in Western societies, with a lifetime prevalence of 6–10% (Hidalgo & Davidson, 2000; Kessler et al., 2005), and 11–37% (De Jong et al., 2001; Norris et al., 2003) in low- and middle-income countries,

respectively. Individual-level risk factors for PTSD, such as gender, psychiatric history, and social support, have been extensively researched although they explain only approximately 20% of the variance in the etiology and maintenance of PTSD (Koenen, Amstadter, & Nugent, 2009; Ozer, Best, Lipsey, & Weiss, 2003). We suggest that a more thorough understanding requires going beyond individual risk factors.

Disorder, defined in the literature as “direct, behavioral evidence of disorganization” (Skogan, 1992, p. 21), can be expressed through physical and social cues within a neighbourhood (Ross & Mirowsky, 1999). Physical cues entail enduring, day-to-day aspects of the environment such as abandoned buildings, noise, or graffiti. The broken windows hypothesis posits that neighbourhood physical disorder signals neglect and diminished social control to individuals residing in the neighbourhood in question and implies to outsiders that high-risk behaviour in disordered neighbourhoods is tolerated, or at least normative (Wilson & Kelling, 1982). Disorder can be further interpreted as a sign that residents do not care. This can result in withdrawal from public space, which in turn increases opportunities for criminal behaviour. Neighbourhood physical disorder also entails social cues, which relate to more people engaging in specific negative events or activities such as public drinking or drug use, panhandling, or indifference. Aspects of social disorder highlight the increased chances of residents falling victim to criminal behaviour in areas that have increased criminal behaviour associated with signs of social disorder such as public drug use.

Previous studies have begun to explore environmental factors, such as disorder described above, as they pertain to psychopathology; the findings suggest that perceived neighbourhood disorder (i.e., visible cues indicating a lack of order and social control in the community) and social cohesion (i.e., the willingness of residents who realize common values to intervene for the common good) are related to mental health (Echeverría, Diez-Roux, Shea, Borrell, & Jackson, 2008; Ross, 2000; Ross & Mirowsky, 1999). This literature has primarily focused on depression, substance use, and schizophrenia, leaving discussion of the effects of place on PTSD in its infancy (Gapen et al.,

2011; Johns et al.; 2012; Lowe, Galea, Uddin, & Koenen, 2014). This is particularly striking considering that PTSD requires a specified aetiological environmental factor (the traumatic event) to develop. From a theoretical perspective, neighbourhood context may impact PTSD by influencing an individual's (a) number and severity of traumatic experiences, (b) premorbid vulnerability to developing PTSD upon trauma exposure, and (c) course of the disorder.

Exposure to trauma varies across populations, countries, and communities (Norris & Slone, 2013). In addition, neighbourhood disorder has been associated with crime and assaultive violence (e.g., rape or being shot) within a community (Breslau, Lucia, & Davis, 2004; Obasaju, Palin, Jacobs, Anderson, & Kaslow, 2009). For example, the level of physical disorder (based on observations of litter, graffiti, and abandoned cars) in neighbourhoods in Pittsburgh, Pennsylvania was found to be associated with levels of crime and firearm injuries or deaths, even after taking neighbourhood poverty into account (Wei, Hipwell, Pardini, Beyers, & Loeber, 2005).

Neighbourhoods characterized by low social cohesion may be deficient in the informal social control necessary to discourage crime and delinquent behavior, and as such, have also been theorized to influence an individual's risk of trauma exposure (Johns et al., 2012). This premise aligns with the reciprocal determinism of neighbourhood disorder and social cohesion (i.e., disorder can decrease social cohesion and vice versa). For example, it has been theorized that when residents interpret disorder as a sign that nobody cares, it can trigger anxiety, fear, worry, and withdrawal from public spaces, inhibiting community cohesiveness and eyes on the street (Jacobs, 1961), which in turn provides opportunity for greater criminal behaviour. It is also worth noting that adverse neighbourhood contextual factors are known to be more prevalent in neighbourhoods with a lower socioeconomic status (SES; Ross, 2000).

Neighbourhood social contextual factors may influence not only an individual's pretrauma psychological state (e.g., perceived level of control), but also one's ability to cope following trauma and as a result may increase the risk of PTSD and hinder an individual's ability to

progress to remission (Carlson & Dalenber, 2000). Furthermore, neighbourhood social cohesion may also be associated with the risk of PTSD by influencing the availability of resources that may be associated with remission (Carlson & Dalenber, 2000).

Previous studies considering neighbourhood context and PTSD have been hindered by a limited generalizability of findings due to suboptimal sampling techniques (e.g., recruitment from a single hospital; Gape et al., 2011) and/or sample specificity (e.g., sampling only African American individuals; Gape et al., 2011; Johns et al., 2012; Lowe et al., 2014), or have focused solely on the relationship between neighbourhood social cohesion and PTSD diagnosis and symptom trajectories (Johns et al., 2012).

This study aimed to expand knowledge from previous studies through cross-sectional investigation in an epidemiological community sample of the associations between neighbourhood disorder and social cohesion and (a) past-year PTSD, (b) remitted PTSD, (c) lifetime PTSD (past-year and remitted combined), and (d) trauma exposure. We hypothesized that greater perceived neighbourhood disorder would be associated with a greater odds of exposure to trauma and of having a past-year or lifetime PTSD diagnoses, and a lower odds of remission from the disorder. These same associations were hypothesized for neighbourhoods perceived to have low levels of social cohesion. Models aimed to account for the reciprocal relationship between perceptions of disorder and social cohesion and potential confounding effects of neighbourhood socioeconomic deprivation. See Figure 1 for a summary of the tested relationships.

METHOD

Participants and Procedure

Data were drawn from a general population study of mental health and mental health service use in an epidemiological catchment area (ECA) in the southwest of Montreal, Canada (Caron et al., 2012). The Montreal ECA has a sample size comparable to those of the psychiatric

epidemiological zones that have been developed/studied in American cities with similarly sized populations (Tohen, Bromet, Murphy, & Tsuang, 2000). The catchment area, population 269,720, comprises a range of social structures, SES, education, and neighbourhood dynamics and security.

A community sample of 2,433 participants took part in the survey (Caron et al., 2012). Demographic information is provided in Table 1 {TBL 1}. Sampling was equally distributed in the study area among five neighbourhoods: Saint-Henri/Pointe St-Charles ($n = 612$), Lachine/Dorval ($n = 603$), LaSalle ($n = 584$), and Verdun ($n = 635$). The number of census tracts was 74 with a minimum of 6, mean of 32.89 ($SD = 14.75$), and maximum of 67 subjects per tract. As expected, the overall participation rate was 48.7%. This rate is superior to median rates reported in epidemiological studies of populations conducted since 2000 (Morton, Cahill, & Hartge, 2006).

After a complete description of the study, participants' informed written consent was obtained. In-person interviews were then conducted by trained lay interviewers, in either English or French, between April 2007 and November 2008. All English language measures underwent linguistic and transcultural validation for use in French and were administered to participants by interviewers trained to administer questions of a sensitive nature. The Research Ethics Board of the Douglas Mental Health University Institute approved all study procedures related to the ECA.

Of the 2,433 participants who took part in the greater survey, 2,392 individuals completed the PTSD module. Individuals were classified by PTSD diagnostic status and trauma exposure as follows: past-year PTSD (past-year diagnosis of PTSD), remitted (lifetime diagnosis of PTSD, but not meeting the criteria in the past 12 months), lifetime PTSD (ever having experienced PTSD in their lifetime thus far; i.e., a group combining past-year and remitted groups), trauma no PTSD (having suffered at least one traumatic event, but never meeting the criteria for diagnosis of PTSD), and no trauma (never having suffered a traumatic event).

<P>Rates of PTSD within the sample population have been previously reported (Monson, Brunet, & Caron, 2015; Monson, Lonergan, Caron, & Brunet, 2015). In summary, 47.7% of individuals ($n = 1,142$) reported having been exposed to at least one traumatic event. Of these, 25 (2.2%) had a past-year diagnosis of PTSD, and 67 (5.9%) were in remission. Of those 2,392 participants with complete PTSD information, 52 participants had missing information on neighbourhood disorder or social cohesion, 189 had missing data for the income variable, and 9 had missing information on duration of residence. Analyses were conducted on participants with complete information on all independent variables. Thus, 2,142 participants were included in analyses, including 1,028 who had suffered a traumatic event. Intraclass correlation (ICC) coefficients were calculated to assess the extent of clustering of the main independent variables by census tracts; ICCs were .10 for social cohesion and .32 for neighbourhood disorder, indicating some level of correlation in these measures within census tracts.</P>

<H2>Measures</H2>

<P>PTSD diagnosis was identified using a slightly modified version of the Canadian Community Health Survey & Canadian Forces Supplement (CCHS-CFS<2>), which is based on the World Health Organization Composite International Diagnostic Interview (CIDI) Version 2.1<2>. Diagnosis is generated according to criteria and definitions of both the *International Classification of Diseases, Tenth Revision* (ICD-10)<2>, and the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; American Psychiatric Association, 2000; Statistics Canada, 2002). Diagnosis was based on the assessment of symptoms and functional disability stemming from exposure to one (or more) of 28 possible traumatic events. The survey further allowed for the endorsement of multiple traumatic events, in which case individuals were assessed on their worst event or if unknown (in one case only), their most recent event.</P>

<P>Perceived neighbourhood characteristics were assessed through self-reported responses to questionnaires. The Neighbourhood Disorder Scale measured resident's perception of disruptive

elements in the neighbourhood (Nario-Redmond, Coulton, & Milligan, 2000). The scale included 11 items assessing levels of visible disorder in the neighbourhood, such as poor maintenance, defaced public structures, abandoned property, loitering, and disorderly conduct. Item responses were scored by participants on a 10-point scale with responses ranging from *rarely* to *frequently* (scored from 1–10, respectively). Total score ranged from 11 to 110. Social Cohesion, a subscale of the Sense of Collective Efficacy Scale (Sampson, Raudenbush, & Earls, 1997), was measured using five items assessing individuals' perceptions of shared values and trust among neighbours, three positive (e.g., "People here are willing to help their neighbours") and two negative (e.g., "People in this neighbourhood generally don't get along with one another"). Item responses were scored on a 5-point scale with responses from 1 = *strongly agree* to 5 = *strongly disagree*. The three positive items were reverse coded so that higher total scores represented greater social cohesion. Total score ranged from 5 to 25. Cronbach's α for the Neighbourhood Disorder and Social Cohesion Scales in this sample were .91 and .77, respectively. Some participants declined to answer, or gave a "don't know" response for individual items in the Neighbourhood Disorder and Social Cohesion Scales. For these individuals, values were estimated using person mean substitution, as recommended in Hawthorne and Elliot (2005).

Data Analysis

Data were analyzed using MPlus v7.1 (Muthén & Muthén, 2013). The following PTSD and trauma-exposure outcomes were analyzed in separate logistic regression models: (a) past-year PTSD diagnosis (all other trauma-exposed participants as the reference group), (b) lifetime diagnosis of PTSD (all other trauma-exposed participants as the reference group), (c) remitted (past-year PTSD as the reference group), and (d) trauma exposure (no exposure as the reference group). We first separately analyzed the association between each of the neighbourhood disorder and social cohesion with PTSD/trauma exposure outcomes (Models 1 and 2, respectively). As illustrated in the conceptual model, we hypothesised that neighbourhood disorder and social

cohesion would be correlated. We therefore tested a third model in which neighbourhood disorder and social cohesion were analyzed together using path analysis (Model 3). In this model, a bidirectional association was specified between the two variables using path analysis. To account for the impact of neighbourhood SES on associations between neighbourhood disorder/social cohesion and PTSD/trauma-exposure outcomes, we then specified a fourth set of models that included a measure of neighbourhood socioeconomic deprivation (Model 4). All models included participants' age, gender, education, household income, and duration of residence at the current address. Models also accounted, through use of robust standard error estimation, for the clustering of observations at the level of census tracts. Neighbourhood disorder and social cohesion were standardized prior to analysis based on sample data. Statistical significance was set at .05 and all hypothesis tests were two-sided. No correction for multiple testing was used due to the low number of hypotheses tested.

Covariates included gender, age, being a high school graduate or not, household income, and duration of residence at the current address. As perceptions of neighbourhood disorder and social cohesion had the potential to be related to the socioeconomic position of the neighbourhood, we also included as a covariate an area-level measure of socioeconomic deprivation expressed at the census tract level using 2006 Canada census data, operationalized as the proportion of households spending 20% or more of their income on food, shelter, and clothing than the average household of similar size, region, and resident density (Statistics Canada, 2007).

RESULTS

Trauma exposure was related to perceived neighbourhood disorder and perceived social cohesion when tested separately (Table 2). Specifically, a standard deviation increase in neighbourhood disorder was associated with a 22.2% higher odds of having experienced trauma, whereas a standard deviation increase in social cohesion was associated with an 8.5% lower odds of having experienced trauma. The association between trauma exposure and perceived neighbourhood disorder remained statistically significant after accounting for perceived social

cohesion and objective neighbourhood socioeconomic deprivation. Perceived social cohesion was no longer statistically significantly related to trauma exposure after accounting for perceived neighbourhood disorder, suggesting the effect might have been confounded or mediated by perceived neighbourhood disorder.

Among participants who had experienced trauma, a standard deviation increase in social cohesion was associated with a 37% lower odds of having a past-year PTSD diagnosis (Table 2). This association remained statistically significant following the inclusion of perceived neighbourhood disorder and neighbourhood socioeconomic deprivation in the models. No statistically significant associations were found between neighbourhood disorder and past-year diagnosis of PTSD.

Among participants who had experienced a traumatic event, perceived neighbourhood disorder was associated with greater odds of lifetime PTSD diagnosis, with each standard deviation increment in neighbourhood disorder being associated with a 41.6% higher odds of ever having been diagnosed with PTSD (Table 2). This association held after the inclusion of perceived social cohesion and objective neighbourhood socioeconomic deprivation in the model. Contrary to the results observed for past-year PTSD diagnosis, lifetime diagnosis was not related to perceived social cohesion.

Among participants who had experienced lifetime PTSD, the odds of remission was 2.45 greater for each standard deviation increase in perceived social cohesion; this association held after accounting for perceived neighbourhood disorder and objective neighbourhood deprivation (Table 2). Neighbourhood disorder was unrelated to remission.

DISCUSSION

As hypothesized, perceived neighbourhood disorder was associated with a greater likelihood of having experienced a traumatic event. Our findings indicated that perceived social

cohesion was associated with trauma exposure, but that association might have been confounded or mediated by perceived neighbourhood disorder. These findings reinforce the importance of considering perceptions of both neighbourhood disorder and social cohesion when considering the potential associations between neighbourhood factors and trauma.</P>

<P>A second pertinent finding from the current study was that among participants who have experienced trauma, perceived neighbourhood disorder was associated with greater odds of a lifetime PTSD diagnosis, but not past-year PTSD. Only one study has examined the direct associations of perceived neighbourhood disorder to PTSD. Gapen et al. (2011) published findings that perceptions of high neighbourhood disorder increase severity of past 2-weeks' symptomatology for PTSD. These findings might be interpreted with caution, however, because Gapen et al. sampled from just one medical facility, thus limiting study generalizability and potentially introducing selection bias resulting in overestimation of the effects of neighbourhood disorder on PTSD symptomatology. Furthermore, the sample included exclusively low-income, African American participants, and assessed PTSD symptomatology over just the 2-week period prior to the survey. The present study builds on and extends these findings to the diagnosis of lifetime and past-year PTSD in a community sampled population. Our finding that perceived neighbourhood disorder was associated with only lifetime diagnosis of PTSD was interesting as it provided evidence that perceived neighbourhood disorder may be mainly associated with a higher likelihood of PTSD through its ability to influence trauma exposure which, in turn, might raise the likelihood of lifetime PTSD.</P>

<P>Although no direct association was found between perceived social cohesion and lifetime diagnosis of PTSD, our findings indicate that among participants who had experienced trauma, perceived social cohesion was directly associated with lower odds of having a past-year PTSD diagnosis. These results align with theoretical premises that suggest that the perception of neighbourhood social cohesion may influence the psychological consequences of exposure to trauma. These findings are discussed further in the context of the remission section below.</P>

<P>A recent study by Johns et al. (2012) found that although the odds of past-year PTSD was not significantly associated with individual-level perceptions of neighbourhood social cohesion, a significant association existed when perceptions of neighbourhood social cohesion were aggregated to the neighbourhood level. Although different in unit and level of measurement, our results measuring social cohesion at the individual level and the multilevel analysis by Johns et al. (2012) expressing social cohesion at the neighbourhood level suggest perceptions of social cohesion shape risk of PTSD through individual response to trauma. Additionally, a recent study by Lowe et al. (2014) using the same dataset as Johns et al. (2012), assessed longitudinal trajectories of PTSD and found that higher perceived social cohesion and support at baseline were predictive of a trajectory pattern of consistently few PTSD symptoms.</P>

<P>Among participants who had experienced PTSD at any point, perceived social cohesion was associated with a higher odd of remission. To our knowledge, no studies have directly examined the potential relationships between perceived neighbourhood disorder and social cohesion with regard to remission from PTSD. Previous literature, however, does exist indicating that informal social ties, a contributing factor in community cohesion, is associated with lesser levels of fear and mistrust related to residing in an area with high perceived neighborhood disorder (Ross & Jang, 2000).</P>

<P>This study is not without limitations. Although comparable to previous surveys, the response rate was relatively low and the sample may not have been entirely representative of the target population. Indeed, the final sample overrepresented women and underrepresented men under the age of 45. Existing literature has demonstrated that women are more likely to experience PTSD after trauma exposure whereas men are more likely to experience trauma. Although it is possible that this may have biased the results, it is difficult to predict if the associations found are more likely to exist in the overrepresented groups. We therefore recommend that the results be replicated in other samples. Despite this limitation, a major strength of this study is that it sampled from a large geographically defined population. This bolsters the study findings against potential biases found with

convenience sampling (e.g., self-selection found within treatment seeking populations). A second key strength is its consideration of the spectrum of PTSD diagnostic status.</P>

<P>Due to the cross-sectional nature of this study the causal direction of effects is unknown. PTSD could negatively influence perceptions of neighbourhood social cohesion and disorder, and vice versa, as seen with studies of PTSD and social support (e.g., Kaniasty & Norris, 2008). Similarly, it is difficult to completely dissociate the effects of both perceived neighbourhood factors (i.e., neighbourhood social cohesion and disorder) from each other. It might be that individuals predisposed towards more positive thoughts might not recount experiences as traumatic and they may also perceive neighbourhoods are more cohesive and less disordered. Research using objective measures of neighbourhood context as well as longitudinal research that accounts for where and when traumatic events occur may be useful in untangling the nature of the relationships. Neighbourhood factors were standardized using sample data. Future studies should explore how these values compare with population-based estimates.</P>

<P>It is also important to acknowledge that the neighbourhood contextual measures used in this study were resident-perceived as opposed to objectively assessed. Objective assessments are typically considered to be concrete and absolute measures of the neighbourhood environment (Lin & Moudon, 2010); however, perceptions are influenced by a range of individual and contextual factors and often do not correspond to objective measures. As such, objectively assessed neighbourhood disorder and cohesion may be differently related to PTSD than was observed in this study. Future research should also consider the addition of objective neighbourhood level measures such as crime rates or other measures obtained through systematic observation methods. Still, perceptions in their own right are important for understanding contextual associations with mental health outcomes and the associations between trauma, PTSD, and perceived social context may provide evidence for the development of interventions to improve residents' perceptions.</P>

<P>An emerging body of research has begun to document the relationships between neighbourhood social conditions and mental illness (Aneshensel, Phelan, & Bierman, 2013; Pearson, Griffin, Davies, & Kingham, 2013). Few studies thus far have assessed whether PTSD is associated with between neighbourhood disorder and social cohesion. Our findings align with previous literature indicating that neighbourhoods play a role in shaping trauma exposure and the diagnosis of lifetime and past-year PTSD, as well as remission from the disorder. Specifically, our findings suggest that perceived neighbourhood disorder could relate to PTSD through a greater likelihood of an individual experiencing a traumatic event. Perceived neighbourhood social cohesion in turn would seem to have more influence through the second pathway by which context affects the risk of PTSD via shaping vulnerability to the disorder after trauma has occurred. This could occur perhaps by influencing residents' vulnerability to the effects of trauma, increasing the risk of developing PTSD, and reducing the ability to recover/remit (Breslau et al., 2004; Dumont, Widom, & Czaja, 2007; Koenen et al., 2009). Perceived neighbourhood disorder and social cohesion are also intertwined in their potential associations with PTSD with social cohesion mediating the association between neighbourhood disorder and PTSD. Whether this mediating function occurs over time requires the further investigation of temporal effects.</P>

<P>Information concerning the pathways through which perceptions of neighbourhood social cohesion and disorder contribute to the incidence of PTSD provides clues to its aetiology and has the potential to inform programs to prevent the development and improve the management of this disabling disorder. Population-based interventions concerning prevention and treatment models for PTSD will benefit from a more concrete understanding of perceived neighbourhood contextual factors and their associations and implications before crisis (primary prevention), during crisis (secondary prevention), and after crisis (tertiary).</P>

<P>Few studies have looked at the associations between neighbourhood context and PTSD. Given the findings reported in this article, research should be conducted to examine if health care

professionals in clinical settings should include questions about the physical and social environments of their clients and if it helps understand the presentation and course of PTSD.</P>

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{FIG1} Figure 1. Overall conceptual mode of relationships explored. Models in which independent variables are included (1–4) are indicated. Tested relationships shown with full lines. Relationships not formally tested in models shown with dotted lines.

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