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An Ecological Systems Approach to Understanding Intimate Partner Violence Outcomes

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AN ECOLOGICAL SYSTEMS APPROACH TO UNDERSTANDING INTIMATE PARTNER VIOLENCE OUTCOMES

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Dedication

I dedicate my dissertation to the women who participated in the Athena Project. Though their names remain confidential, their experiences resonate throughout my work, and their resilience inspires me.

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Abstract

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The present study examined the influence of person-level, event-level, geographic, and social factors on the maintenance of mental health conditions in women survivors of intimate partner violence (IPV). The influence of these factors on posttraumatic stress disorder (PTSD), depression, and generalized anxiety disorder (GAD) was conceptualized using an ecological systems framework. Main effects of 13 empirically-supported predictor variables and interactive effects of race and racial-ethnic make-up of the neighborhood, race and crime, and crime and social support, were examined. Geographic information systems (GIS) technology was used to map neighborhood factors (e.g., racial-ethnic composition, employment rate, median income) and crime. Crime in the environment was mapped at address-level and aggregated to precinct-level, allowing us to examine measurement effects. In hierarchical regression analyses, peritraumatic response to IPV, longer elapsed time since IPV, and sexual IPV were associated with IPV-related PTSD. Exposure to more adverse events, longer elapsed time since IPV, and sexual IPV were associated with depression. Crime interacted with race to predict depression, although the nature of the interactions differed as a function of crime measurement. Precinct-level crime interacted with social support to predict depression. Sexual IPV and exposure to more adverse events were associated with GAD. These findings underscore the role of maintenance factors from multiple systems in symptomatology among women IPV survivors. They suggest that crime is a particularly relevant geographic factor impacting mental health. Clinical and policy implications are discussed, with attention to the utility of integrating GIS technology into future IPV and mental health-related endeavors.

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An Ecological Systems Approach to Understanding Intimate Partner Violence Outcomes

The Centers for Disease Control and Prevention (CDC; Breiding, Basile, Smith, Black, & Mahendra, 2016) define intimate partner violence (IPV) as acts of physical or sexual violence, and acts of psychological aggression (including stalking and coercive behavior), that are perpetrated by a current or former intimate partner. Intimate partnerships, per the CDC, are those characterized by emotional connectedness, regular contact, ongoing physical contact or sexual behavior, identity as a couple, or familiarity and knowledge about one another's lives. It is estimated that more than one in three women will experience one or multiple forms of physical, sexual, and psychological IPV in their lifetimes (Black et al., 2011).

IPV affects women of all ages, racial-ethnic identities, and socioeconomic standings, women of different marital status, and women living in households of varying urbanicity (Rennison & Welchans, 2002). Unfortunately, these women are understudied and often underserved. Additional attention should be focused on this group as IPV exposure is associated with risk for physical injury, significant distress, and poor psychological outcomes (Coker, Davis et al., 2002, Dillon, Hussain, Loxton, & Rahman, 2013; Golding, 1999; Pico-Alfonso et al., 2006). The chronic and debilitating conditions that many women face in the aftermath of violent relationships persist for years after the IPV has ceased (Bogat, Levendosky, & Eye, 2005; Campbell & Soeken, 1999; Dillon et al., 2013), increasing risk for poor social adjustment, personal and social resource loss, and revictimization (Johnson, Zlotnick, & Perez, 2008; Perez & Johnson, 2008).

Among the most widely-studied mental health conditions associated with IPV are posttraumatic stress disorder (PTSD) and depression. In a meta-analysis of studies on female

survivors of physical IPV, Golding (1999) found the average prevalence of these conditions to be 63.8% (range: 31-84%) and 47.6% (range: 15-83%), respectively. Though grossly understudied in comparison, generalized anxiety disorder (GAD), a psychological disorder characterized by excessive and overwhelming worry and apprehension, has also evidenced statistical associations with female experiences of IPV (Suglia, Duarte, & Sandel, 2011; Tolman & Rosen, 2001). GAD is also frequently co-morbid with PTSD in trauma-exposed samples generally (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Researchers have established that PTSD, depression, and GAD represent distinct psychological conditions in trauma-exposed samples and that these trauma responses are not better conceptualized as part of a general distress syndrome (Grant, Beck, Marques, Palyo, & Clapp, 2008). Research is needed that can identify distinct contributors to these chronic conditions.

Contributions from Ecological Perspectives

Scholars from numerous traditions (psychological, sociological, feminist) have emphasized the importance of understanding the contextual nature of IPV and its psychological sequelae (Caldwell, Swan, & Woodbrown, 2012; Yllo, 2010). Proponents of this kind of approach advocate for an understanding of the IPV survivor as situated within her environment and sociocultural context. This nested perspective is consistent with well-established theories of human behavior and psychopathology. Most notably, Bronfenbrenner (1977), in his ecological perspective on human development, emphasized that human behavior can be understood as embedded in a series of systems. At the most distal level, this includes the norms and cultural values that govern a woman's society, such as the espoused gender roles or expectations. Nested within this level are the ecological systems such as the woman's geographic environment and the behavior of others within it, and her social and familial relationships and the interactions of those

involved. At the most proximal level is the woman's sociodemographic identities and her history. Outcomes can be influenced by each of these systems individually, and by the interactions between them (Figure 1).

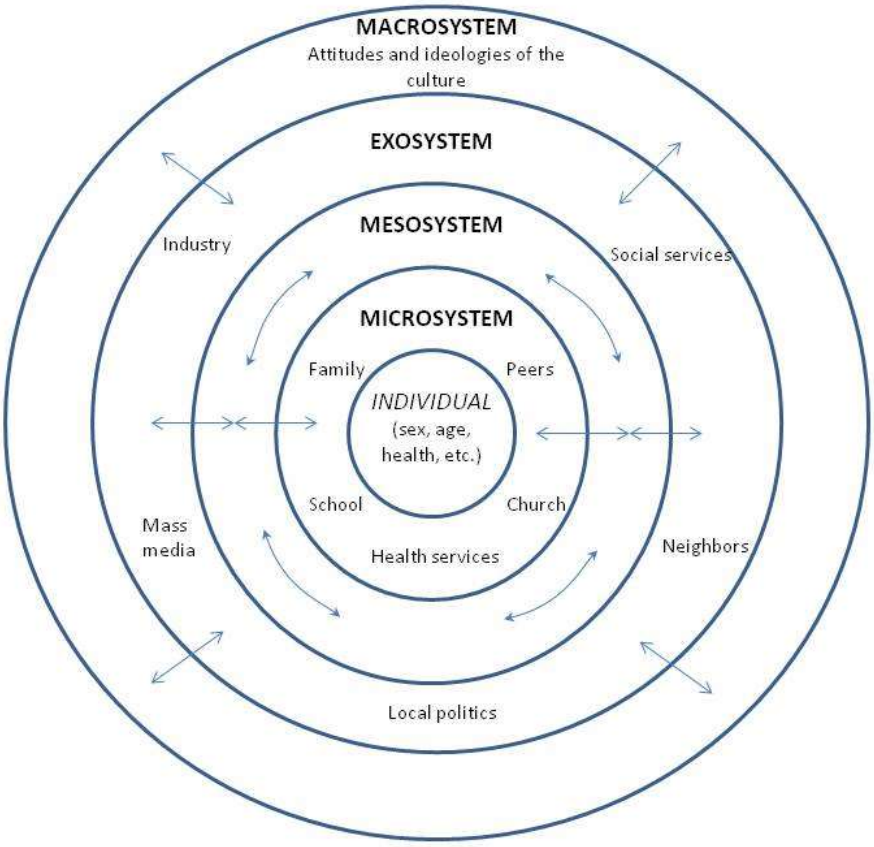


Figure 1. A depiction of Bronfenbrenner's (1977) ecological perspective.

Ecological systems and IPV. Historically, ecological frameworks have been usefully applied to understanding the perpetration of violence against women (Heise, 1998). The nested ecological theory of IPV is considered to be one of the most influential explanations of IPV (Ali & Naylor, 2013). This framework, much like its parent model, takes a multisystem approach to understanding the perpetration of violence against women. It emphasizes personal history, relational context, social structures, societal institutions, norms, and cultural factors. For

example, the model invokes person-level characteristics such as having witnessed violence in the home during childhood, and situational or relational characteristics such as male dominance and control of wealth in the family. The model further considers community characteristics such as neighborhood unemployment rate and isolation of the woman and family, and macroscopic factors such as cultural norms related to masculinity (Heise, 1998). It suggests that to effectively combat violence against women, factors at multiple levels must be considered and targeted simultaneously (Ali & Naylor, 2013).

An evolving literature has grown to indicate that geographic factors warrant recognition in the nested ecological model as well. It is apparent that neighborhood characteristics and individual-level behaviors such as the perpetration of IPV can be linked (Pinchevsky & Wright, 2012). Research in this domain has largely drawn upon advances in the research on "street crime" and has been guided by *social disorganization theory* (Shaw & McKay, 1942). Social disorganization theory concerns itself with the community context of crime and the role of contextual factors in the perpetration of crimes (Pinchevsky & Wright, 2012).

Modern social disorganization theorists have focused on the following contextual factors in explaining crime: concentrated disadvantage; collective efficacy; ethnic heterogeneity; social ties; residential stability; and cultural norms. Concentrated disadvantage, a general term used to denote aspects of neighborhood poverty, is often captured in studies by measuring neighborhood crime, urbanicity, low income, number or density of single-parent families, unemployment, or other economic deprivation variables (Wilson, 1987). Collective efficacy refers to the extent to which neighborhoods are socially cohesive, as well as the extent to which neighborhood residents are willing to intervene on behalf of their community members (Sampson, Raudenbush,

& Earls, 1997). Collectively, these six constructs are commonly referred to as *neighborhood factors* in the criminological and psychological literatures.

Neighborhood factors have widely been found to be associated with experiencing IPV. A review by Pinchevsky and Wright (2012) found concentrated disadvantage, as measured by high crime rates, low income or unemployment, and single family households (Wilson, 1987), to be associated with higher rates of IPV. This relationship has been shown to be significant even after controlling for individual-level factors such as prior violence, substance use, and relevant sociodemographic features (Browning, 2002; Wright & Benson, 2011). The same review found evidence to suggest that greater levels of collective efficacy (i.e., social cohesion and willingness to intervene on a neighbor's behalf) may buffer against IPV. These findings demonstrate that dyadic interactions, which often only occur in the privacy of one's household, can still be influenced by extradyadic neighborhood conditions, communal concerns, and community-driven efforts.

Pinchevsky and Wright's (2012) review found that the nuanced nature of one's interpersonal and communal bonds are relevant in understanding IPV's occurrence as well. For instance, friendships may be more influential than familial relationships, as suggested in a study by Wright and Benson (2010). In their study, neighborhood-level social ties with friends were measured as the proportion of residents in a given area who had at least one friend living within their neighborhood. Familial ties were similarly assessed in this study, except this type of tie referenced a relative or in-law within the neighborhood. Wright and Benson (2010) found that social ties with friends appeared to buffer against IPV experience, but familial ties did not have the same protective effect. Common beliefs and practices among neighbors may also be important. Recent studies have revealed protective effects of higher neighborhood immigrant

concentration against IPV (Pinchevsky & Wright, 2012; Wright & Benson, 2010). In sum, it appears that specific aspects of neighbors' relationships, including their density of friendships and their common cultural backgrounds and norms, influence the likelihood of IPV experience.

Pinchevsky and Wright (2012) reported mixed results for residential stability, which has typically been measured as either a percentage of residents living in a household for five or more years, or as a percentage or ratio of houses occupied by owners (and not renters). Some studies included in their review found positive associations between IPV and stability, other studies found negative associations, and still other ones found null results. Although it is not clear why mixed results have been found regarding the relationship between residential stability and IPV, it is notable that in at least three studies (Benson, Fox, DeMaris, & Van Wyk, 2003; Li et al., 2010; Wright & Benson, 2010), residential stability predicted IPV after controlling for individual variables such as age, race, and education. These findings again make it apparent that neighborhood factors account for incremental variance in IPV perpetration.

Results of Pinchevsky and Wright's (2012) review largely confirm that concentrated disadvantage, lower immigrant concentration, fewer social ties, and lower collective efficacy are associated with IPV. They reinforce the notion that IPV cannot solely be explained by person-level characteristics, nor can IPV solely be explained by society-level macroscopic factors. They suggest that ecological models of IPV should include geographic or neighborhood factors given their important influence on IPV. Representation of these factors in such models could facilitate research seeking to understand the ways in which geographical factors coexist with, and interact with, other identified risk factors for IPV.

In their concluding remarks, Pinchevsky and Wright (2012) reflect on some of the limitations of the statistical approaches used by those in this field of study. Importantly, they

note that "individuals in one neighborhood are likely to be more similar to each other than they are to individuals in another neighborhood" and caution that "this clustering can influence results if not addressed" (p. 128). In other words, at present, most published studies in this domain report on results that may be influenced by autocorrelation, given the clustering of individuals in a neighborhood. Therefore, Pinchevsky and Wright (2012) believe that some caution should be exercised when attempting to draw conclusions from the reviewed studies. These authors also emphasize the need for future research to assess a broader set of IPV-related outcomes, beyond IPV experience or perpetration. For instance, neighborhood characteristics might be studied with respect to IPV severity, revictimization, and reporting of IPV to authorities. We believe that these factors might aptly be applied to research on the psychological outcomes of IPV survivors as well.

Ecological systems and psychological outcomes in trauma survivors. Although ecological models have less often been invoked to understand the development and maintenance of psychopathology among IPV survivors, such a framework may have much utility in this domain (see Dutton, 2009). Below, we introduce the extant research on psychosocial and contextual correlates of IPV-related PTSD and other psychological conditions commonly endorsed by IPV survivors. We introduce these correlates within an ecological framework, discussing person-level factors, event-level factors, and social factors. We also indicate convergence with the larger trauma literature, where relevant. In the section following, we address the lack of research on geographic factors that may contribute to the maintenance of psychopathology in female IPV survivors, and we explain why it is important that that gap be addressed.

Person-level factors. In a review of the literature on psychological outcomes among IPV survivors, Dutton (2009) sought to extract correlates, predictors, mediators, moderators, and distal outcomes of IPV-related PTSD. In the studies she reviewed, lower socioeconomic status and a history positive for childhood abuse were found to be associated with an increased risk for developing PTSD symptoms among IPV survivors. On the other hand, minimal evidence was presented to suggest that race was associated with PTSD development in IPV survivors, especially after accounting for socioeconomic status**.**

These findings are similar to those reported in a meta-analysis completed by Brewin, Andrews, and Valentine (2000). These authors reviewed 77 articles (28 with military samples, 49 with civilian samples) to elucidate risk factors for PTSD among trauma-exposed adults. They found that average effect sizes for demographic variables like race and age were negligible (*r*s = .05 - .06). Other person-level factors, however, showed statistically significant, yet small, effect sizes. This group of factors included less education, lower socioeconomic status, lower intelligence, personal psychiatric history, and familial psychiatric history (*r*s = .10 - .18). Positive history of childhood abuse, adverse childhood events, and previous trauma also were associated with PTSD in the meta-analysis (*r*s = .12 -.19).

A second meta-analysis of 68 articles on trauma-exposed adults by Ozer, Best, Lipsey, and Weiss (2003) found similar results regarding person-level factors; positive trauma history, personal psychiatric history, and familial psychiatric history showed small effects (*r*s = .17). Peritraumatic response variables (more severe peritraumatic emotional response, perceived life threat at the time of the trauma, and peritraumatic dissociation), however, evidenced effects ranging between .26 and .35.

Event-level factors. Across a number of studies, IPV type, frequency, intensity, severity, and chronicity have emerged as significant predictors of IPV-related PTSD symptoms. Dutton (2009) reported that psychological abuse was just as likely as physical abuse, if not more likely, to lead to PTSD symptoms. She also reported that experiencing sexual abuse concomitant with another form of abuse may further increase risk for PTSD.

In an atheoretical review of predictors of IPV-related PTSD and other common psychological outcomes such as depression and anxiety, Dillon et al. (2013) reported that experiencing more than one form of IPV was associated with an increased likelihood of experiencing more depressive symptoms, greater depressive symptom severity, and greater PTSD symptom severity. IPV characteristics were found to be associated with anxiety as well. For instance, Dillon et al. (2013) reported that IPV was associated with anxiety even after statistically controlling for age, education, and income. These authors speculated that the relationship may be dose-dependent, as greater anxiety was found to be associated with more frequent, more intense, and more severe IPV (Dillon et al., 2013). The findings echo Brewin and colleagues' (2000) report, which found a significant relationship between greater trauma severity and greater PTSD symptomatology (r = .23).

Social factors. Depression and anxiety have long been linked to low levels of perceived social support (Clara, Cox, Enns, Murray, & Torgrude, 2003; Dahlem, Zimet, & Walker, 1991; Zimet, Dahlem, Zimet, & Farley, 1988), with several studies noting this relationship among IPV survivors. In a study by Coker, Smith, Thompson, McKeown, Bethea, and Davis (2002), 1,152 women seeking medical care were surveyed on their experiences of IPV, their physical health, their mental health, and their perceived social support. These authors found that after controlling for IPV frequency, perceived social support was negatively associated with perceived mental

health, physical health, PTSD symptoms, depression, anxiety, and suicide attempts. In a study of IPV survivors seeking mental health treatment, lower perceived social support was found to be associated with higher levels of PTSD and depression, but not GAD (Woodward et al., 2013).

Meta analyses provide further support for the association between PTSD and social support. Brewin et al. (2000) found the strongest effect for lack of social support (r = .40) in their meta-analysis. The average effect size for lower perceived support found by Ozer et al. (2003) was -.28. These convergent findings underscore the relevance of perceived social support to mental health concerns in trauma survivors. They suggest that even when trauma history is similar, expression of psychopathology may be different for survivors nested in social networks perceived as supportive, compared with social networks perceived as inadequate.

Geographical factors and psychological outcomes. Geographic correlates of psychopathology in IPV survivors have received little attention in the literature. However, considerable research outside the trauma arena has addressed the association between neighborhood factors and psychological outcomes. Illustrating this relationship, Truong and Ma (2006) completed a systematic review of the research on neighborhood factors and mental health outcomes. Their review of 29 studies revealed significant associations between poverty, poor mental health and psychological disorders such as depression. Depression was also found to be associated with physical characteristics of the environment, such as structural housing problems (i.e., damp, leaking roofs, rot in wood, and infestation; Weich et al., 2002). Truong and Ma's (2006) review further showed that neighborhood factors, such as neighborhood safety, crime, and disorder, are associated with depression, distress, anxiety, and anger. Finally, their review revealed significant associations between mood disturbance and neighborhood affluence, stability, and deprivation (a composite measure of income, employment, health deprivation and

disability, education, skills, training, housing, and geographical access to services; Wainwright & Surtees, 2004).

Studies that have been published since Truong and Ma's 2006 review have also considered the role of community violence as a neighborhood-level contributor to poor mental health. For example, Clark and colleagues (2008) asked 386 mothers at an urban community health center to complete questionnaires assessing their experiences of IPV and exposure to violence (i.e., witnessing violence) in their self-defined neighborhood. They were also asked to report on their depressive and anxiety symptoms. The authors found that witnessing violence in the neighborhood was associated with depressive and anxiety symptoms, whereas witnessing violence outside the neighborhood was not. When stratified by ethnicity, the association between neighborhood violence and symptoms held for Whites but not Latinas. Exposure to neighborhood violence did not interact with IPV to predict symptoms.

Other ecological research has examined interactions between geographic risk factors for poor psychological outcomes and social support (e.g., Kim & Ross, 2009; Ross & Jang, 2000; Stockdale et al., 2007). For example, Ross and Jang (2000) assessed fear (e.g., of robbery, break-in, attack), mistrust (of others and their intentions), and perceived neighborhood disorder, among 2,482 community members. Perceived disorder included social disorder (e.g., high crime rates, people hanging out on streets, drinking, taking drugs) and physical disorder (e.g., graffiti, vandalism, dirt, noise). Fear and mistrust were regressed on perceived disorder, informal social ties (e.g., visiting or chatting with neighbors), formal neighborhood integration (e.g., participation in neighborhood organizations), and their interaction terms. Informal social ties interacted with perceived disorder to predict fear and mistrust; at low levels of perceived disorder, levels of fear and mistrust were low regardless of level of informal social ties.

However, at high levels of perceived disorder, fear and mistrust were higher among those who reported low levels of social ties than among those who reported high levels of social ties. Formal integration interacted with perceived disorder to predict fear in the same manner; high levels of formal integration buffered against the detrimental effects of perceived disorder on fear. These two findings heighten interest in the ways that ecological systems simultaneously exert their influences on psychological states.

To examine if perceived neighborhood disorder and social factors might interact to influence more protracted, diagnostically-relevant symptomatology, Kim and Ross (2009) assessed the effects of perceived neighborhood disorder on self-reported depressive symptoms using the same community sample. In a regression model testing the interaction of perceived disorder and informal social ties, and the interaction of perceived disorder and general social support (i.e., emotional and practical support), both interactions were statistically significant predictors of depression. At high levels of perceived disorder, higher levels of informal social ties buffered against depression. Similarly, at high levels of perceived disorder, higher levels of general social support buffered against depression. Moving forward, it is important to clarify whether effects of perceived neighborhood disorder are contingent upon social factors among help-seeking populations as well.

The findings reviewed in this section underscore the relationship between various geographic factors (e.g., community violence exposure and perceived neighborhood disorder) and psychopathology. They also suggest a compelling need to consider the intersection of geographic factors and other ecological systems when attempting to understand mental health. Specifically, it appears that experiences with violence may vary in their impact on psychological functioning as a function of person-level characteristics (Clark et al., 2008). Further, positive

relationships and strong social support at the level of the social system may reduce the influence of geographic factors on negative emotional wellbeing (Kim & Ross, 2009; Ross & Jang, 2000).

Although these studies did not sample IPV-survivors specifically, they could inform research on IPV-related psychopathology. Research strongly supports the association between geographic factors and mental health (Truong & Ma, 2006), and thus, these factors should be included when testing models of IPV-related psychopathology. These studies also show that psychological outcomes in individuals may vary despite similar experiences; conditions within different systems may be simultaneously exerting their influence on the expression and maintenance of psychopathology, or they may be shaping the way in which risk factors at other levels are impacting and prolonging mental health concerns. For certain, such results are congruent with an approach that recognizes the role of hierarchical, intersecting systems. As such, empirical IPV research informed by this approach is sorely needed.

Geographical factors and psychological outcomes in IPV survivors. Very little research has examined how neighborhood or geographical factors covary with psychological outcomes in IPV survivors. However, studies that have addressed this topic suggest that increased levels of self-reported community violence and perceived neighborhood disorder are associated with posttraumatic stress and depressive symptoms. For instance, Brown, Hill, and Lambert (2005) asked 90 African American women to complete self-report questionnaires on their experiences of IPV and exposure to community violence, including directly experiencing, witnessing, or having knowledge of community violence, in the past three years. These researchers found an additive effect of IPV and community violence on self-reported posttraumatic stress symptoms, such that greater exposure to both forms of violence was associated with greater symptomatology. Beeble, Sullivan, and Bybee (2011) examined self-

reported depressive symptoms and quality of life over two years among 160 mothers with a history of physical victimization who survived IPV. Participant features (race, change in employment status, education, and income) did not predict baseline depressive symptoms or change in depression over time. However, frequency of abuse (physical, psychological), perceived neighborhood disorder, and fear of additional victimization predicted baseline depressive symptoms. Likewise, frequency of abuse (physical, psychological) and fear of victimization predicted change in depression over time. Similar results were found for quality of life. These studies provide preliminary evidence for broadening the lens by which researchers understand IPV and associated psychological outcomes. However, these studies are limited in their methodological approaches, and their results should be interpreted with caution.

Limitations and Advances in Ecological Measurement

Limitations. Researchers concerned with geographic factors and ecological approaches to understanding psychopathology have noted several significant limitations in the way research in this domain has typically been conducted. The first concerns the use of self-report measures of geographic factors **(**e.g., self-reported perceived neighborhood disorder, self-reported history of exposure to community violence). As acknowledged by some authors (e.g., Beeble et al., 2011; Curry, Latkin, & Davey-Rothwell, 2008), an individual's level of distress may influence the way in which that individual sees or remembers her or his environment. This may be due to mood biases (Bower, 1981) or the effects of depression and anxiety on cognitive performance (Kizilbash, Vanderploeg, & Curtiss, 2002). Since those who are depressed may erroneously report more disorder, the use of objective measures of geographic factors would greatly advance ecological research in psychology.

Another limitation in this domain is the frequent use of self-report measures of psychopathology. IPV survivors often present with very high overall levels of distress, and report a number of other significant life stressors (e.g., unemployment, financial difficulties, and lack of child care). As a result, self-report measures may result in inflated estimates of symptomatology. Thus, at present, it is unclear whether geographic factors are more closely linked to general or overall distress, or if geographic factors are uniquely related to specific clinical syndromes. Clinician-administered measures, which are often considered the gold-standard for assessing mental health conditions, provide more precise accounts of clinical symptomatology. These measures are better able to parse apart nonspecific distress and specific symptoms of a disorder. Statistically significant associations between geographic factors and clinician-assessed, disorder-specific symptomatology would be stronger evidence of the relationship between geographic factors and conditions such as PTSD, depression, and GAD.

Using self-report measures to assess clinical symptomatology can also result in inflated symptom estimates in another way. Consider that conditions like PTSD, depression, and GAD have overlapping diagnostic criteria; for instance, sleep disturbance is a symptom of all three disorders according to the two most recent iterations of the *Diagnostic and Statistical Manual of Mental Disorders* [4th ed., text rev.; *DSM–IV-TR;* American Psychiatric Association, 2000; 5th ed.; *DSM–5*; American Psychiatric Association, 2013]. However, there may be qualitative differences in the expression of a symptom like sleep disturbance: there could be difficulty falling asleep, difficulty staying asleep, unwanted early morning wakening, or various symptom permutations. These qualitative differences are important, because they indicate different disorders: early morning wakening, for example, is usually associated with depression, but not PTSD or GAD. Problematically, such qualitative differences cannot become known to the

researcher who uses self-report measures. This means that with self-report measures, a (undifferentiated) symptom could unduly be counted toward multiple psychological conditions. On the other hand, with clinician-administered assessments, clarification can be achieved, usually through additional probing. Then, such knowledge can be used to assign a common symptom like sleep disturbance to one disorder and not another if warranted. In sum, the latter, finer analysis, only possible with clinician-administered assessments, can reduce inflated estimates of symptomatology. The result is a cleaner test of the relationship between geographic factor and psychological disorder.

A final source of concern in this field is the way in which the geographic environment of interest has typically been defined or quantified in past research. When not self-defined by participants, researchers have often relied on census tracts to define neighborhoods. However, a number of authors have critiqued this approach, noting that census tracts are often heterogeneous in size and create artificial boundaries. Analyses that rely on such boundaries may inaccurately represent an individual's most immediate surroundings (Bogat et al., 2005; DePrince, Buckingham, & Belknap, 2014; Truong & Ma, 2006). Analyses based on census tract boundaries may miss geographical features at the edge of a census tract that impact individuals in adjacent tracts. As a result, census tract boundaries may arbitrarily demarcate the environments of women whose realities are very similar. On the other hand, they may bin together women who are spatially proximal to one another but exist in very different landscapes. A more refined approach to defining the neighborhood or environment could foster more meaningful and precise analyses (Truong & Ma, 2006).

Geographic information systems. Geographic Information System (GIS) technology offers a promising approach to addressing the limitations listed above. A GIS refers to a

computerized system in which spatial or georeferenced data can be stored, displayed, and analyzed (Price, 2016). Spatial data is said to be georeferenced when it has been set to correspond with a specific location on the earth's surface (Price, 2016). Georeferenced data can either be discrete, in that the data represent real-world entities with locations and boundaries (e.g., roads or cities), or it can be continuous, in that "data represent a quantity that is measured and recorded everywhere over a surface" (e.g., income; Price, 2016, p. 9). These data can be collected by the researcher herself, or they can be obtained in other ways, such as through reputable websites like that of the United States Census Bureau's (https://www.census.gov/geo/maps-data/data/tiger.html).

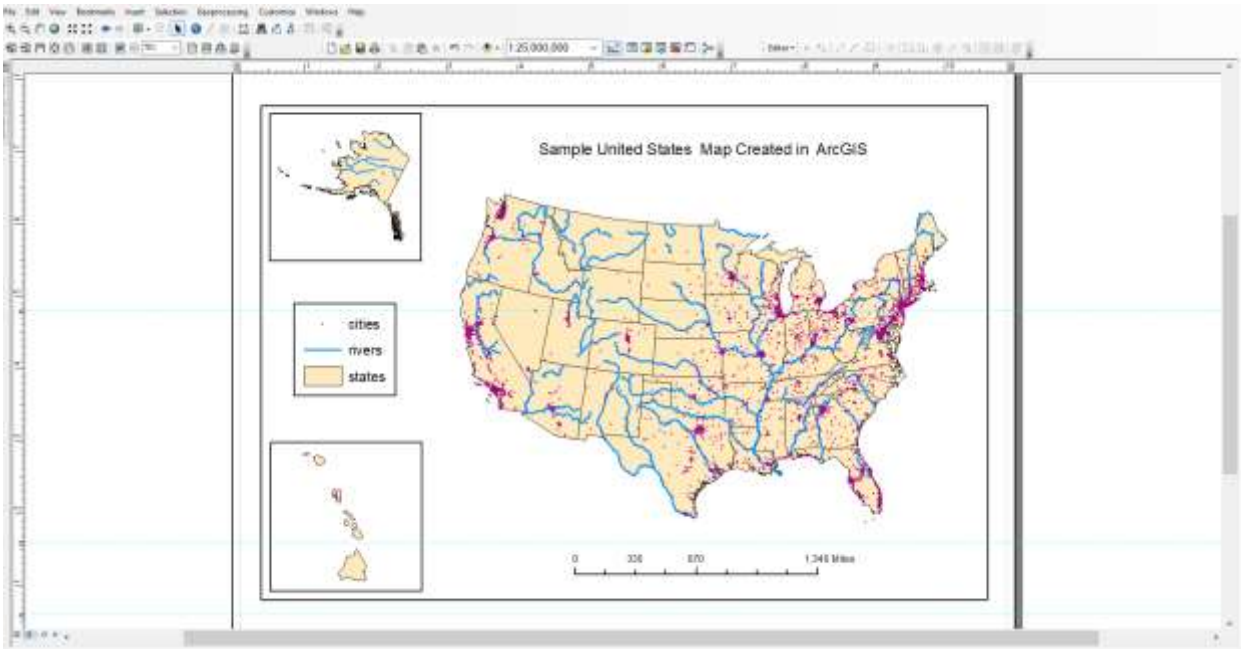
GIS software packages such as ArcGIS (Esri Inc., 2013) allow researchers to visually display different spatial datasets and create informative maps. To make these maps, different types of spatial data are added to a data frame (see Figure 2a). For instance, if one was interested in making a map of the United States, one might add spatial features such as states, rivers, and cities to the data frame (see Figure 2b). States would be represented on the map by polygons, rivers would be represented by lines, and cities would be represented by points. Additional geographic data could be linked to those features; for example, if the state data were obtained from the U.S. Census Bureau, linked geographic data might include 2010 state populations for each of the 48 continental states, Alaska, and Hawaii.

A researcher interested in understanding the relationship between geographic factors and public health issues in her county might also find this type of visual representation of data useful. For instance, she might add to her data frame zip code boundaries (polygons) and day care facilities (points) for her county of interest. She might then seek to visually represent mean income for each zip code on the map using a color gradient. Using a software package like

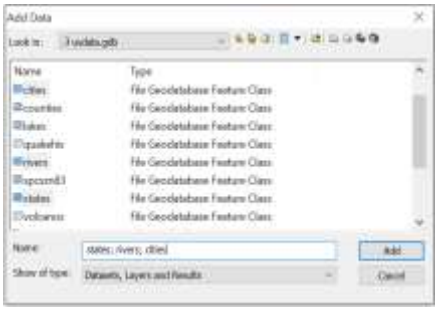
ArcGIS, she could stratify the continuous variable ‘income’ into four strata, and assign to the lower income quartile a light green, the upper income quartile a dark green, and the other quartiles shades of green along the continuum. This would result in a map where each zip code polygon would take on one of the four shades of green depending on its mean income value. She could then begin to look for patterns of clustering of day care facilities, and whether facility-points tend to cluster in wealthier areas (dark green) or poorer areas (light green).

There are, however, significant problems that arise with such an approach, and they align with concerns presented earlier in this manuscript. Zip codes have arbitrary boundaries, and the contents of these polygons may be quite heterogeneous. Therefore, aggregating data to these regions may misrepresent reality. In the example above, for instance, it is plausible that within a single zip code boundary, there are some areas largely populated by poorer individuals and other areas largely populated by wealthier individuals. However, the mean income values the researcher has used were derived from aggregated data (i.e., income values aggregated across all households within each zip code boundary). As a result, pertinent, nuanced information has been lost.

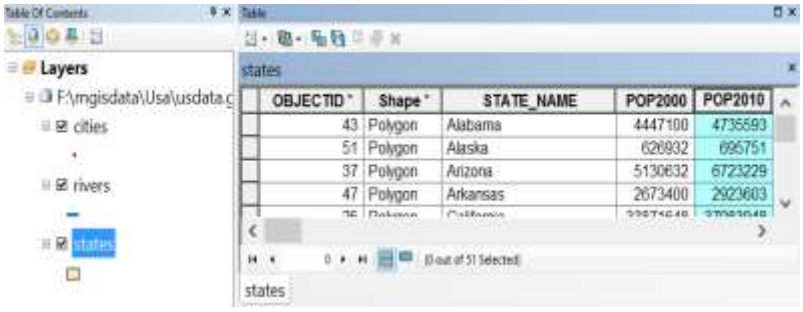
Another problem that arises when comparing arbitrarily-defined polygons that are not uniform in size is termed the Modifiable Areal Unit Problem (MAUP). Imagine that a researcher was interested in the number of single-parent households in her city. Upon observing household data for census tracts in that city, it appears that census tracts larger in surface area have more single-parent households. Here, an interpretation issue arises: because larger census tracts may



(a)



(b)



(c)

Figure 2. Figures 2a, b, and c depict various windows and functions available in ArcGIS (Esri Inc., 2013). Figure 2a depicts a United States map created in ArcGIS using tutorial data included in *Mastering ArcGIS* (Price, 2016). Figure 2b depicts spatial data (referred to as *feature classes* in ArcGIS) stored in a geospatial database. Figure 2c depicts a Table of Contents in ArcGIS and shows the names and symbols associated with the feature classes (cities, rivers, states) that have been added to the data frame. Figure 2c also depicts an attribute table associated with the states feature class. The table includes records for the 50 United States and includes data such as state populations per the 2000 and 2010 census.

be more populous in general, it is not clear what underlying process is driving the observed differences in the absolute value of single-parent households (Price, 2016).

The latter concern, the MAUP, can typically be addressed through approaches such as normalization, where, for instance, one might divide the population-driven estimate (e.g., single-parent households) by the population value for the relevant land area (Price, 2016). The former concern regarding aggregated data is probably best addressed in the social sciences by using data that has been aggregated at the smallest unit possible, if aggregated data must be used. For census-type variables, if available, the optimal choice is usually data organized at the block level or block group level, because these are the smallest units for which census data can be obtained by the general public. Block level is smaller than block group level, however, many variables are not available at block level (U.S. Census Bureau, 2012).

Often, for practical reasons, aggregated data must be used; consider for instance, the impracticalities of collecting income data for every household in a city or county. On the other hand, sometimes it is possible to obtain individual, georeferenced point data for analysis. When possible, this is preferable. For example, one could obtain the locations for all crimes committed in a county or city. In a circumstance such as this, where non-aggregated data can be obtained and used, how to organize, analyze, interpret, and display that data is dependent on the specific research endeavor at hand. If a researcher wants to make inferences regarding the impact of people's 'environments' on their behavior, she must decide first how to appropriately define what constitutes those 'environments'. Once all parameters of interest have been determined, data can be exported from GIS software to other statistical packages, where linear relationships between geographic variables and psychological variables can be assessed.

GIS software packages can accommodate significant flexibility in organizing and distributing geographic data. As a result, they are powerful tools for addressing research questions that traverse the social and earth sciences. They allow for innovative approaches to measuring individuals' environments, and they offer the opportunity for improved analyses that address the shortcomings of many other studies on geographic factors and psychological symptoms.

Empirical applications of GIS to IPV. DePrince and colleagues (2014) have authored the only study to date that has harnessed the power of GIS to estimate the effects of geographic variables on psychopathology in female IPV survivors. DePrince et al. obtained city and census geographic data for 192 female victims of IPV who reported violence by a male perpetrator to the police. Suggesting that the conditions of survivors' most immediate surroundings might have the greatest impact on their mental health, the authors cast a computer-generated grid over the spatial area where participants lived, allowing them to assign participants' addresses to grid pixels 1,000 feet in height and 1,000 feet in width, which they termed *proximal environments*. They then linked to each participant the geographic characteristics associated with the 1,000 square foot pixel which encapsulated their residence.

The authors also assessed, via self-report, person and event-level risk factors for poor psychological outcomes, and symptoms of depression and PTSD. To assess the relative contributions of the various risk factors to participants' symptomatology, the person-level factors (age, race, and socioeconomic status), event-level factors (type and severity of IPV, woman's posttrauma fear appraisal, time since initial IPV incident), and geographic factors (racial-ethnic composition, % single mother and single father households, % homeowners, land value, reported violent crime), were sequentially entered as predictors of PTSD and depressive symptoms in

separate hierarchical regression models. Racial-ethnic identity by racial-ethnic composition of the proximal environment interaction terms were entered in the final step of the regressions. In the full PTSD model, higher levels of fear and greater percentage of single father households in the proximal environment significantly predicted PTSD symptomatology. Further, in addition to a main effect for percentage of Latinos living in the proximal environment, DePrince et al. (2014) observed a trend-level, protective interaction effect of Latina identity and percentage of Latinos (i.e., Latina women with greater Latino proximal community make-up reported fewer PTSD symptoms). In the depression model, higher levels of fear predicted greater depressive symptomatology, and greater percentage of Latinos living in the proximal environment protected against depressive symptomatology. No interactions were significant in DePrince et al.'s (2014) study. Finally, exploratory analyses revealed that higher levels of fear were associated with lower levels of social support. Additionally, higher percentage of Latinos in the proximal environment was associated with higher levels of social support.

DePrince et al.'s (2014) findings inform our understanding of how the proximal environment influences, and interacts with racial-ethnic identity to predict, IPV survivors' mental health. However, questions remain. First, it is yet unknown whether DePrince et al.'s findings would replicate in a sample of women who had not reported IPV to police. As data suggests that approximately half of episodes of violence perpetrated against women go unreported to the police (Greenfeld et al., 1998), replicating DePrince et al.'s findings in a more representative sample of female IPV survivors is important. Second, all measures of psychopathology were self-report in this study, a recurring limitation in this domain of research. Third, only interactions between IPV survivors' racial-ethnic identities and the racial-ethnic composition of their proximal environments were examined, leaving unanswered questions

regarding other inter-system effects on psychological symptoms. A nuanced examination that considers the interaction between person-level, event-level, and geographic factors, as they affect IPV survivors' psychological outcomes, could advance this domain of research greatly. Finally, evidence suggests that social support may buffer against poor psychological outcomes. Accordingly, additional, clinically-relevant information might come from conceptualizing social support as an independent variable with main and interactive effects on IPV survivors' mental health.

Present Study

The present study had two objectives. The first objective was to identify geographic characteristics of the environments of IPV survivors, such as racial-ethnic composition, percentage of single family homes, and frequency of crime, that were associated with the maintenance of PTSD, depression, and GAD symptoms among women IPV survivors. The second objective was to determine whether geographic factors interact with person and event-level factors, as well as with social factors (i.e., perceived social support), to predict the maintenance of PTSD, depression, and GAD symptoms among women IPV survivors. Given debate over measurement of the neighborhood, we opted to use crime data mapped at the address level to assess crime in the proximal environment, as did DePrince et al. (2014), in addition to crime aggregated to the precinct level.

The present study included methodological advancements that built upon the extant literature to address these objectives. Specifically, the study used objective measures of survivors' environments, and a subset of analyses relied on grid-organized crime data, to increase precision in the measurement of geographic factors. Additionally, our study used clinician-based assessments of psychopathology, reducing error in the measurement of

psychological symptoms. Finally, this study was the first of its kind to assess GAD among the outcomes that are prevalent in IPV survivors. In the present study, we reported on symptoms of PTSD, depression, and GAD as specified by the *DSM-IV* (APA, 2000). We elected to use this approach as prior research establishing person-level, event-level, and social factors associated with these conditions relied on *DSM-IV* criteria. This approach ensured consistency in integrating geographic factors into the ecological models previously constructed.

Based on results from DePrince et al.'s (2014) study, we predicted that type of family household would be associated with PTSD, and that racial-ethnic composition of the environment would be associated with depression. We also anticipated significant effects for crime (Brown et al., 2005; Clark et al., 2008) and buffering effects for social support (Woodward et al., 2015). Because it is poorly understood how different systems interact to predict outcomes in survivors of IPV, analyses addressing the second research objective in this study were considered exploratory; no a priori predictions were made.

Method

Participants

Participants included women residents of Shelby County, Tennessee who were assessed within a mental health research clinic for women IPV survivors between 2008 and 2016. Recruitment sources for the clinic included announcements distributed in advocacy centers, churches, health fairs, and college campuses, as well as public service announcements. Women who reported physical, sexual, or psychological IPV, consistent with the CDC's definitions (Breiding et al., 2015, were included in the study. The nature of the violence experienced was determined using a semi-structured interview described in more depth below. Women who were still romantically involved with their abusive partner (n = 58), who still lived with their abusive

partner (n = 50), who reported psychotic symptoms (n = 7), who evidenced unreliable responding (n = 7), or who evidenced low cognitive functioning as evaluated by the assessing clinician (n = 5), were excluded. An additional six women who did not report relationships characterized by IPV were also excluded. This resulted in a sample of 229 women in the present study.

Women in the study ranged in age from 18 to 75 years (M = 36.89 years, SD = 12.41). Additional demographic information and type of abuse experienced is reported in Table 1. Time since the end of the most recent abusive relationship ranged from less than one month to 40 years (M = 38.75 months, SD = 66.37). In this sample, the majority of women (n = 205, 89.5%) endorsed on the Life Events Checklist (see below) directly experiencing one or more adverse events in their lifetime in addition to IPV (M = 3.84 events, SD = 2.27). Over half of the women endorsed childhood physical or sexual abuse (n = 139, 60.7%).

Measures

Demographic information. Demographic information was obtained from a brief, self-report questionnaire administered in the larger study. Information collected included age, race, and income.

Adverse events. Exposure to adverse events was assessed with the Life Events Checklist (LEC; Gray, Litz, Hsu, & Lombardo, 2004). This measure consists of 19 items and measures exposure to potentially traumatic events. Individuals indicate whether each event listed was experienced directly, by watching it happen to someone else, by learning about it from someone else, by watching it on TV, or not at all. In this study, number of adverse events was computed as the total number of directly-experienced events endorsed on the LEC that were not IPV-related.

Table 1

Sample Demographics

	Full Sample (N = 229)		2008 – 2013 Subset (N =172)	
	n	%	*n*	%
Type of intimate partner violence experienced in most recent violent relationship				
Physical, sexual, and psychological	101	44.1	77	44.8
Physical and sexual	3	1.3	1	0.6
Physical and psychological	86	36.0	67	39.0
Sexual and psychological	14	7.2	10	5.8
Physical only	2	1.3	2	1.2
Psychological only	23	10.2	15	8.7
Race/ethnicity				
African American	98	42.81	76	44.2
Caucasian	101	44.1	78	45.3
Hispanic	9	3.9	6	3.5
Native American	1	0.4	1	0.6
Asian	3	1.3	2	1.2
Other	15	6.6	8	4.7
Declined to respond	2	0.9	1	0.6
Educational background				
Elementary school	2	0.9	2	1.2
High school	25	10.9	17	9.9
Attended or completed college	165	72.0	123	71.6
Attended or completed graduate training	36	15.7	30	17.4
Declined to respond	1	0.4	0	0.0
Annual household income				
Below $10,000	51	22.3	42	24.4
$10,000-$20,000	63	27.5	45	26.2
$20,000-$30,000	29	12.7	20	11.6
$30,000-$50,000	32	14.0	25	14.6
Over $50,000	37	16.1	31	17.9
Declined to respond	17	7.4	9	5.2

Peritraumatic response and time since IPV. A semi-structured interview was used to obtain details regarding the IPV experienced by women in the larger study. This interview, which is modeled after a similar interview for motor vehicle accident survivors (Blanchard &

Hickling, 2004), is an omnibus assessment used to obtain details regarding significant romantic relationships, any physical, sexual, or emotional abuse experienced in the context of those relationships, and time since the last abusive relationship. Participants were also asked to report on their peritraumatic responses to the IPV by indicating on a response scale from 0 (not at all) to 100 (the most): during the worst period of time with your most recent abuser, how fearful or afraid were you?; how helpless did you feel?; and, how much danger did you feel you were in?. For our analyses, a composite peritraumatic response variable was computed as the mean value of these three ratings. It is important that all three pertiraumatic responses are represented as some forms of IPV, such as psychological abuse, may not incite feelings of fear or danger, but could lead to feelings of helplessness that still foster clinically-significant symptomatology.

IPV type and severity. The Conflict Tactics Scale Revised Version (CTS-2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996) was used to assess physical and sexual abuse and severity. The 12-item partner physical aggression subscale, and the 7-item partner sexual coercion subscale, assess prevalence of experiences of physical and sexual abuse, respectively, in the context of the participant's most abusive relationship. Sample items from the physical aggression and sexual coercion subscales include "My partner punched or hit me with something that could hurt" and "My partner used force (like hitting, holding down, or using a weapon) to make me have sex", respectively. Response options on the CTS-2 range from 0 (this has never happened) to 6 (more than 20 times in the past year) or 7 (not in the past year, but it did happen before). Scores were collapsed to reflect never happened (0) or ever happened (1) and summed. Previous studies have shown evidence of internal consistency of the physical aggression and sexual coercion subscales and attest to their construct validity; these subscales show convergence with, and divergence from, other variables as would be expected, consistent with theory (Straus

et al., 1996). Internal consistency in our sample was good for the physical aggression subscale ($\alpha = .89$) and the sexual coercion subscale ($\alpha = .85$).

The Psychological Maltreatment of Women Inventory – Short Form (PMWI–SF, Tolman, 1999) was used to assess emotional abuse. This measure yields two 7-item subscales: an emotional/verbal subscale encompassing verbal attacks, demeaning behavior, and emotional withholding; and, a dominance/isolation subscale encompassing isolation from resources, demands for obedience and subservience, and rigid adherence to stereotyped sex roles. Participants are instructed to respond to items with regard to their most abusive relationship. Response options on the PMWI range from 1 (never) to 5 (very frequently) or not applicable. Item scores are summed to yield the two subscales.

In a previous study with a community sample of women (Tolman, 1999), the original PMWI demonstrated construct validity through associations with the nonphysical abuse subscale of the Index of Spousal Abuse (Hudson & McIntosh, 1981). Further, both the original and short form subscales differentiated IPV survivors from women who had not experienced IPV. Internal consistency of these scales were acceptable in that study. Internal consistency in our sample was excellent for the emotional/verbal subscale ($\alpha = .92$) and good for the dominance/isolation subscale ($\alpha = .88$).

Environment characteristics. Participants' addresses were obtained at the beginning of the assessment. Crime data, including location and crime type (burglary, robbery, theft from a motor vehicle, aggravated assault, rape, justifiable homicide, murder), were obtained from the Memphis Police Department. Mapped data (i.e., address-level data) was obtained for the years 2007 through 2012, and aggregated data (i.e., precinct-level data) was obtained for the years 2007 through 2015. Crime data were paired with participant data such that participants were

linked with crimes committed in the year prior to their assessment date. Crime occurring in the year prior to assessment was thought to best capture environment conditions that would influence mental health symptoms reported at the time of assessment. In part, this is because crime may differ from year to year based on spatial allocation of police resources (e.g., presence of police officers and patrol cars in neighborhoods).

Spatial demographic and economic data was obtained from the 2008-2012 TIGER/Line® – American Community Survey (ACS) geodatabase (publicly available here: https://www.census.gov/geo/maps-data/data/tiger-data.html). This geodatabase contains paired spatial data and data on an extensive number of demographic and economic variables obtained through the ACS. The ACS (known as the "long form" Census prior to 2000) is ongoing and randomly samples approximately 3.5 million addresses in the United States and Puerto Rico. Variables extracted for analysis in the present study included race of householder, employment status for the population 16 years and older, median household income, and female head of family households. All data of interest were available at block group level. These variables were normalized to account for differences in population density across Shelby County.

Social support. The Multidimensional Scale of Perceived Social Support **(**MSPSS; Zimet et al., 1988) was used to measure perceived social support. Sample items from this 12-item measure include "I can count on my friends when things go wrong" and "My family is willing to help me make decisions". Response options range from 1 (very strongly disagree) to 7 (very strongly agree). Item ratings are summed then divided by 12 to create a total score.

Several studies to date attest to the reliability and validity of this measure (Dahlem et al., 1991; Clara et al., 2003; Stewart, Umar, Tomenson, & Creed 2014; Zimet et al., 1988). In both clinical and nonclinical samples, MSPSS scores have been shown to be associated with

depression and anxiety in the direction theoretically expected. Available evidence from these studies further suggests good test-retest reliability and internal consistency of this measure. Internal consistency in our sample was excellent ($\alpha = .92$).

PTSD symptoms. IPV-related PTSD symptoms were assessed with the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990, the gold-standard clinician measure for PTSD. This interview-style assessment includes 17 items that assess the three symptom clusters of PTSD. Symptoms in the re-experiencing cluster include recurrent, intrusive thoughts, memories, nightmares, and flashbacks, and significant psychological distress and physiological reactivity upon exposure to internal or external trauma reminders. Symptoms in the avoidance and numbing cluster include avoidance of harmless trauma reminders, difficulty recalling trauma memories, diminished engagement and enjoyment in once-pleasurable activities, feelings of detachment, emotional numbness, and foreshortened sense of future. Symptoms in the arousal and hypersensitivity cluster include sleep disturbance, irritability or anger, difficulty concentrating, hypervigilance, and exaggerated startle response. To meet diagnostic criteria for PTSD, per the *DSM-IV*, one must experience at least one re-experiencing symptom, at least three avoidance and numbing symptoms, and at least two arousal and hypersensitivity symptoms. These symptoms must persist for more than one month.

Prompts, specifically anchored to the experience of IPV, were used to obtain ratings of past-month symptom frequency and intensity. Symptom frequency ratings range from 0 (not at all) to 4 (nearly every day), and symptom intensity ratings range from 0 (no distress) to 4 (extreme distress). Frequency and intensity ratings are summed to produce a total severity score ranging from 0 to 136.

Interviews were administered by trained, graduate-level clinicians. To assess diagnostic reliability, a subset of interviews (n = 54, 23.6%) were randomly selected and reviewed by a second, independent clinician. Intraclass correlations (ICCs), computed to determine interrater reliability, suggested considerable agreement by independent raters (ICC = .93).

Depression and generalized anxiety disorder. The Anxiety Disorders Interview Schedule-IV (ADIS-IV; DiNardo, Brown, & Barlow, 1994), an interview-style assessment of anxiety and mood disorders, was used to assess features of major depressive disorder (MDD), dysthymia, and GAD, as defined by the *DSM-IV*. ADIS-IV modules assess specific symptoms, as well as symptom-related ratings of interference and distress, which are used to determine clinical impairment. Additionally, the ADIS-IV includes questions regarding physical health conditions, medication use, or drug use, in order to rule-out organic or substance-induced disorder.

Symptoms of MDD include depressed mood, anhedonia, significant appetite or weight change, sleep disturbance, psychomotor agitation or retardation, fatigue, feelings of worthlessness or excessive guilt, concentration difficulties, and recurrent thoughts of death or suicidality. To meet diagnostic criteria for MDD, an individual must endorse five or more of these symptoms, with at least one of the endorsed symptoms being depressed mood or anhedonia. The symptoms must occur within the same two week period and occur during the majority of days during that period for a diagnosis to be made.

Symptoms of dysthymia include depressed mood, appetite disturbance, sleep disturbance, fatigue, low self-esteem, concentration difficulties, and feelings of hopelessness. To meet diagnostic criteria for dysthymia, an individual must endorse three or more of these symptoms, with at least one of the endorsed symptoms being depressed mood. The symptoms must occur

over the same two-year period, more days than not, without any two-month or longer period of symptom relief, for a diagnosis to be made.

Symptoms of GAD include excessive anxiety and worry, and difficulty controlling that worry. To meet diagnostic criteria for GAD, an individual must endorse anxiety about a number of activities, more days than not, over a period of at least six months. Additionally, three or more of the following symptoms must be experienced during that period, and at least some must have occurred more days than not during the six months of worry: restlessness or feeling "on edge"; feeling easily fatigued; difficulty concentrating; irritability; muscle tension; and sleep disturbance.

After assessing the criteria above, interviewers assigned MDD, dysthymia, and GAD clinical severity ratings (CSRs) based on symptom severity and clinical impairment. CSRs range from 0 (no interference or distress) to 8 (very severe interference and distress). CSRs of four or higher indicate that the individual meets diagnostic criteria for these disorders. For the purposes of addressing our research questions, MDD and dysthymia CSRs were collapsed to create one depressive disorder category (see Brown, Chorpita, & Barlow, 1998; Woodward et al., 2013). We assigned participants the value of the higher of the two CSRs, in keeping with current research practices.

As with the CAPS, the video-taped interviews were administered by trained, graduate-level clinicians, and a subset (n = 58, 25.3%) was randomly selected and reviewed by a second, independent clinician. ICCs were computed to determine interrater reliability and indicated considerable interrater agreement for GAD (ICC = .91), MDD (ICC = .82), and dysthymia (ICC = .86).

Procedure

Upon arrival for the larger study, participants were provided with written consent forms and were verbally informed of the study's purpose, risks, benefits, and other pertinent study details. Following informed consent, participants completed sequentially the demographics form, LEC, IPV interview, CAPS, ADIS-IV, and a self-report assessment battery including the CTS-2, PMWI-SF, and MSPSS. Feedback was delivered to the participants once their assessments were completed. Participants were then debriefed and provided with university or community referrals as appropriate. All procedures received prior approval by the university Institutional Review Board.

Data Analysis Plan

Spatial data were mapped using the State Plane TN FIPS 4100, NAD83, U.S. Survey (Feet) coordinate system. Participant addresses and crime locations were geocoded and added to GIS layers in ArcGIS version 10.5 (Esri Inc., 2016). Akin to the approach used by DePrince et al. (2014), a fishnet with 1,000 square foot quadrants was generated in ArcGIS and overlaid upon a TIGER/Line® – ACS map of Shelby County. Spatial joins were used to link ACS data and quadrant centroids and to obtain counts of crimes committed in each quadrant for 2007-2012 crime data. Spatial joins were used to obtain counts of crimes committed in Shelby County precincts for 2007-2015 crime data. Spatial joins were then used to link participants with the geographic characteristics of the quadrants and precincts that their addresses fell within.

Statistical analyses were performed using IBM SPSS Statistics Version 23 (IBM Corp., 2015). Preliminary data screening included inspection for univariate outliers (i.e., values 3.29 standard deviations above or below the mean), multivariate outliers (identified using Mahalanobis distance and a significance threshold of $p < .001$), skew, kurtosis, and

multicollinearity (Tabachnick & Fidell, 2013). Missing data were estimated using multiple imputation, as this approach does not require data to be missing at random or missing completely at random (Tabachnick & Fidell, 2013).

Hierarchical linear regression was used to assess the relationship between person and event-level factors, geographic factors, social support, and psychological outcomes. Separate sets of regressions were run for the limited (2008-2013) sample, using address-level crime data, and the full sample (2008-2016) sample, using crime data aggregated at the precinct-level. Each set of predictors was entered separately into the model to determine the incremental variance explained by each set. Block 1 predictors included: race (stratified as non-African American [i.e., Caucasian, Hispanic, Native America, Asian, other, declined to respond; reference group], and African American); income (stratified as annually $0-$30,000 [reference group]; $30,000 or higher); number of other (non-IPV) adverse events directly experienced; and peritraumatic response to the IPV. African Americans were grouped separately from participants of other races as they represent the racial majority in Shelby County (52.1% per the 2010 Census) and may have unique experiences given both current and historical conditions in the mid-south (e.g., racism, segregation, slavery). Block 2 predictors included: time since the most recent IPV incident; and IPV type (physical, sexual, psychological). Block 3 predictors included: racial make-up of the proximal environment; %female head of family households in the proximal environment; crimes in the proximal environment or precinct; median income in the proximal environment; and %unemployment in the proximal environment. Block 4 predictor was social support.

Exploratory analyses were conducted by adding a final set of individual-by-system and system-by-system interactions to the model. Specifically, we included interaction terms that

tested the interaction of: race X racial make-up of proximal environment; race X crime; and social support X crime. Race was dummy coded before the interaction term was computed. The other (continuous) variables were standardized prior to computing the interaction term (Hayes, 2013).

Significant interactions were probed using simple slope analysis (Aiken & West, 1991; Hayes, 2013). We selected this approach because it can be used for interaction terms containing both continuous variables and dummy coded categorical variables (Hayes, 2013). The simple slopes approach is based upon the equation:

$$\hat{y} = b_0 + b_1x_1 + b_2x_2 + b_3x_1x_2 \quad (1)$$

where $\hat{y}$ is the value of the dependent variable at given values of independent variables x_1 and x_2 (the variables that comprise the interaction term), b_0 is the value of the intercept in the regression model containing the interaction term, b_1 is the regression coefficient associated with variable x_1, b_2 is the regression coefficient associated with variable x_2, and b_3 is the regression coefficient associated with the interaction term.

Simple slopes analysis was conducted using the transformed variables that were entered into the regression analyses. Simple slopes were tested for their difference from zero at $x_2 = 0$ and at $x_2 = 1$ for categorical moderators (i.e., race), and at one standard deviation above and below the sample mean for continuous moderators (i.e., social support).

Results

Hierarchical Regression Analyses Including Participants Assessed between 2008 and 2013 (Address-level Crime Data)

Preliminary analyses. Univariate outliers were identified for the following variables: peritraumatic response; time since most recent IPV; crime; %female head of households; median

income; and %employment. Univariate outliers were corrected to one unit greater than the highest non-outlier value, or one unit less that the lowest non-outlier value, in a given variable's distribution (Tabachnick & Fidell, 2013). There were no multivariate outliers. Bivariate correlations were scanned to check for multicollinearity. The following variables evidenced correlation coefficients > .70: emotional/verbal IPV and dominance/isolation IPV; thus the two scale scores were added together to form a singular psychological IPV factor. Percentage of African Americans living in the proximal environment, percentage of Caucasians living in the proximal environment, and percentage of female heads of family households in the proximal environment evidenced correlations exceeding .70 as well. Percentage of Caucasians and percentage of female head of family households were therefore removed from the analyses, and percentage of African Americans living in the proximal environment was used as our indicator of racial make-up of the proximal environment. The following variables were transformed due to nonnormal distributions: non-IPV events (square root transformation); peritraumatic response (inverse log transformation); time since most recent IPV (log transformation); physical IPV (inverse square root transformation); psychological IPV (inverse square root transformation); crime (inverse transformation); median income (log transformation); and %employment (inverse square root transformation). In each case, transformation normalized the distribution.

Bivariate associations. Two significant bivariate associations were observed in the limited (2008-2013) sample (*p*s < .05; Table 2). Time since last incident of IPV was negatively associated with PTSD (r = -.22), and social support was negatively associated with depression (r = -.29).

Analyses predicting PTSD. Results for hierarchical regressions predicting PTSD can be found in Table 3. All blocks other than Block 1 (p = .325) yielded significant models (*p*s < .05).

With Block 2 added to the model, time since IPV significantly predicted PTSD, b = -6.58, p = .032, β = -.23; the longer the elapsed time since IPV, the lower the levels of PTSD symptoms. Time remained as the only significant variable in the model in Block 3 (b = -6.48, p = .034, β = -.23) and Block 4 (b = -6.25, p = .037, β = -.22). Time approached significance in Block 5 (b = -7.089 p = .058, β = -.25). Social support approached significance in Block 4 (b = -2.74, p = .060, β = -.20) and Block 5 (b = -2.78, p = .059, β = -.20), and sexual IPV reached statistical significance as a predictor of PTSD in Block 5 (b = 1.66, p = .030, β = .19).

Analyses predicting depression. Results for hierarchical regressions predicting depression can be found in Table 3. The overall model was nonsignificant with Block 1 (p = .082), Block 2 (p = .172) and Block 3 (p = .167) sequentially added. However, with the addition of Block 4 (p = .007) and Block 5 (p < .001), the model reached significance. In Block 4, social support significantly predicted depression (b = -0.43, p = .003, β = -.27); less support was associated with more severe depression. In Block 5, an interaction effect emerged for crime and race (b = 1.11, p = .006, β =.29). Simple slopes analysis revealed a significant slope for participants who did not identify as African American (t = -2.54, p = .012); among these participants, depression varied as a function of crime, with greater crime in the proximal environment associated with more severe depression (Figure 3a). No significant association

Table 2

Bivariate Associations (2008 – 2013 Subset)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Race	1.00																	
2. Income	-.19*	1.00																
3. Adverse events	.06	-.16*	1.00															
4. Peritraumatic response	-.10	-.06	.03	1.00														
5. Time	-.09	.13	.01	-.15*	1.00													
6. Physical IPV	.06	-.02	-.12	.25*	-.03	1.00												
7. Sexual IPV	.05	-.01	.03	-.10	.06	-.41**	1.00											
8. Psychological IPV	.14	0.06	.01	.15	.10	.27*	-.16	1.00										
9. %Caucasian	-.55**	.22**	-.02	.09	.03	-.01	-.03	-.07	1.00									
10. %African American	.56**	-.22**	.02	-.10	-.04	.05	.02	.05	-.98**	1.00								
11. %Female head of households	.40**	-.13	.00	-.22**	.00	-.04	.15	-.06	-.73**	.74**	1.00							
12. Crime: Address level	-.24**	.24**	.07	-.03	.04	-.07	.01	-.27*	.29**	-.28**	-.22**	1.00						
13. Median income	-.35**	.29**	-.09	.02	.03	.05	-.02	-.06	.65**	-.62**	-.58**	.31**	1.00					
14. %Employment	.28**	-.17*	.06	-.10	-.02	.02	.07	-.08	-.41**	.43**	.44**	-.06	-.42**	1.00				
15. Social support	-.12	.08	-.13	-.05	.05	-.11	-.02	-.05	.08	-.10	.01	.01	.08	-.08	1.00			
16. PTSD	-.02	-.12	.10	-.05	-.22*	-.13	.15	-.09	.05	-.04	.04	.00	.05	-.11	-.20	1.00		
17. Depression	.08	.01	.16	-.06	-.02	-.02	.07	.09	-.14	.14	.08	-.09	-.12	.04	-.29**	.34**	1.00	
18. GAD	-.13	.12	.06	.08	.13	.08	.17	-.05	.11	-.10	-.10	.04	.14	.02	-.04	.16	.40**	1.00

Note. IPV = intimate partner violence. PTSD = posttraumatic stress disorder. GAD = generalized anxiety disorder.

*$p < .05$. ** $p < .01$. ***$p < .001$.

Table 3

Hierarchical Regression Analyses Predicting Posttraumatic Stress Disorder, Depression, and Generalized Anxiety Disorder (2008 – 2013 Subset)

	PTSD						Depression						GAD					
	Adj R^2	ΔR^2	*F*	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	F	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	*F*	ΔF	*b*	*t*
Step 1	0.01	0.03	1.51	1.79			0.03	0.05	**1.90**	2.64			0.04	0.06	1.98	**3.40**		
Race					-2.22	-0.65					0.34	0.76					-0.49	-1.15
Income					-5.10	-1.36					0.23	0.48					0.55	1.12
AE					3.23	.80					0.77	1.94					0.37	1.04
PR					-1.97	-0.78					-0.21	-0.74					0.24	0.83
Step 2	007	0.08	**2.72**	**4.55**			0.03	0.02	**1.45**	1.10			0.12	0.09	**3.46**	**5.84**		
Race					-2.99	-0.93					0.20	0.43					-0.52	-1.37
Income					-4.04	-1.00					0.20	0.37					0.53	1.03
AE					3.30	0.84					**0.80**	**2.08**					0.45	1.27
PR					-2.22	-0.92					-0.28	-0.91					0.25	0.76
Time					**-6.58**	**-2.29**					-0.17	-0.60					0.37	1.03
Phys IPV					-1.18	-0.39					0.06	0.15					0.68	1.35
Sex IPV					1.26	1.61					0.09	0.94					0.25	2.12
Psyc IPV					-0.09	-0.09					0.12	0.82					-0.09	-0.61
Step 3	0.09	0.03	**2.21**	1.81			0.03	0.02	**1.41**	1.11			0.11	0.01	**2.61**	0.62		
Race					-1.48	-0.37					-0.24	-0.45					-0.50	-0.97
Income					-5.05	-1.17					0.40	0.68					0.50	0.96
AE					3.63	0.89					**0.85**	**2.18**					0.48	1.32
PR					-2.46	-1.01					-0.27	-0.86					0.28	0.83
Time					**-6.48**	**-2.26**					-0.17	-0.63					0.39	1.06
Phys IPV					-1.03	-0.33					0.08	0.17					0.63	1.27
Sex IPV					1.34	1.67					0.09	0.95					0.24	2.02
Psyc IPV					-0.23	-0.23					0.09	0.64					-0.09	-0.59
%AA					0.02	0.23					0.01	1.10					0.00	0.02
Crime(A)					-0.42	-0.09					-0.42	-0.73					-0.37	-0.67
M income					4.88	0.57					-0.42	-0.38					1.22	1.01
%Employ					-2.22	-1.47					-0.07	-0.41					0.16	0.98

Table 3 (Continued)

Hierarchical Regression Analyses Predicting Posttraumatic Stress Disorder, Depression, and Generalized Anxiety Disorder (2008 – 2013 Subset)

	PTSD						Depression						GAD					
	Adj R^2	ΔR^2	*F*	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	F	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	*F*	ΔF	*b*	*t*
Step 4	0.13	0.04	**2.76**	**10.56**			0.18	0.05	**2.36**	**10.82**			0.11	0.00	**2.61**	0.46		
Race					-1.96	-0.47					-0.33	-0.61					-0.51	-0.98
Income					-4.78	-1.11					0.44	0.76					0.51	0.97
AE					2.65	0.61					0.70	1.78					0.47	1.26
PR					-2.59	-1.06					-0.29	-0.97					0.28	0.80
Time					**-6.25**	**-2.22**					-0.14	-0.51					0.39	1.07
Phys IPV					-1.78	-0.61					-0.05	-0.12					0.62	1.23
Sex IPV					1.2	1.49					0.07	0.74					0.24	2.00
Psyc IPV					-0.32	-0.33					0.09	0.61					-0.10	-0.61
%AA					0.01	0.17					0.01	1.10					0.00	0.01
Crime(A)					-0.92	-0.20					-0.50	-0.90					-0.38	-0.70
M income					5.14	0.60					-0.34	-0.32					1.22	1.00
%Employ					-2.29	-1.50					-0.08	-0.47					0.16	0.97
SS					-2.74	-2.00					**-0.43**	**-3.12**					-0.06	-0.46
Step 5	0.18	0.06	**3.17**	**5.16**			0.12	0.06	**2.80**	**4.93**			0.11	0.01	**2.10**	0.91		
Race					-2.05	-0.51					-0.21	-0.40					-0.50	-0.99
Income					-6.84	-1.2					0.47	0.86					0.51	1.00
AE					2.75	0.64					0.72	1.90					0.51	1.30
PR					-2.35	-0.97					-0.34	-1.19					0.30	0.90
Time					-7.09	-2.11					-0.03	-0.12					0.44	1.26
Phys IPV					-2.07	-0.96					-0.03	-0.07					0.61	1.22
Sex IPV					**1.66**	**2.18**					0.05	0.57					0.23	1.96
Psyc IPV					0.17	0.18					0.14	0.94					-0.09	-0.56
%AA					-0.08	-0.92					0.01	0.63					-0.00	-0.29
Crime(A)					-7.64	-1.3					**-1.65**	**-2.50**					-0.57	-0.82
M income					8.67	1.04					0.05	0.05					1.39	1.14
%Employ					-2.43	-1.54					-0.03	-0.20					0.15	0.94
SS					-2.78	-2.01					**-0.41**	**-2.99**					-0.04	-0.31
Race X %AA					5.64	1.44					0.23	0.47					0.36	0.54
Race X crime					4.73	1.33					**1.11**	**2.79**					0.14	0.35
SS X crime					-3.48	-1.23					0.30	1.34					0.11	0.59

Note. PTSD = posttraumatic stress disorder. GAD = generalized anxiety disorder. AE = adverse event. PR = peritraumatic response. Time = time elapsed since IPV. IPV = intimate partner violence. %AA = Percentage of African Americans in the proximal environment. Crime (A) = Address-level crime. M income = Median income in the proximal environment. %Employ= percentage of people employed in the proximal environment. SS= social support. Bolded values are significant, $p < .05$.

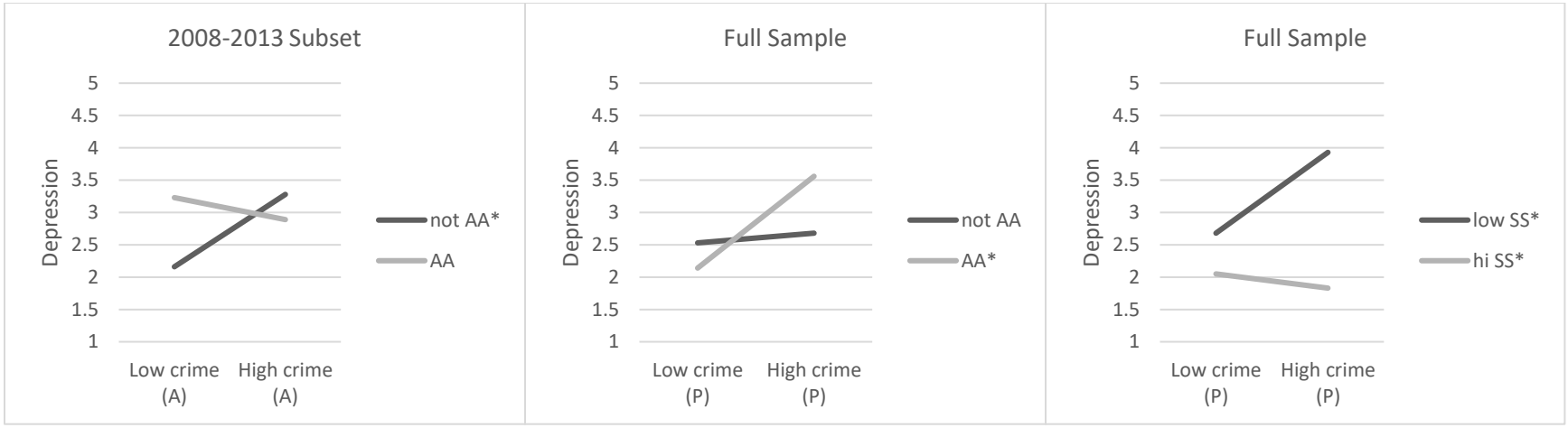
between crime in the proximal environment and depression was observed for participants who identified as African American (t = -1.04, p = .301). Main effects of crime (b = -1.65, p = .013, β = -.27) and social support were observed (b = -0.41, p = .003, β = -.25), and exposure to adverse events approached significance (b = 0.72, p = .060, β = .16) in Block 5.

Analyses predicting GAD. Results for hierarchical regressions predicting GAD can be found in Table 3. All blocks yielded significant models (ps < .05). However, across all blocks, no variables significantly predicted GAD; only marginally significant effects were found for sexual IPV in Blocks 2, 3, 4, and 5 (bs = 0.24 – 0.25, ps = .052 – .068 , βs = .23 – .25).

Hierarchical Regression Analyses Including the Full Sample (Crime Data Aggregated by Precinct)

Preliminary analyses. Univariate outliers were identified and corrected for the same variables as noted above with the following exceptions: in the full sample, univariate outliers were corrected for emotional verbal IPV, but there were no univariate outliers for crime. There were no multivariate outliers in the full sample. Bivariate correlations revealed the same concerns regarding multicollinearity; thus our analyses for the full sample mirror those conducted with the limited (2008-2013) sample. The same transformations were used with the following exceptions: crime did not require transformation, and social support was transformed using inverse square root transformation. In each case, transformations normalized the distributions.

Bivariate associations. At the bivariate level, the following variables were significantly associated with PTSD in the expected direction (ps < .05; Table 4): peritraumatic response (r = -.19); time since IPV (r = -.20); physical IPV (r = -.22); sexual IPV (r = .16); psychological IPV (r = -.17); and social support (r = .19). The following variables were significantly associated



(a) (b) (c)

Figure 3. Figures 3a, b, and c depict significant interaction effects. Low and high crime and social support were determined using median splits of the untransformed variables. Mean values of depression are plotted for ease of interpretation. AA = African American. (A) = address-level crime. (P) = precinct-level crime. * Indicates slope of line is significantly different from zero, $p < .05$.

with depression: exposure to adverse events (r = .19); time since IPV (r = -.15); %Caucasians in the proximal environment (r = -.16); %African Americans in the proximal environment (r = .17); %female head of family households in the proximal environment (r = .15); and social support (r = .28). Only sexual IPV was significantly associated with GAD at the bivariate level (r = .23).;

Analyses predicting PTSD. Results for hierarchical regressions predicting PTSD can be found in Table 5. All blocks yielded significant models (ps < .05). In Block 1, which contained person-level factors, peritraumatic response significantly predicted PTSD symptoms (b = -6.08, p = .003, β = -.20); greater fear, helplessness, and danger was associated with greater symptomatology. With Block 2 added to the model, peritraumatic response (b = -5.04, p = .015, β = -.16) as well as time since IPV (b = -6.45, p = .001, β = -.23) significantly predicted PTSD; the longer the elapsed time since IPV, the lower the levels of PTSD symptoms. Similar results for peritraumatic response (b = -4.45, p = .033, β = -.15) and time since IPV (b = -6.55, p = .001, β = -.23) were found in Block 3. Again, in Block 4, pertraumatic response (b = -4.59, p = .026, β =-.15) and time since IPV (b = -6.20, p = .002, β = -.22) were significant. Only time reached statistical significance as a predictor of PTSD in Block 5 (b = -6.24, p = .004, β = -.22); peritraumatic fear was marginally significant (b = -3.82, p = .072, β = -.13).

Analyses predicting depression. Results for hierarchical regressions predicting depression can be found in Table 5. All blocks yielded significant models (ps < .05). In Block 1, which contained person-level factors, exposure to adverse events significantly predicted depression (b = 0.80, p =.027, β = .18); greater exposure was associated with greater depression severity. Exposure to adverse events remained significant with the addition of Block 2 (b =0.77, p = .035, β = .17) and Block 3 (b = 0.84, p = .017, β = .19) to the model. Time since IPV

Table 4

Bivariate Associations (Full Sample)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Race	1.00																	
2. Income	-.15*	1.00																
3. Adverse events	0.11	-.14*	1.00															
4. Peritraumatic response	-.04	-.08	-0.03	1.00														
5. Time	-.04	.18**	.01	-.11	1.00													
6. Physical IPV	-.03	-.01	-.19*	.29**	-.06	1.00												
7. Sexual IPV	.05	-.04	.07	-.15*	.01	-.40**	1.00											
8. Psychological IPV	.14	.00	-.07	.30**	.07	.31**	-.29**	1.00										
9. %Caucasian	-.56**	.26**	-.05	.04	.03	.03	-.06	-.08	1.00									
10. %African Americans	.57*	-.26**	.05	-.04	-.04	-.01	.06	.06	-.98**	1.00								
11. %Female head of households	.38**	-.18*	-.02	-.16*	-.03	-.08	.19**	-.09	-.72**	.72**	1.00							
12. Crime: Precinct level	.12	-.02	-.04	-.05	.03	.02	.01	.05	-.06	.08	.08	1.00						
13. Median income	-.34**	.31**	-.05	-.0	.02	.08	-.12	-.01	.64**	-.61**	-.56**	.00	1.00					
14. %Employment	.28**	-.19*	.05	-.05	.03	.03	.10	-.04	-.46**	.49**	.49**	-.02	-.47**	1.00				
15. Social support	-.09	.12	-.18*	-.03	.07	.04	-.07	-.07	.08	-.10	-.07	-.07	.11	-.16*	1.00			
16. PTSD	-.04	-.08	.14	-.19**	-.20**	-.22*	.16*	-.17*	001	000	.06	.15	.05	-.02	-.19*	1.00		
17. Depression	.06	-.07	.19*	-.11	-.15*	-.13	.16	.00	-.16*	.17*	.15*	.13	-.08	.04	-.28**	.38**	1.00	
18. GAD	-.12	.10	.12	-.02	.05	-.02	.23**	-.09	.08	-.07	-.03	.02	.10	.02	-.10	.27**	.45**	1.00

Note. IPV = intimate partner violence. PTSD = posttraumatic stress disorder. GAD = generalized anxiety disorder.

*$p < .05$. ** $p < .01$. ***$p < .001$.

Table 5

Hierarchical Regression Analyses Predicting Posttraumatic Stress Disorder, Depression, and Generalized Anxiety Disorder (Full Sample)

	PTSD						Depression						GAD					
	Adj R^2	ΔR^2	*F*	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	F	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	*F*	ΔF	*b*	*t*
Step 1	0.05	0.07	**4.06**	**4.06**			0.04	0.06	**3.31**	**3.31**			0.03	0.04	2.65	2.65		
Race					-2.80	-1.01					0.14	0.36					-0.54	-1.64
Income					-3.82	-1.15					-0.26	-0.59					0.49	1.18
AE					4.82	1.75					**0.80**	**2.28**					**0.61**	**2.01**
PR					**-6.08**	**-2.96**					-0.37	-1.36					-0.04	-0.15
Step 2	0.12	0.08	**4.91**	**5.42**			0.08	0.06	**3.46**	**3.47**			0.08	0.07	**3.52**	**4.23**		
Race					-2.97	-1.07					0.02	0.05					-0.55	-1.68
Income					-2.10	-0.60					-0.10	-0.21					0.52	1.12
AE					3.89	1.33					**0.77**	**2.18**					**0.62**	**2.03**
PR					**-5.04**	**-2.43**					-0.43	-1.45					0.03	0.09
Time					**-6.45**	**-3.36**					**-0.61**	**-2.57**					0.08	0.30
Phys IPV					-3.83	-1.28					-0.20	-0.68					0.39	1.52
Sex IPV					0.63	0.86					0.14	1.55					**0.26**	**3.67**
Psyc IPV					-0.30	-0.35					0.14	1.50					-0.04	-0.39
Step 3	0.14	0.04	**4.14**	2.37			0.11	0.05	**3.41**	**3.07**			0.08	0.01	**2.62**	0.85		
Race					-3.97	-1.22					-0.57	-1.14					-0.61	-1.41
Income					-2.53	-0.71					0.05	0.10					0.48	1.05
AE					4.17	1.49					**0.84**	**2.45**					**0.62**	**2.04**
PR					**-4.45**	**-2.13**					-0.36	-1.17					0.07	0.25
Time					**-6.55**	**-3.32**					**-0.62**	**-2.64**					0.08	0.28
Phys IPV					-4.18	-1.44					-0.22	-0.75					0.34	1.30
Sex IPV					0.64	0.87					0.14	1.52					**0.27**	**3.60**
Psyc IPV					-0.40	-0.45					0.13	1.41					-0.04	-0.35
%AA					0.04	0.61					0.02	1.91					0.00	0.39
Crime(P)					0.01	1.91					0.00	1.67					0.00	0.48
Income					7.67	1.09					0.36	0.40					1.02	1.16
%Employ					0.06	0.04					-0.08	-0.47					0.10	0.57

Table 5 (Continued)

Hierarchical Regression Analyses Predicting Posttraumatic Stress Disorder, Depression, and Generalized Anxiety Disorder (Full Sample)

	PTSD						Depression						GAD					
	Adj R^2	ΔR^2	*F*	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	F	ΔF	*b*	*t*	*Adj* R^2	ΔR^2	*F*	ΔF	*b*	*t*
Step 4	0.16	0.02	4.32	5.47			0.15	0.04	**4.17**	**11.29**			0.08	0.01	**2.55**	1.55		
Race					-4.14	-1.27					-0.59	-1.14					-0.62	-1.42
Income					-2.44	-0.71					0.07	0.16					0.49	1.11
AE					2.99	1.02					0.63	1.86					0.55	1.71
PR					**-4.59**	**-2.23**					-0.39	-1.35					0.07	0.23
Time					**-6.20**	**-3.09**					**-0.55**	**-2.33**					0.10	0.35
Phys IPV					-4.07	-1.45					-0.20	-0.66					0.35	1.37
Sex IPV					0.61	0.84					0.13	1.50					**0.26**	**3.55**
Psyc IPV					-0.58	-0.63					0.10	1.09					-0.05	-0.45
%AA					0.04	0.64					0.02	2.00					0.00	0.40
Crime(P)					0.01	1.85					0.00	1.57					0.00	0.43
M Income					7.44	1.05					0.30	0.31					1.01	1.13
%Employ					-0.27	-0.19					-0.13	-0.82					0.09	0.45
SS					7.37	1.74					**1.29**	**2.89**					0.42	0.90
Step 5	0.16	0.01	3.75	1.22			0.22	0.07	4.98	**6.96**			0.08	0.01	**2.20**	0.77		
Race					-4.36	-1.31					-0.75	-1.57					-0.66	-1.56
Income					-2.53	-0.72					0.07	0.18					0.46	1.04
AE					3.33	1.11					0.48	1.44					0.56	1.67
PR					-3.82	-1.80					-0.49	-1.70					0.10	0.31
Time					**-6.24**	**-2.98**					-0.36	-1.55					0.14	0.48
Phys IPV					-4.86	-1.62					-0.15	-0.47					0.31	1.23
Sex IPV					0.51	0.68					**0.16**	**2.07**					**0.26**	**3.64**
Psyc IPV					-0.57	-0.63					0.10	1.02					-0.05	-0.41
%AA					-0.02	-0.28					0.01	1.40					0.00	-0.02
Crime(P)					0.01	1.85					0.00	-0.71					0.00	0.36
M Income					8.40	1.16					0.37	0.43					1.07	1.21
%Employ					-0.47	-0.33					-0.09	-0.53					0.07	0.36
SS					6.90	1.69					**1.33**	**2.96**					0.39	0.81
Race X %AA					4.66	1.36					0.27	0.65					0.31	0.70
Race X crime					-2.32	-0.67					**0.86**	**2.51**					0.01	0.02
SS X crime					-0.73	-0.60					**0.46**	**2.47**					0.01	0.03

Note. PTSD = posttraumatic stress disorder. GAD = generalized anxiety disorder. AE = adverse event. PR = peritraumatic response. Time = time elapsed since IPV. IPV = intimate partner violence. %AA = Percentage of African Americans in the proximal environment. Crime (P) = Precinct-level crime. M income = Median income in the proximal environment. %Employ= percentage of people employed in the proximal environment. SS = social support. Bolded values are significant, $p < .05$

was also associated with depression with the addition of Block 2 (b = -0.61, p = .011, β = -.18) and Block 3 (b = -0.62 p = .009, β = -.18); the longer the interval since the IPV relationship ceased, the lower the severity of depression. With the addition of Block 4, social support significantly predicted depression (b = 1.29, p = .005, β = .21); less support was associated with more severe depression. The association between time since IPV and depression also remained significant (b = -0.55, p = .021, β = -.16), and the association between exposure to adverse events and depression approached significance (b = 0.63, p = .068, β = .13).

With the addition of Block 5, an interaction effect emerged for crime and race (b = 0.86, p = .014, β = .23). Simple slopes analysis revealed a significant slope for participants who identified as African American (t = 2.90, p = .004); among these participants, depression varied as a function of crime, with greater precinct-level crime associated with more severe depression (Figure 3b). No significant association between precinct-level crime and depression was observed for participants who did not identify as African American (t = -0.87, p = .385).

An interaction effect emerged for crime and social support as well (b = 0.46, p = .026, β = .23). Simple slopes analysis revealed that simple slopes for both low and high social support significantly differed from zero (t = 3.53, p = .001 for each slope). The interaction is plotted in Figure 3c and shows that depression increased as a function of crime when social support was low, whereas depression decreased as a function of crime when social support was high.

A main effect of social support was observed (b = 1.33, p = .005, β = .22); in addition sexual IPV significantly predicted depression in Block 5 (b = 0.16, p = .041, β = .15).

Analyses predicting GAD. Results for hierarchical regressions predicting GAD can be found in Table 5. All blocks other than Block 1 (p = .063) yielded significant models (ps < .05). Across Blocks 2 and 3, exposure to more adverse events was associated with greater GAD

severity (*b*s = 0.61 – 0.62, *p*s = .042 – .046, βs = .13 – .15). Across Blocks 2, 3, 4, and 5, greater sexual IPV severity was associated with greater GAD severity (*b*s = 0.26 – 0.27, *p*s < .001, βs = .27 – .30).

Discussion

The present study aimed to examine psychological conditions among survivors of IPV from an ecological systems perspective. Specifically, we were interested in identifying person and event-level, geographic, and social factors maintaining symptoms of PTSD, depression, and GAD among help-seeking women assessed in the aftermath of violent relationships. In hierarchical regression analyses, shorter elapsed time since IPV, heightened peritraumatic response to IPV, and more severe sexual IPV were associated with greater PTSD symptoms. In hierarchical regression analyses predicting depression, history of more adverse events, shorter elapsed time since IPV, and more severe sexual IPV were associated with more severe depression. Further, crime was associated with depression, with the association varying as a function of participant's race and level of social support; higher social support and non-African American identity buffered against depression at high levels of precinct-level crime, whereas African American identity buffered against depression at high levels of crime in the proximal environment. Finally, in hierarchical regression analyses predicting GAD, history of more adverse events and more severe sexual IPV were associated with more severe GAD.

In addition to offering a comprehensive, systems-level examination of empirically-supported correlates of PTSD, depression, and GAD in trauma survivors, our study was unique in several distinct ways. First, the GIS, grid-based approach used in this study offered increased precision and objectivity in measuring the proximal environments of IPV survivors; this approach has only been used in one other study in this area of research to our knowledge

(DePrince et al., 2014). Further, our study extended that of DePrince et al.'s by assessing social support as a predictor of clinical symptomatology, by examining inter-system interactions previously unaddressed, and by including GAD as an outcome variable. All clinical outcomes were assessed using clinician-administered measures, allowing us to parse general distress and symptomatology unique to specific psychological conditions. In addition, we examined crime as mapped at the address-level and as aggregated at the precinct-level. With this approach, we were able to explore the impact of level of measurement of crime on the association between this relevant geographic factor and psychological conditions of interest. Shelby County, TN has a high incidence of crime and is heterogeneous in socioeconomic status, lending well to the aims of our research.

Examining Associations at the Person, Event, Geographic, and Social System Levels

Posttraumatic Stress Disorder.

Person and event-level factors. In the trauma and IPV literature, various theoretical models (e.g., Dutton, 2009; Ehlers & Clark, 2000) and empirical studies have focused on the influence of psychological and contextual variables on the maintenance of PTSD in trauma survivors. In our models, elapsed time since the termination of IPV and peritraumatic response appeared to be two of the most important variables associated with IPV-related PTSD. Similar to other studies, our results suggested that IPV is both detrimental to women's mental health, and that mental health symptoms tend to remit over time once exposure to IPV ends (Bogat, Levendosky, DeJonghe, Davidson, & von Eye, 2004; Campbell & Soeken, 1999). These findings suggest that women are most vulnerable in the acute aftermath of violence, and that peritraumatic response to IPV may be an important early indicator of chronic PTSD. When

resources are limited, these two variables might be used to identify women at highest risk and most in need of services.

Despite consistent findings in the literature regarding the influence of trauma exposure history (Brewin et al., 2000; Dutton, 2009; Ozer et al., 2003), we did not find an association between number of experienced adverse events and severity of PTSD when models controlled for other risk and maintenance factors. We also did not find physical or psychological IPV to be significantly associated with PTSD in comprehensive models as we might have expected (Dutton, 2009). The combination of our significant and nonsignificant findings are consistent with the notion that subjective trauma experience and appraisal, as opposed to trauma severity, are the most proximal predictors of chronic PTSD symptomatology following the termination of IPV (Ehlers & Clark, 2000). Future research might examine whether proximal factors like subjective experience and appraisal mediate associations between distal factors (e.g., trauma history, trauma severity) and PTSD (Calvete, Corral, & Estevez, 2007; Dutton, 2009; Foa, Ehlers, Clark, Tolin, & Orsillo, 1999; Twaite & Rodriguez-Srednicki, 2004).

Sexual IPV. The association between sexual IPV and PTSD is an area worthy of further research. In our limited sample (2008-2013), sexual IPV was positively associated with PTSD in the final block of the PTSD hierarchical regression; however, no significant association was observed in the full sample. Sexual IPV is understudied relative to physical and psychological IPV; however, some research suggests that this type of IPV may be associated with poorer outcomes. For instance, in a study of IPV-exposed, help-seeking women, Pico-Alfonso et al. (2006) found marginally higher interviewer-assessed PTSD symptoms among woman who endorsed experiencing sexual IPV concomitant with psychological and/or physical IPV. However, hierarchical regressions predicting PTSD symptoms from age, history of psychological

and psychiatric treatment, lifetime victimization, and physical, psychological, and sexual IPV, evidenced significant associations between psychological IPV and PTSD, but not sexual IPV and PTSD. Notably, of those women who reported IPV in Pico-Alfonso et al.'s sample, only 12% reported sexual IPV; in contrast, approximately 52% of our sample reported experiencing this type of abuse. Bennice, Resick, Mechanic, and Astin (2003) found unique effects of sexual IPV, but not physical IPV, on self-reported PTSD in a sample of 57 help-seeking female IPV survivors. Their sample was demographically similar to ours and consisted predominantly of women no longer romantically involved with their abusive partner. Although Bennice et al. did not explicitly note prevalence of IPV in the sample, they did report that approximately 13% of participants endorsed forced sex at the time of the last abusive episode. In considering the findings of these two studies alongside findings of the present study, it is possible that sample composition differences and less variability in severity of sexual abuse in the Pico-Alfonso et al. sample may be relevant to the discrepant results. This conclusion is tentative however, as we only observed a statistically significant association in our limited sample.

Geographic factors. Geographic factors were not significantly associated with PTSD in our models. In DePrince et al.'s (2014) study, percentage of Latinos in the proximal environment and percentage of single father households were significantly associated with self-reported PTSD symptoms. We did not include percentage of Latinos in the proximal environment in our models given differences in the racial-ethnic make-up of Denver, CO as compared with Shelby County, TN. We also did not include percentage of female head of family of households given concerns about multicollinearity. Our nonsignificant results for crime and percentage of African Americans in the proximal environment are consistent with the findings of DePrince et al.

In this emerging area of research, it is still unclear which geographic factors, if any, contribute to the maintenance of PTSD. Whereas some authors have suggested that measurement of characteristics in arbitrarily-defined neighborhoods (e.g., census tracts) might explain nonsignificant findings for geographic factors and clinical symptomatology (e.g., DePrince et al., 2014), we did not find that mapping crime at the level of the proximal environment (versus aggregating crime at the precinct level) yielded different associations between crime and PTSD. It is possible that geographic factors are associated with the maintenance of PTSD, but that they vary in their relevance to IPV survivors across different communities. For example, racial-ethnic make-up of the community may matter less when the community's racial-ethnic composition is more heterogeneous than homogenous. Norms of the majority group, or individualistic versus collectivist culture may also be relevant variables when considering geographic factors and PTSD or other mental health conditions. Finally, it is possible that the geographic factors most associated with poor mental health outcomes like mood and anxiety disorders are more immediately visible indicators of neighborhood disorder such as litter, graffiti, loitering, and dilapidated buildings (Truong & Ma, 2006). From an ecological perspective, understanding the intersection of macrosystem processes and the built environment is important in further clarifying these associations.

Social support. Whereas perceived social support was significantly associated with PTSD at the bivariate level in the full sample, support evidenced only a marginally significant association with PTSD in our limited sample (2008-2013), and this association did not reach statistical significance when analyses were run with the full sample (Block 4, $p = .095$; Block 5, $p = .101$). These findings run contrary to our hypotheses which were based on a rich literature supporting the relationship between PTSD and perceived social support in IPV survivors (e.g.,

Coker, Smith et al., 2002; Woodward et al., 2013) and trauma survivors broadly (Brewin et al., 2000; Ozer et al., 2003). Accordingly, the lack of a significant relationship between these variables was quite surprising.

In considering these unusual findings, it is noteworthy that research on social support in the context of trauma exposure and PTSD has generally been approached through an interpersonal lens on PTSD. Through this lens, reaction to trauma is influenced by attachment styles and trauma appraisals made by support figures, while trauma-related psychopathology erodes social support and interferes with the formation of healthy attachments (Monson, Fredman, & Dekel, 2010; Monson, Taft, & Fredman, 2009). As suggested in the cognitive-behavioral interpersonal theory of PTSD (Monson et al., 2010), cognitive, behavioral, and affective characteristics of members of a dyad (one of which is trauma-exposed) reciprocally affect dyadic functioning; in turn, relational processes (e.g., communication) and relationship quality (e.g., cohesion, intimacy) are affected. This approach to understanding PTSD builds on traditional theories by incorporating an interpersonal context. However, it does not address the full range of social processes that may influence PTSD. The research of Bradley, Schwartz, and Kaslow (2005) suggests that social cognitions and social processes based in cultural identities may be important factors that influence PTSD as well. Their work with disenfranchised, IPV-exposed African American women found that social support was no longer associated with PTSD symptoms when accounting for self-esteem and negative religious coping (in addition to childhood and adulthood abuse). These findings suggest that when addressing the role of social processes in maintaining IPV-related PTSD, it is important to consider social factors beyond traditionally-assessed constructs like perceived support.

Maercker and Horn's (2012) socio-interpersonal framework model of PTSD might be used to illuminate the ways in which accounting for PTSD-relevant factors at multiple system-levels (e.g., time since trauma exposure, peritraumatic response, crime) influences the quality of the relationship between social support and PTSD. These authors propose a three-tiered, interactional model: at the individual level are intrapersonal features and social cognitive-affective features (e.g., shame, guilt); at the close relationships level are psychological intimacy, disclosure, support, and negative exchange; and at the distant social level are group membership and cultural and societal conditions that influence trauma-processing. Future research might rely on Maercker and Horn's framework for identifying mechanisms and moderators of the multifaceted relationship between social factors and PTSD in IPV-exposed women. Potential avenues for exploration include variation in social reactions to survivors' IPV disclosure across support figures (Sylaska & Edwards, 2014), and the influence of social cognitions (e.g., self-blame) and community or sociocultural factors (e.g., ostracism, attitudes about IPV, cultural norms) on help-seeking behaviors (Liang, Goodman, Tummala-Narra, & Weintraub, 2005; Patterson, Greeson, & Campbell, 2009).

Depression.

Person and event-level factors. Regression analyses testing the associations between factors across systems and depression revealed that in early blocks of the models, greater exposure to adverse events was significantly associated with more severe depressive symptomatology. This finding is consistent with a broad literature suggesting that exposure to trauma is a particularly relevant risk factor for depression in women (Kessler, 2003; Piccinelli & Wilkinson, 2000). In the full sample, time since IPV was also negatively associated with depression, consistent with prior research (Campbell & Soeken, 1999). Time remained

significant in the full sample in Block 4, but it was not significant in Block 5 (p = .123). Unexpectedly, physical and psychological IPV severity were not significantly associated with depression in our models controlling for other relevant variables. On the other hand, sexual IPV, which can compound risk for negative psychological outcomes including depression (Pico-Alfonso et al., 06), was significantly associated with depression in the full model.

Although physical and psychological IPV did not evidence unique associations with depression in our study, other studies show that chronicity of these forms of IPV and multiple IPV exposures confer risk for depression (Bogat, Levendosky, Thera, von Eye, & Davidson, 2003; Lindhorst & Oxford, 2008). Research also shows that the effects of childhood abuse on depression are compounded by exposure to physical and sexual IPV (Fogarty, Fredman, Heeren, & Liebschutz, 2008). Potentially, associations between physical and psychological IPV and depression may be moderated by time elapsed since last IPV exposure, which was significant in our analyses. A study by Bonomi et al. (2006) examining risk for depression in women with no history of IPV, recent IPV (past five years), and remote IPV (before past five years) controlled for childhood abuse in their analyses. These authors found that relative to the no-IPV group, the recent-IPV group was more likely to report depression symptoms. The remote-IPV group was more likely to report depression symptoms than the no-IPV group as well, although this effect was less pronounced. In sum, the relevance of IPV severity to depression may be secondary to, or altered by, factors like elapsed time since last IPV exposure, and exposure to other interpersonal traumas.

Geographic factors. Geographic factors obtained from the ACS were not significantly associated with depression. These nonsignificant findings align with those in the DePrince et al. (2014) study, in which only percentage of Latinos in the proximal environment significantly

predicted depression (given the racial make-up of Shelby County, TN, we did not include percentage of Latinos in the proximal environment in our analyses). Other research using IPV (Beeble et al., 2011) and non-IPV samples (Truong & Ma, 2006) has found associations between depression and subjective reports of neighborhood disorder. As noted earlier, often in those studies, disorder was operationalized as the presence of visible indicators such as litter and graffiti in the neighborhood. In addition, many earlier studies that have found associations between self-reported environment conditions and depression have been limited by the possibility of mood-congruent reporting (i.e., depressed participants may construe their environment more negatively). More research is needed to conclude whether our nonsignificant finding for the ACS geographic variables are the result of differences in environment indicators measured (e.g., unemployment versus readily apparent environment conditions), or if we did not detect differences because assessment of geographic factors in our environment was unobstructed by mood biases.

Crime, social support, and race. Whereas geographic factors obtained through the ACS were not significantly associated with depression, significant results were found for crime when interaction terms were added in the final blocks of our depression analyses. As might be expected, high social support appeared to buffer the effects of precinct-level crime on depression, and low social support appeared to exacerbate effects of precinct-level crime on depression. We did not find the same results when crime was mapped at the address-level. It is notable, however, that a third of participants in our study had zero crimes mapped to their proximal environment (i.e., the 1,000 square foot quadrant); accordingly, we may have been limited in our ability to detect this association.

In both depression models, race moderated the effects of crime on depression severity. However, the nature of the associations were different when crime was assessed at the level of the proximal environment and when crime was aggregated to the precinct-level. Crime in the proximal environment was positively associated with depression among participants who self-identified their race/ethnicity as other than African American (77% identified as Caucasian). This finding is somewhat similar to the results of Clark et al. (2008); these authors assessed the association between witnessing violence in a self-defined neighborhood and self-reported depression symptoms among a sample of low socioeconomic status women in an urban neighborhood. Among Caucasian women, witnessing violence was significantly associated with depression. However, this association did not hold for Latina women. Clark et al. (2008) postulated that cultural differences in Caucasian versus Latina women's expression of emotion might account for the observed moderating effect of race; for instance, Latina women might be more likely exhibit anxiety symptoms in the aftermath of violence exposure. However, it is unlikely that cultural or cultural-regional differences in the expression of emotion could account for our findings; we found that when crime was aggregated to the precinct-level, depression was positively associated with crime among African Americans (but not the reference group). The underlying reason for differences in our findings at the address and precinct-levels is an interesting area for further investigation and might be informed by the extant literature on coping and resilience among IPV survivors.

A number of factors are known to protect against poor mental health outcomes among African American women. For instance, Meadows, Kaslow, Thompson, and Jurkovic (2005) found that among disenfranchised, IPV-exposed African American women, hope, spirituality, self-efficacy, coping, social support, and effectiveness of obtaining resources were associated

with not attempting suicide. Wright, Perez, and Johnson (2010) found that empowerment mediated the association between race and self-reported depression in a sample of IPV-exposed women living in shelters; they proposed that African American women make meaning of their traumatic experiences through internal coping mechanisms in ways that foster power and strength. If these factors are protective for African American women IPV survivors, it is unclear why they would not maintain their protective power at the level of the greater community (i.e., at precinct-level). Future research might explore if shared histories of discrimination and oppression at the community-level might lessen the impact of individual-level resilience factors and contribute to depressive symptomatology. However, researchers should take care to recognize heterogeneity among IPV-exposed African American women and the communities they reside within (West, 2004). In this vein, we advocate that our results inform culturally humble approaches to understanding the intersection of race, crime, and mental health, and we caution against an overgeneralization of our findings to other communities.

Generalized Anxiety Disorder.

Person, event, geographic, and social factors. We did not find that any of the factors typically associated with symptoms of PTSD and depression significantly predicted GAD in the limited sample (2008-2013); only sexual IPV was a marginally significant predictor across Blocks 2 through 5 of the model (p = .052-068). In the full sample, the association between sexual IPV and GAD reached statistical significance. In the full sample, exposure to other adverse events was also significantly associated with GAD in Blocks 1 through 3.

It is challenging to contextualize our GAD findings because of the paucity of research addressing GAD in trauma survivors and sexual IPV's association with mental health conditions (particularly so with GAD). However, some authors propose that exposure to early trauma may

underlie the development of GAD and that additional traumas throughout the lifespan serve to maintain or exacerbate GAD symptomatology (Borkovec, Alcaine, & Behar, 2004). It is posited that recurrent trauma exposure may bolster appraisals of the world as threatening and appraisals of the self as unequipped to cope. Through this lens, worry is maintained because it allows trauma survivors to distract themselves from more emotionally-laden memories. Our findings for adverse events and sexual IPV could fit within this framework, although more research is needed in this domain. Further research is also needed to understand why sexual IPV, more so that physical IPV or psychological IPV, contributes to the maintenance of GAD.

Summary of finding on PTSD, depression, and GAD. Taken together, a number of themes can be distilled from our study's findings. First, there appears to be a transdiagnostic relevance of time since IPV, history of trauma exposure, and sexual IPV on PTSD, depression, and/or GAD. IPV survivors may be at greatest risk for poor mental health outcomes during IPV and in the early months after the end of a violent relationship. Social support and racial-ethnic identity may, in some contexts, buffer against (or confer additional risk for) depression, but these associations do not appear to generalize to other disorders when contextualized in a multisystem framework. It is important that other resilience factors are identified, particularly ones that can be capitalized on in the acute aftermath of IPV exposure. From an ecological perspective, the identification of resilience factors should be approached with a culturally-informed lens.

Our results show that crime may be the most important geographic factor when considering the maintenance of depression among IPV survivors. Further, they demonstrate that level of measurement of crime matters. Our results make it apparent that the nature of the relationship between crime, depression, and relevant third variables can look different depending on how neighborhood crime is operationalized.

It is interesting that crime's association with psychological symptomatology is unique to depression. Whereas some have posited that perceptions of uncontrollability (Latkin & Curry, 2003) and feeling unsafe (Stevenson, 1998) might underlie an association between crime and depression, it is not clear from our data that this is the case. Uncontrollability and feeling unsafe might be expected to maintain PTSD and GAD symptoms as well. Schematic representations of the world as completely dangerous and the self as incapable of navigating it are thought to be central components underlying PTSD (Foa et al., 1999); as such, one would expect safety and control concerns in the presence of crime to activate these schemas and exacerbate PTSD symptoms. Likewise, models of GAD suggest that affected individuals experience uncontrollable worry coupled with low confidence in their own ability to solve problems (Dugas, Gagnon, Ladouceur, & Freeston, 1998); in turn, one would expect that if worries regarding control were kindled by crime, GAD symptoms would increase. Alternative explanations that better account for the unique association between crime and depression need to be considered.

Unlike depression, PTSD (as assessed in *DSM*-IV) and GAD are generally characterized by avoidance, hyperarousal, and intrusive thoughts about a particular event or multiple stressors (APA, 2000, 2013). For PTSD and GAD, anxiety related to specific stressors, and low utilization of resources due to avoidance, may be mechanisms that account for enough variance in the maintenance of symptoms that crime has little incremental influence on symptomatology. Likewise, for PTSD, an index trauma may be the source of such great concern about safety that additional neighborhood violence has negligible effects on PTSD symptoms.

In the most recent iteration of the *DSM* (i.e., *DSM*-5), PTSD is additionally characterized by negative alterations in cognition and mood (APA, 2013). Symptoms include negative beliefs about the self, world, and others, persistent negative emotional state, and distorted sense of

blame; these symptoms were not counted toward PTSD symptomatology in the present study, which relied on *DSM*-IV criteria. Future research might evaluate crime's association with this additional cluster of symptoms, given its conceptual similarities with symptoms of depression. An examination of the association between crime and negative alterations in cognition and mood may help us better understand mechanisms linking crime and particular mental health symptoms in IPV survivors.

Although crime may be uniquely associated with depression, it is important to remember that we used a within-groups design for our study, and that our sample had considerable comorbidity. Accordingly, even though living in a high crime neighborhood may not necessarily contribute to the maintenance of PTSD or GAD symptoms above and beyond other relevant factors, crime may still be a relevant factor conferring risk for mental health concerns and potentially limiting access to treatment. In other words, neighborhood crime may still stifle women's ability to access treatment, even if crime does not exacerbate symptoms of the disorder for which they seek treatment. Depression, maintained by crime, could also interfere with therapy engagement and adherence, and achieving PTSD-related treatment gains. As such, residence in a neighborhood with high crime is clinically relevant among any IPV survivor experiencing depression, even if depression is not the primary presenting concern. Our findings might suggest that moving out of high crime neighborhoods could lead to depression symptoms remitting in IPV survivors. Unfortunately, many factors (e.g., financial, legal/custodial) restrict survivors' ability to do so.

Limitations

A number of limitations to the current study exist. First, our regression analyses tested a large number of predictor variables, and we may have been underpowered to detect effects of

certain factors on the maintenance of PTSD, depression, and GAD. Additionally, due to sample size limitations, a number of maintenance and protective factors that might be relevant to psychopathology in IPV survivors could not be tested. For instance, variables that underscore resilience like empowerment and spirituality were not included in our analyses. We also used a single measure of perceived social support that was self-report in nature and did not differentiate between sources of social support (e.g., friends, family, significant others). Future research might seek to clarify if certain sources of support are most relevant to IPV survivors (Woodward et al., 2015). We did not assess support from the community or religious groups, and these may be relevant sources of support worth examining in future studies. Immigration and acculturation processes may also be relevant to symptomatology in certain IPV-survivor subgroups (Pinchevsky & Wright, 2012; Yoshihama, 2002).

Our data were cross-sectional, and this precludes our ability to make definitive statements regarding the directionality of relationships between the predictor variables and mental health outcomes. Whereas low social support may maintain symptoms of depression, it is also possible that depression erodes social support. Depression may also influence choices regarding living environments (Truong & Ma, 2006) or restrict social mobility, leading depressed individuals to live in more dangerous neighborhoods. Alternative variables, like lack of financial resources, could also account for associations between crime and depression. Although income was not a significant predictor of depression in our analyses, other indicators of economic strain, such as residential stability and receiving public assistance, were not measured in this study (Pinchevsky & Wright, 2012). Finally, we assessed the relationship between geographic factors in the year prior to evaluation and current symptomatology. Women may move several times in the aftermath of a violent relationship, staying with friends or family, living in shelters, or finding

other temporary housing. We did not collect data regarding the time women spent at the addresses they provided. We were not able to assess neighborhood conditions during childhood either, and this might be an interesting avenue for future research. Studies that build upon the literature on geographic factors and mental health conditions could control for duration of residence, test moderating effects of such duration, or examine neighborhood conditions throughout the lifespan.

Clinical Implications

Recognizing the limitations of the current study, we believe that our findings have a number of important clinical implications. The first regards elements of treatment. Empirically supported treatments for PTSD include prolonged exposure (PE), cognitive processing therapy (CPT) and eye movement desensitization and reprocessing (EMDR; Foa, Keane, Friedman, & Cohen, 2008). Although these treatments are unique, they generally capitalize on elements including exposure to the trauma and trauma reminders, and/or modulating trauma-related cognitions and emotions. These treatments focus on factors at the person-level. Likewise, empirically-supported treatments for depression such as behavioral activation predominantly focus on individual-level processes. Some treatments for PTSD and depression also focus on the interpersonal context of disorder (e.g., interpersonal therapy for depression; Bleiberg & Markowitz, 2008). Although these therapies may be (and hopefully are) carried out by clinicians sensitive to their clients' unique identities and value systems, they do not include an explicit focus on the larger societal context of trauma and the trauma survivor.

Our study suggests that clinical practice with survivors of IPV should consider the woman in context and attend to the multiple systems that maintain symptomatology. Perhaps this is most important for IPV-exposed women experiencing depression. As social and

geographic factors appear particularly relevant to the maintenance of depressive symptomatology, the development and implementation of treatments for depression would benefit from ecological perspective-driven insights. This might include the incorporation of cultural elements into treatment content, and integration of social support into treatment planning. The development of community-based initiatives that are not explicitly mental health-related but that foster relationships and seek to reduce social disorganization in the neighborhood is another important avenue to explore.

The Built Environment and Policy Implications

Our results have several implications that are relevant to public policy. As stated, our results suggest that exposure to crime is the most robust geographic factor in predicting depression in IPV survivors. They do not suggest that racial-ethnic make-up of a community or objective indicators of poverty (e.g., unemployment), contribute to the maintenance of mental health conditions. Whereas the latter geographic factors may complicate treatment seeking, engagement, and adherence through a number of pathways (e.g., lack of transportation or child care), living in a neighborhood with high levels of crime appears to be the most proximal geographic predictor of ongoing depressive symptomatology. Stated differently, although crime and poverty are correlated, the most vulnerable survivors of IPV can be identified by their neighborhood's level of crime, rather than its socioeconomic status. Crime's prominence in the depression analyses suggest that when developing and funding mental health facilities, consideration of facilities' proximity to, and accessibility from, high crime neighborhoods is imperative.

Just as GIS can be used to map geographic features associated with mental health outcomes as in this study, GIS can also be a powerful tool in examining the relationship between

the built environment and mental health care. GIS-informed research has found that reduced time and quantity of services available to vulnerable populations may contribute to inequities in health care utilization (Hyndman, d'Arcy, & Holman, 2001). This is particularly relevant given that some IPV survivors may have less flexibility in scheduling appointments due to reliance on public transportation (which may be unreliable or increase the length of the trip substantially) or challenging work schedules (e.g, night shifts, multiple part time jobs). GIS technology can also be used to identify disparities in awareness and availability of community resources. Recently, Cardazone, Sy, Chik, and Corlew (2014) used GIS technology to map and visually illustrate disparities in awareness regarding childhood abuse and neglect, as well as the distribution of organizations tasked with addressing these issues. They then used the geographically-represented data from their study to inform where organizational resources and support might best be distributed in future public welfare endeavors. A similar approach could be used to identify geographic areas where IPV is stigmatized, and to probe the nature of barriers to resource uptake in high crime areas.

By using GIS to map crime and addresses of vulnerable individuals, developers could identify locations where treatment programs are most needed. By mapping features of the built environment (e.g., bus routes, walkability), developers could identify locations that would be most accessible for high-risk IPV survivors. GIS could be used as a component of program evaluation; for instance, an element of evaluation might include repeated assessments of the geographic distribution of mental health problems following targeted implementation of services. Increasing the safety of areas where existing programs are offered may also be important; however, this must be done strategically, as some research has found that highly vulnerable groups (e.g., sex workers, injection drug users) avoid community-based programs when police

presence is dense (Shannon et al., 2008). As resource utilization may be impacted as much by features of the built environment as by psychological factors, the integration of insights from the mental health fields, GIS technology, and urban planning, represents a critical step toward improved provision of care.

Even when mental health care becomes more accessible, the effects of violence on mental health will remain. IPV survivors may find themselves locked in a cycle in which exposure to crime maintains depression, depression impairs functioning, impairment in functioning results in loss of social capital, and low social capital precludes movement to lower crime areas and resource utilization. This brings us to a final thought on policy implications, which regards the way in which policy makers, city planners, and activists approach reducing neighborhood crime. A major concern is gentrification, in that such "restoration" processes often increase cost of living without appreciable decreases in crime (McDonald, 1986). This may lead to further disenfranchisement or displacement of highly vulnerable individuals. Although it is beyond the scope of this study to solve this complex issue, we advocate that the identification of solutions should mirror the identification of challenges; it should be done within a multisystem framework, with the help of professionals from multiple fields, and with the input of survivors themselves.

References

Aiken, L. S., & West, S. G.(1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage.

Ali, P. A., & Naylor, P. B. (2013). Intimate partner violence: A narrative review of the feminist, social and ecological explanations for its causation. *Aggression and Violent Behavior*, *18*, 611-619. https://doi.org/10.1016/j.avb.2013.07.009

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). Arlington, VA: American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890423349

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing. https://doi.org/10.1108/rr-10-2013-0256

Beeble, M. L., Sullivan, C. M., & Bybee, D. (2011). The impact of neighborhood factors on the well-being of survivors of intimate partner violence over time. *American Journal of Community Psychology*, *47*, 287-306. https://doi.org/10.1007/s10464-010-9398-6

Bennice, J. A., Resick, P. A., Mechanic, M., & Astin, M. (2003). The relative effects of intimate partner physical and sexual violence on post-traumatic stress disorder symptomatology. *Violence and Victims*, *18*, 87-94. https://doi.org/10.1891/vivi.2003.18.1.87

Benson, M. L., Fox, G. L., DeMaris, A. A., & Van Wyk, J. (2003). Neighborhood disadvantage, individual economic distress and violence against women in intimate relationships. *Journal of Quantitative Criminology*, *19*, 207–235. https://doi.org/10.1023/a:1024930208331

Black, M.C., Basile, K.C., Breiding, M.J., Smith, S.G., Walters, M.L., Merrick, M.T., … Stevens, M.R. (2011). *The National Intimate Partner and Sexual Violence Survey (NISVS): 2010 summary report*. Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Blake, D., Weathers, F., Nagy, L., Kaloupek, D., Klauminzer, G., Charney, D., & Keane, T. (1990). *Clinician-administered PTSD scale (CAPS),* Boston, MA: National Center for Post-Traumatic Stress Disorder, Behavioral Science Division. https://doi.org/10.1037/t00072-000

Blanchard, E. B., & Hickling, E. J. (2004). *After the crash: Assessment and treatment of motor vehicle accident survivors* (2nd ed.). Washington, DC: American Psychological Association. https://doi.org/10.1037/10237-000

Bleiberg, K. L., & Markowitz, J. C. (2008). Interpersonal psychotherapy for depression. In D. H. Barlow (Ed.), *Clinical handbook of psychological disorders: A step-by-step treatment manual, 4th ed.* (pp. 306-327). New York, NY: The Guildford Press.

Bogat, G. A., Levendosky, A. A., DeJonghe, E., Davidson, W. S., & von Eye, A. (2004). Pathways of suffering: The temporal effects of domestic violence on women's mental health. *Maltrattamento e abuso all'infanzia, 6,* 97–112.

Bogat, G. A., Levendosky, A. A., & Eye, A. V. (2005). The Future of Research on Intimate Partner Violence: Person-Oriented and Variable-Oriented Perspectives. *American Journal of Community Psychology*, *36*, 49-70. https://doi.org/10.1007/s10464-005-6232-7

Bogat, G. A., Levendosky, A. A., Theran, S., von Eye, A., & Davidson, W. S. (2003). Predicting the psychosocial effects of interpersonal partner violence (IPV). *Journal of Interpersonal Violence, 18,* 1271–1291. https://doi.org/10.1177/0886260503256657

Bonomi, A. E., Thompson, R. S., Anderson, M., Reid, R. J., Carrell, D., Dimer, J. A., & Rivara, F. P. (2006). Intimate partner violence and women's physical, mental, and social functioning. *American Journal of Preventive Medicine, 30,* 458-466. https://doi.org/10.1016/j.amepre.2006.01.015

Borkovec, T. D., Alcaine, O. M., & Behar, E. (2004). Avoidance theory of worry and generalized anxiety disorder. In R. G. Heimberg, C. T. Turk, & D. S. Mennin (Eds.). *Generalized anxiety disorder: Advances in research and* practice (pp.77 -108). New York, NY: The Guildford Press.

Bower, G. H. (1981). Mood and memory. *American Psychologist, 36,* 129-148. https://doi.org/10.1037//0003-066x.36.2.129

Bradley, R., Schwartz, A. C., & Kaslow, N. J. (2005). Posttraumatic stress disorder symptoms among low-income, African American women with a history of intimate partner violence and suicidal behaviors: Self-esteem, social support, and religious coping. *Journal of Traumatic Stress, 18,* 685-696. https://doi.org/10.1002/jts.20077

Breiding, M.J., Basile, K.C., Smith, S.G., Black, M.C., & Mahendra, R.R. (2015). *Intimate Partner Violence Surveillance: Uniform Definitions and Recommended Data Elements, Version 2.0.* Atlanta, GA: National Center for Injury Prevention and Control, Centers for Disease Control and Prevention.

Brewin, C. R., Andrews, B., & Valentine, J. D. (2000). Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *Journal of Consulting and Clinical Psychology*, *68*, 748-766. https://doi.org/10.1037//0022-006x.68.5.748

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist*, *32*, 513-531. https://doi.org/10.1037//0003-066x.32.7.513

Brown, J. R., Hill, H. M., & Lambert, S. F. (2005). Traumatic stress symptoms in women exposed to community and partner violence. *Journal of Interpersonal Violence*, *20*, 1478-1494. https://doi.org/10.1177/0886260505278604

Brown, T. A., Chorpita, B. F., & Barlow, D. H. (1998). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of Abnormal Psychology*, *107*, 179-192. https://doi.org/10.1037//0021-843x.107.2.179

Caldwell, J. E., Swan, S. C., & Woodbrown, V. D. (2012). Gender differences in intimate partner violence outcomes. *Psychology of Violence*, *2*, 42-57. https://doi.org/10.1037/a0026296

Calvete, E., Corral, S., & Estévez, A. (2007). Cognitive and coping mechanisms in the interplay between intimate partner violence and depression. *Anxiety, Stress, and Coping*, *20*, 369-382. https://doi.org/10.1080/10615800701628850

Campbell, J. C., & Soeken, K. L. (1999). Women's Responses to Battering Over Time: An Analysis of Change. *Journal of Interpersonal Violence*, *14*, 21-40. https://doi.org/10.1177/088626099014001002

Cardazone, G., Sy, A. U., Chik, I., & Corlew, L. K. (2014). Mapping one strong ‘Ohana: Using network analysis and GIS to enhance the effectiveness of a statewide coalition to prevent

child abuse and neglect. *American Journal of Community Psychology*, *53*, 346-356. https://doi.org/10.1007/s10464-014-9641-7

Clara, P. I., Cox, B. J., Enns, M. W., Murray, L. T., & Torgrude, L. J. (2003). Confirmatory factor analysis of the Multidimensional Scale of Perceived Social Support in clinically distressed and student samples. *Journal of Personality Assessment, 81*, 265-270. https://doi.org/10.1207/s15327752jpa8103_09

Clark, C., Ryan, L., Kawachi, I., Canner, M. J., Berkman, L., & Wright, R. J. (2008). Witnessing community violence in residential neighborhoods: a mental health hazard for urban women. *Journal of Urban Health*, *85*, 22-38. https://doi.org/10.1007/s11524-007-9229-8

Coker, A. L., Davis, K. E., Arias, I., Desai, S., Sanderson, M., Brandt, H. M., & Smith, P. H. (2002). Physical and mental health effects of intimate partner violence for men and women. *American Journal of Preventive Medicine*, *23*, 260-268. https://doi.org/10.1016/s0749-3797(02)00514-7

Coker, A. L., Smith, P. H., Thompson, M. P., McKeown, R. E., Bethea, L., & Davis, K. E. (2002). Social support protects against the negative effects of partner violence on mental health. *Journal of Women's Health & Gender-based Medicine*, *11*, 465-476. https://doi.org/10.1089/15246090260137644

Curry, A., Latkin, C., & Davey-Rothwell, M. (2008). Pathways to depression: The impact of neighborhood violent crime on inner-city residents in Baltimore, Maryland, USA. *Social Science & Medicine*, *67*, 23-30. https://doi.org/10.1016/j.socscimed.2008.03.007

Dahlem, N. W., Zimet, G. D., & Walker, R. R. (1991). The multidimensional scale of perceived social support: A confirmation study. *Journal of Clinical Psychology*, *47*, 756-761. https://doi.org/10.1037/t03506-000

DePrince, A. P., Buckingham, S. E., & Belknap, J. (2013). The geography of intimate partner abuse experiences and clinical responses. *Clinical Psychological Science, 2,* 258-271. https://doi.org/10.1177/2167702613507556

Dillon, G., Hussain, R., Loxton, D., & Rahman, S. (2013). Mental and physical health and intimate partner violence against women: A review of the literature. *International Journal of Family Medicine, 2013,* 1-15. https://doi.org/10.1155/2013/313909

DiNardo, P. A., Brown, T. A., & Barlow, D. H. (1994). *Anxiety Disorders Interview Schedule for DSM-IV: Lifetime version (ADIS-IV-L),* New York, NY: Oxford University Press.

Dugas, M. J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998). Generalized anxiety disorder: A preliminary test of a conceptual model. *Behaviour Research and Therapy, 36,* 215-226. https://doi.org/10.1016/S0005-7967(97)00070-3

Dutton, M. A. (2009). Pathways linking intimate partner violence and posttraumatic disorder. *Trauma, Violence, & Abuse, 10,* 211-224. https://doi.org/10.1177/1524838009334451

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy, 38,* 319-345. https://doi.org/10.1016/s0005-7967(99)00123-0

Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F., & Orsillo, S. M. (1999). The posttraumatic cognitions inventory (PTCI): Development and validation. *Psychological Assessment, 11,* 303. https://doi.org/10.1037//1040-3590.11.3.303

Foa, E. B., Keane, T. M., Friedman, M. J., & Cohen, J. A. (Eds.). (2008). *Effective treatments for PTSD: Practice guidelines from the International Society for Traumatic Stress Studies.* New York, NY: Guilford Press.

Fogarty, C. T., Fredman, L., Heeren, T. C., & Liebschutz, J. (2008). Synergistic effects of child abuse and intimate partner violence on depressive symptoms in women. *Preventive medicine*, *46*(5), 463-469. https://doi.org/10.1016/j.ypmed.2007.12.009

Golding, J. M. (1999). Intimate partner violence as a risk factor for mental disorders: A meta-analysis. *Journal of Family Violence*, *14*, 99-132.

Grant, D. M., Beck, J. G., Marques, L., Palyo, S. A., & Clapp, J. D. (2008). The structure of distress following trauma: posttraumatic stress disorder, major depressive disorder, and generalized anxiety disorder. *Journal of Abnormal Psychology*, *117*, 662-672. https://doi.org/10.1037/a0012591

Greenfeld, L. A., Rand, M. R., Craven, D., Klaus, P. A., Perkins, C. A., Ringel, C., ... & Fox, J. A. (1998). *Violence by intimates: Analysis of data on crimes by current or former spouses, boyfriends, and girlfriends*. Retrieved from http://www.bjs.gov/content/pub/pdf/vi.pdf

Gray, M. J., Litz, B. T., Hsu, J. L., & Lombardo, T. W. (2004). Psychometric properties of the life events checklist. *Assessment*, *11*, 330-341. https://doi.org/10.1177/1073191104269954

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: The Guilford Press.

Heise, L. L. (1998). Violence against women an integrated, ecological framework. *Violence Against Women*, *4*, 262-290. https://doi.org/10.1177/1077801298004003002

Hudson, W. W., & McIntosh, S. R. (1981). The assessment of spouse abuse: Two quantifiable dimensions. *Journal of Marriage and the Family*, *43*, 873-888. https://doi.org/10.2307/351344

Hyndman, J. C., D'Arcy, C., & Holman, J. (2001). Accessibility and spatial distribution of general practice services in an Australian city by levels of social disadvantage. *Social Science & Medicine*, *53*, 1599-1609. https://doi.org/10.1016/s0277-9536(00)00444-5

Johnson, D. M., Zlotnick, C., & Perez, S. (2008). The relative contribution of abuse severity and PTSD severity on the psychiatric and social morbidity of battered women in shelters. *Behavior Therapy*, *39*, 232-241. https://doi.org/10.1016/j.beth.2007.08.003

Kessler, R. C. (2003). Epidemiology of women and depression. *Journal of Affective Disorders*, *74*, 5-13. https://doi.org/10.1016/S0165-0327(02)00426-3

Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*, 1048-1060. https://doi.org/10.1001/archpsyc.1995.03950240066012

Kim, J., & Ross, C. E. (2009). Neighborhood-specific and general social support: which buffers the effect of neighborhood disorder on depression? *Journal of Community Psychology*, *37*, 725-736. https://doi.org/10.1002/jcop.20327

Kizilbash, A. H., Vanderploeg, R. D., & Curtiss, G. (2002). The effects of depression and anxiety on memory performance. *Archives of Clinical Neuropsychology*, *17*, 57-67. https://doi.org/10.1016/s0887-6177(00)00101-3

Latkin, C. A., & Curry, A. D. (2003). Stressful neighborhoods and depression: A prospective study of the impact of neighborhood disorder. *Journal of Health and Social Behavior*, 34-44. https://doi.org/10.2307/1519814

Li, Q., Kirby, R. S., Sigler, R. T., Hwang, S.-S., LaGory, M. E., & Goldenberg, R. L. (2010). A multilevel analysis of individual, household, and neighborhood correlates of intimate

partner violence among low-income pregnant women in Jefferson County, Alabama. *American Journal of Public Health*, *100*, 531–539. https://doi.org/10.2105/ajph.2008.151159

Liang, B., Goodman, L., Tummala-Narra, P., & Weintraub, S. (2005). A theoretical framework for understanding help-seeking processes among survivors of intimate partner violence. *American Journal of Community Psychology*, *36*, 71-84. https://doi.org/10.1007/s10464-005-6233-6

Lindhorst, T., & Oxford, M. (2008). The long-term effects of intimate partner violence on adolescent mothers' depressive symptoms. *Social Science & Medicine*, *66*, 1322-1333. https://doi.org/10.1016/j.socscimed.2007.11.045

Maercker, A., & Horn, A. B. (2013). A socio-interpersonal perspective on PTSD: The case for environments and interpersonal processes. *Clinical Psychology & Psychotherapy*, *20*, 465-481. https://doi.org/10.1002/cpp.1805

McDonald, S. C. (1986). Does gentrification affect crime rates? *Crime and Justice*, *8*, 163-201.

McLafferty, S. L. (2003). GIS and health care. *Annual Review of Public Health*, *24*, 25-42. https://doi.org/10.1146/annurev.publhealth.24.012902.141012

Meadows, L. A., Kaslow, N. J., Thompson, M. P., & Jurkovic, G. J. (2005). Protective factors against suicide attempt risk among African American women experiencing intimate partner violence. *American Journal of Community Psychology*, *36*, 109-121. https://doi.org/10.1007/s10464-005-6236-3

Monson, C. M., Fredman, S. J., & Dekel, R. (2010). Posttraumatic stress disorder in an interpersonal context. In J. G. Beck (Ed.), *Interpersonal processes in the anxiety disorders: Implications for understanding psychopathology and treatment (*pp. 179-208).

Washington, DC: American Psychological Association. https://doi.org/10.1037/12084-007

Monson, C. M., Taft, C. T., & Fredman, S. J. (2009). Military-related PTSD and intimate relationships: From description to theory-driven research and intervention development. *Clinical Psychology Review*, *29*, 707-714. https://doi.org/10.1016/j.cpr.2009.09.002

Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin*, *129*, 52-73. https://doi.org/10.1037//0033-2909.129.1.52

Patterson, D., Greeson, M., & Campbell, R. (2009). Understanding rape survivors' decisions not to seek help from formal social systems. *Health & Social Work, 34*, 127-136. https://doi.org/10.1093/hsw/34.2.127

Perez, S., & Johnson, D. M. (2008). PTSD compromises battered women's future safety. *Journal of Interpersonal Violence*, *23*, 635-651. https://doi.org/10.1177/0886260507313528

Piccinelli, M., & Wilkinson, G. (2000). Gender differences in depression. *The British Journal of Psychiatry*, *177*, 486-492. https://doi.org/10.1192/bjp.177.6.486

Pico-Alfonso, M. A., Garcia-Linares, M. I., Celda-Navarro, N., Blasco-Ros, C., Echeburúa, E., & Martinez, M. (2006). The impact of physical, psychological, and sexual intimate male partner violence on women's mental health: Depressive symptoms, posttraumatic stress disorder, state anxiety, and suicide. *Journal of Women's Health*, *15*, 599-611. https://doi.org/10.1089/jwh.2006.15.599

Pinchevsky, G. M., & Wright, E. M. (2012). The impact of neighborhoods on intimate partner violence and victimization. *Trauma, Violence, & Abuse*, *13*, 112-132. https://doi.org/10.1177/1524838012445641

Price, M. (2016). *Mastering ArcGIS*. New York, NY: McGraw Hill Education.

Rennison, C. M., & Welchans, S. (2002). *Intimate partner violence. Bureau of Justice Statistics Special Report*. Retrieved from http://www.ojp.usdoj.gov/bjs/pub/pdf/ ipv.pdf.

Ross, C. E., & Jang, S. J. (2000). Neighborhood disorder, fear, and mistrust: The buffering role of social ties with neighbors. *American Journal of Community Psychology*, *28*, 401-420. https://doi.org/10.1023/a:1005137713332

Sampson, R. J., Raudenbush, S. W., & Earls, F. (1997). Neighborhoods and violent crime: A multilevel study of collective efficacy. *Science*, *277*, 918-924. https://doi.org/10.1126/science.277.5328.918

Shannon, K., Rusch, M., Shoveller, J., Alexson, D., Gibson, K., & Tyndall, M. W. (2008). Mapping violence and policing as an environmental–structural barrier to health service and syringe availability among substance-using women in street-level sex work. *International Journal of Drug Policy*, *19*, 140-147. https://doi.org/10.1016/j.drugpo.2007.11.024

Shaw, C. R., & McKay, H. D. (1942). *Juvenile delinquency and urban areas: A study of rates of delinquency in relation to differential characteristics of local communities in American cities.* Chicago, IL: University of Chicago Press.

Stevenson, H. C. (1998). Raising safe villages: Cultural-ecological factors that influence the emotional adjustment of adolescents. *Journal of Black Psychology*, *24*, 44-59. https://doi.org/10.1177/00957984980241004

Stewart, R. C., Umar, E., Tomenson, B., & Creed, F. (2014). Validation of the multi-dimensional scale of perceived social support (MSPSS) and the relationship between social support, intimate partner violence and antenatal depression in Malawi. *BMC Psychiatry*, *14*, 180. https://doig.org/10.1186/1471-244X-14-180

Stockdale, S. E., Wells, K. B., Tang, L., Belin, T. R., Zhang, L., & Sherbourne, C. D. (2007). The importance of social context: neighborhood stressors, stress-buffering mechanisms, and alcohol, drug, and mental health disorders. *Social Science & Medicine*, *65*, 1867-1881. https://doi.org/10.1016/j.socscimed.2007.05.045

Straus, M. A., Hamby, S. L., Boney-McCoy, S., & Sugarman, D. B. (1996). The revised conflict tactics scales (CTS2) development and preliminary psychometric data. *Journal of Family Issues*, *17*, 283-316. https://doi.org/10.1177/019251396017003001

Suglia, S. F., Duarte, C. E., & Sandel, M. T. (2011). Housing quality, housing instability, and maternal mental health. *Journal of Urban Health*, *88*, 1105-1116. https://doi.org/10.1007/s11524-011-9587-0

Sylaska, K. M., & Edwards, K. M. (2014). Disclosure of intimate partner violence to informal social support network members: A review of the literature. *Trauma, Violence, & Abuse*, *15*, 3-21. https://doi.org/10.1177/1524838013496335

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.) Boston, MA: Allyn and Bacon.

Tolman, R. M. (1999). The validation of the Psychological Maltreatment of Women Inventory. *Violence and Victims*, *14*, 25-37.

Tolman, R. M., & Rosen, D. (2001). Domestic violence in the lives of women receiving welfare mental health, substance dependence, and economic well-being. *Violence Against Women, 7*, 141-158. https://doi.org/10.1177/1077801201007002003

Truong, K. D., & Ma, S. (2006). A systematic review of relations between neighborhoods and mental health. *Journal of Mental Health Policy and Economics*, *9*, 137.

Twaite, J. A., & Rodriguez-Srednicki, O. (2004). Childhood sexual and physical abuse and adult vulnerability to PTSD: The mediating effects of attachment and dissociation. *Journal of Child Sexual Abuse, 13*, 17-38. https://doi.org/10.1300/j070v13n01_02

U.S. Census Bureau (2012). *Geographic Terms and Concepts - Block Groups.* Retrieved from https://www.census.gov/geo/reference/gtc/gtc_bg.html

Wainwright, N. W. J., & Surtees, P. G. (2004). Places, people, and their physical and mental functional health. *Journal of Epidemiology and Community Health*, *58*, 333-339. https://doi.org/10.1136/jech.2003.012518

Weich, S., Blanchard, M., Prince, M., Burton, E., Erens, B. O. B., & Sproston, K. (2002). Mental health and the built environment: cross-sectional survey of individual and contextual risk factors for depression. *The British Journal of Psychiatry*, *180*, 428-433. https://doi.org/10.1192/bjp.180.5.428

West, C. M. (2004). Black women and intimate partner violence: New directions for research. *Journal of Interpersonal Violence, 19*, 1487-1493. https://doi.org/10.1177/0886260504269700

Wilson, W. J. (1987). The truly disadvantaged: The inner city, the underclass, and public policy. Chicago, IL: University of Chicago Press.

Woodward, M. J., Eddinger, J., Henschel, A. V., Dodson, T. S., Tran, H. N., & Beck, J. G. (2015). Social support, posttraumatic cognitions, and PTSD: The influence of family, friends, and a close other in an interpersonal and non-interpersonal trauma group. *Journal of Anxiety Disorders, 35*, 60-67. https://doi.org/10.1016/j.janxdis.2015.09.002

Woodward, M. J., Patton, S. C., Olsen, S. A., Jones, J. M., Reich, C. M., Blackwell, N., & Beck, J. G. (2013). How do attachment style and social support contribute to women's psychopathology following intimate partner violence? Examining clinician ratings versusself-report. *Journal of Anxiety Disorders, 27*, 312-320. https://doi.org/10.1016/j.janxdis.2013.02.007

Wright, E. M., & Benson, M. L. (2010). Immigration and intimate partner violence: Exploring the immigrant paradox. *Social Problems, 57*, 480–503. https://doi.org/10.1525/sp.2010.57.3.480

Wright, E. M., & Benson, M. L. (2011). Clarifying the effects of neighborhood disadvantage and collective efficacy on violence ‘‘behind closed doors’’ *Justice Quarterly, 28*, 775–798. https://doi.org/10.1080/07418825.2010.533687

Wright, C. V., Perez, S., & Johnson, D. M. (2010). The mediating role of empowerment for African American women experiencing intimate partner violence. *Psychological Trauma: Theory, Research, Practice, and Policy, 2*, 266-272. https://doi.org/10.1037/a0017470

Yllo, K. A. (2005). Through a feminist lens: Gender, diversity, and violence: Extending the feminist framework. In D. R. Loseke, R. J. Gelles, & M. M. Cavanaugh (Eds.), *Current controversies on family violence* (pp. 611-622). Thousand Oaks, CA: Sage Publications.

Yoshihama, M. (2002). Battered women's coping strategies and psychological distress: Differences by immigration status. *American Journal of Community Psychology*, *30*, 429-452. https://doi.org/10.1023/A:1015393204820

Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, *52*, 30-41. https://doi.org/10.1207/s15327752jpa5201_2