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NEIGHBORHOOD CHARACTERISTICS AND SEXUAL INTIMATE PARTNER VIOLENCE AGAINST WOMEN AMONG LOW-INCOME, DRUG-INVOLVED NEW YORK CITY RESIDENTS: RESULTS FROM THE IMPACT STUDIES

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Abstract

We assessed relations among neighborhood characteristics and sexual intimate partner violence against women (SIPVAW), among low-income, drug-involved, women (N=360) and men (N=670) in New York City between 2005 and 2009. Six percent of women (n=22) and 5% of men (n=33) reported experiencing and perpetrating SIPVAW in the past year with a main partner. In adjusted mixed models among women, neighborhood ethnic heterogeneity was significantly, negatively associated with SIPVAW victimization. In adjusted logistic models among men, neighborhood collective efficacy was significantly, positively associated with SIPVAW

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perpetration. Novel theoretical frameworks are needed to guide research on neighborhoods and partner violence.

Keywords

sexual violence; neighborhoods; intimate partner violence; social disorganization; multilevel modeling; collective efficacy

INTRODUCTION

A growing body of research documents relations among neighborhood characteristics and a range of violent outcomes (see Sampson, 2002 for a comprehensive review of the literature). Socioeconomic conditions (Hyman et al., 2006; Peterson and Krivo, 2009), indicators of social disorganization (Sampson and Groves, 1989; Sampson et al., 1997), and other socio-structural factors (Bursik, 1988; Sampson et al., 2002) have been linked with both lethal and non-lethal violence outcomes, among youths and adults. Increasingly, analyses focus on intimate partner violence against women. These studies have typically assessed neighborhood-level indicators of social disorganization and have found mixed results, with the exception of neighborhood or area disadvantage or poverty, which has been consistently associated with a higher risk of violence (Cunradi et al., 2000; Browning, 2002; Van Wyk et al., 2003; Pearlman et al., 2003; Fox and Benson, 2006; Spriggs et al., 2009). Most studies to date have examined predictors of the risk of physical intimate partner violence against women victimization, often excluding sexual partner violence from the definition. Thus, little is known about relations among neighborhood conditions and sexual intimate partner violence against women (SIPVAW) among adults.

Sexual Intimate Partner Violence against Women

Recent, nationally representative data on sexual violence against women within intimate relationships is scarce. According to the National Violence against Women Survey (NVAWS), conducted 15 years ago in 1995/96, approximately 14% of women experienced a completed or attempted sexual assault in their lifetime (Tjaden and Thoennes, 2006). Of the lifetime assaults assessed by the NVAWS, 46% of the perpetrators were a spouse/ex-spouse, current/former cohabiting partner, boyfriend/girlfriend, or date. The report concluded that 7.7% and 0.2% of all US women experienced intimate partner sexual assault in their lifetimes and the past year, respectively (Tjaden and Thoennes, 2006). More recent lifetime SIPVAW estimates range from 10.8% (Basile et al., 2007) to 10.2% (Breiding et al., 2008). The health effects of experiencing sexual violence are numerous and profound, with immediate and longer-term effects on physical, psychological, sexual and reproductive health (McFarlane et al 2005a; Campbell et al 2009). Analyses of the NVAWS data found that perpetrator type (being an intimate partner, acquaintance or relative) was significantly related to both depressive symptomatology and self-reported health status, above and beyond the severity of the sexual and/or physical assault (Demaris and Kaukinen, 2005). Smaller clinical samples found a unique effect of sexual partner violence on Posttraumatic Stress Disorder severity (Breslau et al., 1999; Bennice et al., 2003; McFarlane et al., 2005b; Dutton et al., 2005) and depressive or severe depressive symptoms (Bonomi et al., 2007). Low-

income, drug involved women often experience particularly brutal partner physical and sexual violence (Frye et al., 2001; El-Bassel, Gilbert and Rajah, 2003; Rajah, 2007) and drug use by women has been established to increase risk of experiencing sexual and physical violence, which in turn leads to further drug use (Hedtke, Ruggiero and Fitzgerald, 2008).

The Neighborhood Environment and Intimate Partner Violence against Women

Several investigations into the role of the neighborhood environment and intimate partner violence against women have emerged in recent years. Most have been framed within social disorganization theory, which posits that reciprocal social interactions co-create the moral order by determining what behaviors are considered deviant or prohibited and facilitating the social bonds that both define and restrict these behaviors. The disruptive effects of industrialization, urbanization, and immigration weaken the social ties within a community diminishing the power of social norms and social controls to regulate behavior; consequently, social problems or reorganizations occur (Blumer, 1937; Shaw and McKay, 1942; Sampson and Groves, 1989). Whether an individual engages in a prohibited behavior depends in part on the strength of that individual's bond to and involvement in the community, as well as the ability of neighbors to restrict the behavior in question.

Social disorganization theory has been reformulated as a theory of collective efficacy (Sampson, 2003). As originally applied, there was a direct relationship between neighborhood structural factors, such as poverty, stability (assessed via residential mobility) and cohesion (assessed via ethnic homogeneity) and individual-level crime and violence (Kornhauser, 1978; Sampson, 1988; 1991; Sampson and Groves, 1989). More recently, collective efficacy, the group-level characteristic that combines social cohesion and informal social control, has been specified as the intervening mechanism that is thought to mediate, either wholly or in part, the relationship between socio-structural factors and crime and violence (Sampson, Raudenbush and Earls, 1997; Sampson, Morenoff and Raudenbush, 2005). The enactment of the informal social control component of collective efficacy is a reflection of social cohesion and adherence to shared values of the community (Sampson, 2003); neighborhood variation in violence is then due to "the differential ability of neighborhoods to realize the common values of residents and maintain effective social controls." (Sampson, Raudenbush and Earls, 1997; p. 918).

Ecological analyses of intimate partner violence against women conducted to date suggest that neighborhood factors indicative of social disorganization are less important determinants of intimate partner violence rates as compared with non-intimate partner violence rates, although such studies do not permit inference regarding risk at the individual level (Miles-Doan, 1998; Frye and Wilt, 2001). Research examining neighborhood factors indicative of social disorganization and risk of intimate partner femicide, as compared with non-intimate partner femicide, failed to find an inverse association between these factors and intimate femicide; The authors concluded that the impact of the neighborhood factors measured was similar across both lethal outcomes (Frye et al 2008). Multi-level models have generally found a positive relationship between neighborhood poverty and non-lethal intimate partner violence, but have found less evidence of such relations among other neighborhood-level factors indicative of social disorganization, such as residential mobility

or ethnic heterogeneity (O'Campo et al., 1995; Cunradi et al., 2000; Browning, 2002; Van Wyk et al., 2003; Fox and Benson, 2006; Emery et al 2010). One of the earliest neighborhood effects studies of intimate partner violence reported that neighborhood collective efficacy reduced individual-level risk of intimate partner violence (Browning, 2002), whereas another study reported no effect of collective efficacy or other related neighborhood-level factors on a range of partner violence-related outcomes, such as leaving a relationship or subsequent victimization (Block and Skogan, 2001). The most recent investigations in this area have used multilevel regression models with both fixed and random effects modeled. One found that, among low-income pregnant women residing in Alabama, residential stability was positively associated with partner violence victimization, while controlling for relevant individual- and couple-level characteristics (Li et al., 2010). Another found that, among adolescents in Chicago, collective efficacy accounted for a part of what neighborhood-level variation existed in intimate partner violence, but only among young men and in models of victimization, as opposed to perpetration (Jain et al., 2010). Finally, Wright and Benson (2010) report that immigrant concentration is negatively associated with intimate partner violence among women in Chicago.

We know of no study to date that assesses relations among neighborhood environmental characteristics and *sexual* partner violence against adult women using multilevel modeling. Gaining a clearer understanding of these potential relations not only contributes to the growing knowledge around the role of the neighborhood environment in intimate partner violence, but also has the potential to inform interventions at the neighborhood level to prevent sexual violence, much of which is between dating and intimate partners. There is a growing effort to encourage bystander intervention into sexual violence and create social environments that are not supportive of sexual violence (see for example, Banyard, Moynihan and Plante 2007). Despite a growing body of research on the role of collective efficacy to partner violence, there is little basic research though that could inform the development of neighborhood-based primary prevention of sexual violence interventions for adults, despite numerous calls for such interventions generally (Casey and Lindhorst 2009). This analysis represents an effort to begin to build this knowledge base, specific to sexual partner violence.

The purpose of this analysis is to determine whether neighborhood-level indicators of social disorganization are associated with self-reported SIPVAW among low-income, New York City (NYC) residents, the majority of whom are either current or former drug users. In addition to assessing factors indicative of social disorganization, we measured indicators of neighborhood physical disorder and general crime rates, as these two neighborhood-level characteristics often co-vary (Sampson, 2011 in Wilson and Petersilia) with indicators of social disorganization, and may independently contribute to violence against women within intimate partnerships (Cunradi, 2010). The analysis also assesses relations among individual-level factors that may increase risk of SIPVAW, such as drug and alcohol use (Frye et al., 2001; El-Bassel et al., 2001; El-Bassel et al., 2003a; 2003b;) and level of acculturation (Raj and Silverman 2003; Sanderson et al., 2004; Caetano et al., 2007) and relationship power (Pulerwitz et al., 2002; Dunkle et al., 2004; Jewkes et al., 2010).

METHODS

Procedures and Sample

This analysis draws upon data collected for the Inner-City Mental Health Study Predicting HIV/AIDS and Other Drug Transitions (IMPACT) studies, a set of cross-sectional studies of the relationship between the neighborhood environment and various health outcomes, the details of which have been described previously (Weiss et al., 2007; Ompad et al., 2008). Recruitment was conducted using street-intercept sampling in thirty-eight neighborhoods in four NYC boroughs (Manhattan, Brooklyn, Queens and the Bronx) between 2005 and 2009; walk-ins to the research field station were also included if eligible. All participants had to be eighteen years of age or older and had either to live in the target neighborhood or spend at least 50% of their time in that neighborhood. In addition, participants fell into one of the following self-reported, drug use-related categories: non-injection drug users (i.e., current users of inhaled or snorted heroin, crack, cocaine, or methamphetamines, but no reported lifetime history of injection drug use); injection drug users (i.e., current use of injected heroin, crack, cocaine, or methamphetamines); former drug users (i.e., previous use of heroin, crack, cocaine, or methamphetamines, but no reported use within the last three months); club drug user (i.e., current use of ecstasy, LSD, PCP, GHB, ketamine and/or methamphetamines, with or without current use of heroin, crack or cocaine). Finally, individuals who had never used drugs, except marijuana, were included as well. If eligible, and after providing informed consent, participants were administered a face-to-face interview over two days on a wide range of topics from drug use to sexual behavior to perceptions of their neighborhood. Information on partner violence was collected on the second day of the interview. Participants were reimbursed \$20 per interview for their time and effort; the study was reviewed and approved by the Institutional review Board of the New York Academy of Medicine.

Out of the 606 women sampled in the larger IMPACT study at the time this analysis was begun (in late 2008), 423 (69.8%) completed the second day of the interview and reported a main sexual partner (defined as “someone whom you feel close to in your heart, like a steady girlfriend/boyfriend or a spouse”) in the last 12 months. Of these, 31 (7.3%) were excluded because they lacked the geographic information needed to map them to a neighborhood of residence. Of these 392 women, 1 participant (0.3%) was excluded because she did not provide information on experience of sexual violence. Finally, an additional 31 (7.9%) were excluded due to missing or incomplete data on key covariates such as income, race/ethnicity, age, education, alcohol dependence and relationship dominance. Out of the 1176 men sampled in the larger IMPACT study at the time of this analysis, 816 (69.4%) completed the second day of the interview and reported a main sexual partner (defined as “someone whom you feel close to in your heart, like a steady girlfriend/boyfriend or a spouse”) in the last 12 months. Of these, 94 (11.5%) were excluded because they lacked the geographic information needed to map them to a neighborhood of residence. Of these 722 men, 5 participants (0.7%) were excluded from analysis because they did not provide information on perpetration of sexual violence. Finally, an additional 47 (6.5%) were excluded due to missing or incomplete data on key covariates such as income, race/ethnicity,

age, education, and childhood experience of abuse and drug dependence. Thus, the final study sample consisted of 670 men and 360 women.

Measures

Dependent Variable—The main independent variable assessed was SIPVAW with a main male partner in the year prior to the interview. Both SIPVAW victimization and perpetration was measured using a modified version of the Revised Conflict Tactics Scale (CTS2) (Straus et al 1996). Specifically, among other items, participants were asked how often in the past year a partner “used threats to make you have sex” and “used force (like hitting, holding down, or using a weapon) to make you have sex?” ($\alpha=0.842$). We dichotomized the scale to model SIPVAW victimization (among women) in the past year or SIPVAW perpetration (among men) in the past year as compared with no victimization or perpetration in the past year.

Independent Variables

Individual-level Factors—We assessed a range of individual-level covariates, identified a priori based on the considerable literature on individual-level correlates of SIPVAW (Basile 2002; 2007; Frye et al 2001), in three domains for their associations with SIPVAW, including sociodemographic factors, psychosocial/substance use, and partner/relationship. Sociodemographic factors included age (assessed as a continuous variable), race (White, Black, Latino, Other), income level (no income, between \$1,000 and \$4,999 per year and more than \$5,000 per year), income from criminal activity (such as theft, conning or drug dealing), employment status (paid job, full or part time vs. no paid job), education level (high school education or more vs. less than high school education), and born in the US (yes/no). Acculturation was also assessed, using items from the Welfare Reform Baseline Interview as adapted by Marin and colleagues (1987). Psychosocial factors assessed included childhood experience of abuse, witnessing of maternal abuse and affective lability (Harvey et al., 1989) (women’s sample $\alpha = 0.88$; men’s sample $\alpha = 0.85$). Substance use factors assessed included heroin, crack and cocaine dependence in the past year using items from the National Household Survey on Drug Abuse, designed to measure dependence using DSM-IV criteria (Arria et al., 2002). Partner factors evaluated included partner’s age and length of relationship. Relationship decision-making dominance was measured using five items from the relationship decision making dominance sub-scale of Pulerwitz’ Relationship Power Scale (Pulerwitz et al., 2000), which has acceptable reliability (women’s sample $\alpha = 0.78$; men’s sample $\alpha = 0.68$), and where a higher score indicates greater relationship power.

Neighborhood-level Factors—The 59 residential community districts delineated by the New York City Office of City Planning, which are socially and politically meaningful neighborhoods in the city, formed the neighborhood unit of analysis (Galea et al., 2003). Community Districts in NYC range in size from approximately 35,000 to over 200,000 residents. In the present analysis, the 670 men sampled were drawn from 52 community districts; the 360 women were drawn from 41 community districts. Thus not all NYC community districts were represented, with the men’s sample coming from a larger number of community districts. ArcView 9.2 software (Redlands, CA) was used to assign study

participants to a neighborhood of residence. Neighborhood-level data were obtained from two sources: archival data and the New York Social Experiences Survey (NYSESES). NYSES is a representative random-digit-dialing phone survey of 4000 NYC residents aged 18 and older conducted in 2002 (Ahern et al., 2009). NYSES assessed a range of neighborhood factors characterizing the 59 community districts of NYC and had a response rate of 54% among eligible participants, which is typical of such surveys in urban areas (Galea et al., 2003); comparisons with the underlying population revealed that it was representative in terms of age, gender and race/ethnicity (Stuber et al., 2008).

Archival data was derived from US Census data (US Census Bureau, 1990; US Census Bureau, 2000), New York City Housing and Vacancy Survey (NYCHVS - US Census Bureau, 1999), and New York City Mayor's Management Report (NYC Mayor's Office of Operations, 2002). Archival census data provided information on neighborhood-level sociodemographic characteristics, including the age and race/ethnicity distribution of the population, percent female-headed households, median household income, per capita income and percent unemployed. Data from the New York Police Department was used to measure the murder and assault rates per 100,000 (Infoshare, <http://infoshare.org/>); these rates were z-score transformed for use in analysis. Applying a data reduction approach used in our previous analysis of risk of intimate partner femicide, as compared with non-intimate partner femicide, we used both principal components factor analysis and knowledge of the literature to reduce the number of neighborhood-level variables derived from archival sources, by identifying statistically related neighborhood-level characteristics for use in analyses (Frye et al., 2008). Thus, from the archival data, we created factors by summing the z scores of each factor component including: educational/occupational attainment: % less than a high school degree and % not in a managerial or administrative occupation ($\alpha = 0.96$); immigrant concentration/isolation: % foreign-born and % households that were linguistically isolated ($\alpha = 0.63$); external physical disorder: % housing units vacant, dilapidated or deteriorated, and % external wall problems, window problems, or stairway problems ($\alpha = 0.88$); internal physical disorder: % housing units w/internal water leakage, toilet breakdowns, or peeling paint and plaster and % not owner occupied ($\alpha = 0.95$). Additionally, we assessed the roles of ethnic heterogeneity and residential mobility as fifth and sixth indicators of social disorganization according to the original formulation of the theory. Ethnic heterogeneity measures the degree to which communities are heterogeneous in terms of racial and/or ethnic composition; we calculated the measure by subtracting from 1 the sum of the squared proportions (percentage Black, percentage White, and percentage Hispanic) of the population for each group, such that a higher score indicates greater heterogeneity. Residential stability was assessed using the proportion of residents living in the same house for the past years. We controlled for median household income in all multivariable analyses as we were most interested in non-income related indicators of social disorganization, as the sample was largely a low income sample.

From NYSES we assessed collective efficacy, a key component of social disorganization, by combining the measures of social cohesion and informal social control, as per Sampson and colleagues (Sampson et al., 1997). Neighborhood-level social cohesion was measured using the following items: "people around here are willing to help their neighbors" and "people in

this neighborhood can be trusted.” Informal social control was assessed using the traditional items (Sampson et al., 1997), which included following questions: “if there was a fight in front of your house or building and someone was being beaten or threatened, how likely is it that your neighbors would break it up?” and “if a group of neighborhood children were skipping school and hanging out on a street corner, how likely is it that your neighbors would do something about it?” We created a single item to measure informal social control of intimate partner violence against women, asking: “If a man was hitting his wife on the street in your neighborhood, how likely is it that your neighbors would do something about it?” Finally from NYSES, we created an index of neighborhood levels of physical assault and burglary victimization, using the following questions about the past 12 months: “Have you been the victim of a serious physical attack or assault?” and “Were you robbed or was your home burglarized?” Responses to these questions were aggregated up to the CD level and transformed into z-scores for use in analyses.

Analysis—In this study, we initially built multilevel models applying a generalized linear mixed modeling approach, as our outcome was binary (Guo and Zhao, 2000), using the GLIMMIX procedure in SAS 9.2 (Cary, NC). Our modeling proceeded in steps. First, univariate distributions were examined and bivariate relations were estimated in unadjusted logistic models. Next, we developed the individual-level model, including a core set of individual-level sociodemographic factors, specifically age, race, education and income. In this individual-level model, we also included individual-level factors associated at $p < .10$ in bivariate analyses. When individual-level covariates were inter-correlated, we ran regressions to identify uncorrelated individual-level factors for inclusion in the final multivariable individual-level model, with all individual-level variables modeled as fixed effects. Next, we estimated associations between each neighborhood-level factor and risk of SIPVAW victimization and perpetration, adjusting for the individual-level covariates selected from the individual-level model and the following neighborhood-level confounders: median household income, the homicide rate (using archival data), and the NYSES indicator of assault and burglary. The estimation method used was the default pseudo-likelihood method (Wolfinger and O’Connell, 1993). Next, a final model was fit for males and for females, including neighborhood factors found to be associated with the outcomes at the $p < .10$ level, and adjusting for individual-level and neighborhood-level factors described above. At each step, we estimated variability in our outcomes across neighborhoods by calculating median odds ratios first for the empty model, as well as for all subsequent models (Merlo et al., 2006). With the models of SIPVAW perpetration among men, we did not find evidence of clustering at the neighborhood level that would require the use of mixed modeling, thus we built multivariable logistic models for this analysis.

RESULTS

Neighborhood Sociodemographic Characteristics

Forty-one of 59 community districts were represented in models among women; fifty-two of 59 among men. The neighborhoods included were home to more low-income and non-white residents when compared to community districts not included. Thus, for example, in models among women, the mean neighborhood-level proportion of white residents was 11% and in

models among men it was 13%. In contrast, among all 59 community districts, the mean neighborhood-level proportion of white residents was 35%. In terms of income, the mean neighborhood-level median household income in models of women was \$25,394, and in models among men it was \$26,672. Among all 59 community districts, the mean neighborhood-level median household income is \$38,293. Thus, the neighborhoods included in the analysis are on average lower socioeconomic status and more non-white, as compared with the 59 community districts that make up NYC.

Sociodemographic Characteristics and SIPVAW Victimization among Women: Univariate and Bivariate Analyses

The average age of the women in our sample was 39.0 (sd=9.7) and the majority were African-American (57.5%) and Hispanic (29.7%), with the remainder being white (7.2%) or Asian/Other (5.6%). Half (49.7%) of the sample had less than a high school degree (or equivalent) and most female participants reported little to no personal income, with 69.4% reporting an annual income less than \$5,000 per year. Approximately a third (32.5%) reported being employed in the past 6 months. Just 10% reported being born outside of the USA, although about 40% reported that their parents were born outside of the USA. Just over a quarter (26.4%) and a third (33.9%) met criteria for cocaine and crack dependence respectively in the last year; just under a quarter (23.9%) met criteria for heroin dependence and 10.3% met criteria for alcohol dependence. Over a third (34.8%) reported experiencing physical abuse by a parent or guardian as a child and more than a third (39.9%) reported witnessing their mother or mother-figure being abused. In terms of relationship characteristics, partners' average age was 42.0 (sd=10.3) and the average number of years that the relationship had lasted was 6.7 (sd=7.1). Twenty-two women (6.1%) reported experiencing SIPVAW in this sample of street-recruited women living in NYC.

SIPVAW victimization was not associated with any socio-demographic factors (Table 1). SIPVAW victimization was positively associated with cocaine (OR=2.45; 95% CI: 1.01, 5.94) and alcohol dependence (OR=4.70; 95% CI: 1.75, 12.63) and marginally positively associated with witnessing abuse of a mother/mother-figure in childhood (OR=2.25; 95% CI: 0.93, 5.47); SIPVAW was negatively associated with relationship power (OR=0.22; 95% CI: 0.08, 0.59).

Sociodemographic Characteristics and SIPVAW Perpetration among Men: Univariate and Bivariate Analyses

The average age of the men in our sample was 38.9 (sd=10.9) and, as with the women enrolled in the study, the sample was largely African-American (48.8%) and Hispanic (42.1%), with the remainder being white (3.9%) or Asian/Other (5.2%). Almost half (44.8%) had less than a high school degree (or equivalent) and most male participants reported little to no personal income, with 71.3% reporting an annual income of \$5,000 or less per year. Approximately half (49.7%) reported being employed in the past 6 months. Almost one in five (18.8%) reported being born outside of the USA, and 48.0% reported that their parents were born outside of the US. Almost a third met criteria for cocaine (32.5%), crack (29.3%), and heroin (30.1%) dependence in the last year; 14.6% met criteria for alcohol dependence. Almost a third (31.5%) reported experiencing physical abuse by a

parent or guardian as a child and witnessing their mother or mother-figure being abused (29.6%). In terms of relationship characteristics, partners' average age was 36.4 (sd=10.4) and the average number of years that the relationship had lasted was 5.8 (sd=7.1). Thirty-three men (4.9%) reported perpetrating SIPV with a main female partner in the past year.

In bivariate analyses (Table 1), SIPVAW perpetration was associated with only one socio-demographic factor: income from drug dealing in the past six months (OR=2.41; 95% CI: 1.17, 4.97). Perpetration of SIPVAW was positively associated with depression (OR=1.63; 95% CI: 1.04, 2.58), and cocaine (OR=2.99; 95% CI: 1.47, 6.08) and crack dependence (OR=2.72; 95% CI: 1.34, 5.50). Among men, both experiencing childhood physical abuse (OR=3.59; 95% CI: 1.75, 7.37) and witnessing abuse of a mother/mother-figure in childhood were positively associated with SIPV perpetration (OR=3.47; 95% CI: 1.70, 7.08).

SIPVAW Victimization among Women: Multilevel Analyses

We assessed relations between neighborhood characteristics and SIPVAW victimization; in the unadjusted models (results not shown), no neighborhood-level factors were statistically significantly associated with SIPVAW among women, although ethnic heterogeneity was marginally, negatively associated. However, when we adjusted for individual-level characteristics (age, race, education, income, alcohol dependence and relationship power) and neighborhood-level covariates (median household income, murder rate, and the burglary/assault index), ethnic heterogeneity emerged as significantly and negatively associated ($p=.028$) with SIPVAW victimization (Table 2). In the fully adjusted model, ethnic heterogeneity was associated with a 68% decrease in self-reported likelihood of SIPVAW (OR=0.32; 95% CI: 0.12, 0.88). The neighborhood-level measure of informal social control of intimate partner violence was not significantly associated with SIPVAW victimization. Examination of the median odds ratios, which increased from the empty model (MOR=1.72) to models including both individual- and neighborhood-level factors (for example, MOR=2.07 in the model with ethnic heterogeneity) suggest negative confounding (Table 3). Thus, it is likely that unmeasured and therefore uncontrolled neighborhood-level factors exist that are correlated with both ethnic heterogeneity and SIPVAW, and make independent contributions to risk of SIPVAW victimization among women. In comparison to a model with only individual-level characteristics (not shown), including neighborhood-level factors increased the magnitude of the association between individual-level alcohol dependence (OR=3.83; 95% CI: 1.27, 11.60) and relationship dominance (OR=0.18; 95% CI: 0.06, 0.53) and SIPVAW victimization (Table 3).

SIPVAW Perpetration among Men: Multilevel Analyses

As with SIPVAW victimization among women, no neighborhood-level factors were significantly associated with SIPVAW perpetration among men in unadjusted models (results not shown), although neighborhood-level informal social control was marginally associated (OR=1.38; 95% CI: 0.96, 1.99). However models that included individual-level (age, race, education, income, cocaine dependence, experience of childhood abuse by a parent and witnessing abuse of a mother/mother figure) and neighborhood-level covariates (median household income, murder rate, and the burglary/assault index), revealed that

neighborhood-level collective efficacy was significantly and positively associated with SIPVAW perpetration, as was one of its component scales, informal social control (Table 2). In the final model of SIPVAW perpetration among men, individual-level Hispanic ethnicity was marginally protective of SIPVAW perpetration (OR=0.43; 95% CI: 0.18, 1.05) and neighborhood-level collective efficacy was associated with an increase in self-reported SIPVAW perpetration (OR=1.69; 95% CI: 1.02, 2.80). Relative to a model with only individual-level covariates (data not shown), including neighborhood-level factors increased the magnitude of the association of cocaine dependence (OR=3.37; 95% CI: 1.55, 7.31) and experiencing childhood physical abuse (OR=2.81; 95% CI: 1.27, 6.24), but diminished the association between witnessing abuse of a mother/mother-figure in childhood and SIPVAW perpetration (OR=2.47; 95% CI: 1.12, 5.42) (Table 4).

DISCUSSION

We start by discussing both the prevalence of SIPVAW victimization and perpetration and results of bivariate analyses, as these results are of general interest to women's health and partner violence researchers, sexual violence clinical responders and violence prevention practitioners. Approximately 6% of women in the sample reported SIPV victimization in the past year; 5% of men reported perpetrating such violence against a main female partner. These victimization estimates among women are higher than published reports among representative populations (Coker et al., 2000; Thompson et al., 2006), but are consistent with estimates from NYC-based samples of female, generally low income, former drug users (Frye et al., 2001; El-Bassel et al., 2005a; 2005b). El-Bassel and colleagues (2007) report that, among men on methadone, 2% reported severe sexual violence and 21% reported less severe sexual violence with a primary female partner in the past six months. The bulk of research on sexual violence perpetration has been conducted among college samples (see for example, Koss and Dinero, 1988) or youth (Fry et al., 2008) and therefore not comparable to this low-income, street-recruited urban sample.

In models of SIPVAW victimization, bivariate analyses revealed several individual-level factors to be strongly related to victimization. Although population-based studies of partner violence generally find a significant protective effect of higher levels of personal income (see for example, Breiding et al., 2008), analyses here revealed that individual-level income was not significantly associated with either SIPVAW victimization. Consistent with previous research into correlates of sexual and physical partner violence victimization among women, we found that women who report alcohol dependence were more likely to report relationship violence, whereas women who report greater relationship power were less likely to experience partner violence (Coker et al., 2000; El-Bassel et al., 2003a, 2003b; Martin et al., 2007). In models of SIPVAW perpetration among men, we found associations among experiencing and witnessing domestic violence in childhood and perpetration, consistent with the partner violence literature among men (El-Bassel et al., 2001), as well as the literature on the intergenerational transmission of violence (Shields and Hanneke, 1988).

Although there was neighborhood-level variation in self-reported past year SIPVAW victimization among women, the only neighborhood factor measured and found to be associated with SIPVAW in fully-adjusted, multilevel mixed models was ethnic

heterogeneity. That neighborhood-level ethnic heterogeneity was inversely associated with SIPVAW victimization is not consistent with social disorganization theory, which posits that high levels of ethnic heterogeneity, along with other indicators of structural neighborhood instability, reduce social cohesion, thus weakening informal social controls on deviant behavior and resulting in higher levels of violence. Here we found a modest, but significant, protective effect of ethnic heterogeneity on SIPVAW victimization. It is possible that ethnic heterogeneity is actually a marker for another factor, such as concentrated immigration or linguistic isolation that confers protection in a conceptually plausible manner. Recent research on immigration and general crime suggests that high levels of immigration reduce crime levels (Desmond and Kubrin, 2009; Ousey and Kubrin, 2009). Similarly, immigrant concentration has also been found to be protective of risk of police-reported intimate partner violence among Hispanic women (Pearlman et al., 2003) and female residents of Chicago (Wright and Benson, 2010). Thus, we assessed the relationship between immigrant concentration/linguistic isolation and SIPVAW victimization but found no association between this neighborhood-level characteristic and risk of SIPVAW among this sample of low-income women living in NYC. An alternative explanation is that ethnic homogeneity may contribute to an environment where sexual and intimate partner violence exists, through shared values of tolerance and/or support of intimate partner and/or sexual violence. Thus, when these values are challenged through increasing ethnic heterogeneity, partner and/or sexual violence diminishes. Although we were able to examine the relationship between neighborhood-level informal social control of intimate partner violence, we had no way to assess the impact of area-level social norms or tolerance of partner violence and/or sexual violence.

We assessed a number of potential neighborhood-level confounders of relations between our focal neighborhood-level factors and SIPVAW victimization, including the age and race/ethnicity distributions, various indicators of neighborhood socioeconomic status (i.e., % female-headed households, % unemployed, median household income) and neighborhood crime rates, specifically an index of burglary and assault and murders per 100,000. Consistent with Li's (2010) recent investigation with low-income women, we found no relationship between neighborhood income and the outcome, perhaps because of the somewhat limited income range of the neighborhoods represented in the analysis. In models among women, the values of the median odds ratios suggest negative confounding. There are several unmeasured neighborhood-level factors that might explain the negative confounding; thus, neighborhood-level attitudes, or social norms, around the acceptability of either or both partner violence and sexual coercion/violence against women might explain some of the variability in risk attributable to the neighborhood level. As well, it is possible that neighborhood-level resources to prevent or address intimate partner physical and/or sexual violence, or the visibility of these resources, exert an impact of risk of victimization. Recent qualitative reports suggest that unavailability of neighborhood resources specific to domestic violence are perceived by residents to contribute to the maintenance of physical IPV (O'Campo, 2005; Yonas, 2011).

When examining neighborhood factors in models of SIPVAW perpetration among men, we found that neighborhood-level collective efficacy was associated with an increased risk of SIPVAW perpetration. This finding is also not congruent with social disorganization theory.

It is consistent with findings from a recently published study of partner violence perpetration among young men in Chicago, which also failed to find a relationship between neighborhood-level collective efficacy and partner violence perpetration (Jain et al., 2010). We considered that collective efficacy may be functioning as an indicator of high levels of general crime and/or violence, neighborhood characteristics that could explain the observed, positive association between collective efficacy and SIPVAW perpetration. Thus, we evaluated relations among neighborhood-level crime indicators, including assault and murders per 10,000, using official crime statistics, and self-reported victimization and burglary, using the NYSES data, but found no statistically significant relationship among these crime indicators and SIPVAW perpetration. Further, we controlled for these neighborhood-level indicators of crime in multi-variable regressions and found no relationship to SIPVAW perpetration.

Strengths and Limitations

This analysis has both strengths and limitations. The first limitation is the narrow definition of SIPVAW used. Sexual violence against women is widely recognized to encompass more than forced sex or sex achieved through the threat of force (Basile 2002). Future research designed to assess neighborhood-level correlates of SIPVAW must use a broader definition. Next, inherent to all cross-sectional research, is that no causation may be inferred from the correlations identified in the analysis. As well, inherent to much place-based research, generalizability to other urban areas is limited. In terms of neighborhood units used in the analysis, although socially and politically meaningful, community districts are large and internally heterogeneous, decreasing our ability to detect neighborhood effects. A related limitation is that not all 59 community districts were included in the analyses, such that the neighborhoods included had on average more lower income and fewer white residents than the full 59 community districts of NYC. Using smaller neighborhood units like census tracts could have potentially diminished the impact of these two related limitations, creating more homogenous neighborhood units with greater variability by income and race across units. However, we chose to use community districts because the NYSES-derived, neighborhood-level measures of collective efficacy and informal social control of partner violence were collected at and designed to be representative of the community district level. That we were able to model both neighborhood collective efficacy and a unique neighborhood-level measure of informal social control of partner violence is a major strength of the analysis. Another strength is that the neighborhood-level data (NYSES) and the outcome data (IMPACT) were drawn from two separate samples, reducing the threat of same source bias. However, this also resulted in a temporal mismatch between the neighborhood- and individual-level data collected, which raises two related issues. The first is that the models depend upon the belief that the neighborhood conditions measured in 2002 were largely the same as the neighborhood conditions between 3 and 6 years later. The second is that IMPACT participants who moved into the neighborhood recently would not have experienced the neighborhood conditions measured in 2002, thus resulting in misclassification. Although a limitation, we do not believe that the pace of neighborhood change between 2002 and 2005/2008 was rapid enough to warrant not using the NYSES data, which because of its unique data elements allowed us to model informal social control specific to partner violence. As well, 68% and of IMPACT study participants with complete

data reported residing in their neighborhood for 3 or more years prior to the survey. Finally, the NYSES survey response rate was 54% and the possibility exists that the most marginalized NYC residents did not take part in the survey; this could have resulted in neighborhood-level ratings that do not reflect the entire community and under-represent negative perceptions of community factors such as social cohesion and informal social control. This could result in diminished variability and/or less precise estimates of neighborhood-level factors attenuating our ability to detect effects of these variables.

In terms of the individual-level data, the IMPACT studies were designed to recruit a representative sample of different groups of drug users living or spending time in select NYC neighborhoods, and thus the sample over-represents residents with current or past drug use, resulting in a generally low-income sample. However, the average low income of participants may also be seen as a strength of the study, as it increased our ability to examine the unique effects of neighborhood-level indicators of social disorganization in models relatively unconfounded by individual-level income. Similarly, that the sample was largely composed of current or former drug users limits our ability to generalize findings to non-drug involved populations, however it also strengthens our ability to make statements about the effects of neighborhood characteristics on this subpopulation that is at high risk of experiencing and perpetrating partner violence.

CONCLUSIONS

Consistent with previous research on physical IPV (Li et al., 2010; Jain et al., 2010), these results fail to offer strong support for social disorganization theory as a theoretical explanation of neighborhood effects on intimate partner violence, in this instance specific to sexual violence. Analysts have considered that social disorganization theory may not be appropriately extended to intimate partner violence victimization for several reasons. First, partner violence often happens “behind closed doors” and thus may be hidden from neighborhood residents, the social actors who are expected to enact informal social control according to social disorganization theory (Block and Skogan, 2001; Browning, 2002). This is particularly true for sexual partner violence. Second, both partner and sexual violence are thought to have highly normative components, with perpetration in particular being sensitive to the social network-based and normative inputs, at the individual level (Loh et al., 2005; Abbey et al., 2001, Santana et al., 2006). Victimization, on the other hand, may be more influenced by neighborhood-level resources, whether they are family- and informal organization-based, that would assist women escape partner violence (Yonas et al., 2011). Although social disorganization theory can accommodate the normative aspects of violence, and two analyses of the same Chicago-based dataset have found support for this notion (Emery et al 2010; Browning, 2002), it is one of several often unmeasured aspects of the neighborhood environment that may in fact be relevant to partner violence victimization and perpetration (Frye and O’Campo, 2011).

Looking across studies of neighborhood factors and intimate partner violence against women, including this analysis of SIPVAW, it seems that it may be time to take a fresh look at this research question: how do neighborhoods control and/or contribute to intimate partner violence against women? Recent research has attempted to directly study the process of

informal social control of intimate partner violence (Frye, 2007; Frye et al., 2010, in press), as well as how key neighborhood leaders respond to partner violence (Yonas et al., 2011). O'Campo and colleagues (2005) have applied mixed methods to identify specific neighborhood factors related to both partner violence perpetration and victimization, from the perspectives of neighborhood residents. These analyses have identified unique aspects of the neighborhood environment, as well as insights into specific groups of residents who may not benefit from what informal social control of partner violence does exist. Raghavan and colleagues (2006) focus on the level of partner violence in the neighborhood-based social networks of women who are victimized and how this affects women's perceptions of what is normative and acceptable. As further grounded research results emerge, the next wave of neighborhood effects research on partner violence against women ought to incorporate these insights and apply novel neighborhood-level measures, reflective of these understandings, and network-focused mediators to conduct multi-level analyses that will truly advance the knowledge base (Frye and O'Campo, 2011). Such advances are critical to informing and further developing the growing number of neighborhood-based primary and secondary prevention efforts that are underway throughout the US.

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TABLE 1

Sociodemographic Characteristics and Associations with Sexual Intimate Partner Violence against Women (SIPVAW) Victimization and Perpetration: IMPACT Studies, New York City, 2004–08

	Total	SIPVAW	No SIPVAW	p-value	Total	SIPVAW	No SIPVAW	p-value
	SIPVAW Victimization Among Women (N=360)				SIPVAW Perpetration by Men (N=670)			
Sexual Intimate Partner Violence (past year), No. (%)	360	22 (6.1)	338 (93.9)		670	33 (4.9)	637 (95.1)	
Age, Mean (SD)	39.0 (9.7)	40.9	39.9	.352	39.9 (10.9)	41.0	38.8	.263
Race/ethnicity, No. (%)				.893				.512
Hispanic	107 (29.7)	5 (22.7)	102 (30.2)		282 (42.1)	11 (33.3)	271 (42.5)	...
Black	207 (57.5)	15 (68.2)	192 (56.8)		327 (48.8)	18 (54.5)	309 (48.5)	...
White	26 (7.2)	1 (4.5)	25 (7.4)		26 (3.9)	1 (3.0)	25 (3.9)	...
Other	20 (5.6)	1 (4.5)	19 (5.6)		35 (5.2)	3 (9.1)	32 (5.0)	...
Foreign born, No. (%)	37 (10.3)	3 (13.6)	34 (10.1)	.486	125 (18.8)	4 (12.1)	121 (19.1)	.316
Foreign born parents, No. (%)	139 (39.4)	6 (28.6)	133 (40.1)	.296	320 (48.0)	15 (45.5)	305 (48.1)	.766
Acculturation Mean (SD)	2.8 (0.8)	3.2 (1.4)	2.7 (0.8)	.451	2.5 (0.8)	2.3 (0.9)	2.5 (0.8)	.272
Education, No. (%)				.641				.175
Less than HS	179 (49.7)	12 (54.5)	167 (49.4)	...	300 (44.8)	11 (33.3)	289 (45.4)	...
HS grad	181 (50.3)	10 (45.5)	171 (50.6)	...	370 (55.2)	22 (66.7)	348 (54.6)	...
Employed in past 6 months, No. (%)				.944				.101
No	243 (67.5)	15 (68.2)	228 (67.5)	...	337 (50.3)	12 (36.4)	325 (51.0)	...
Yes	117 (32.5)	7 (31.8)	110 (32.5)	...	333 (49.7)	21 (63.6)	312 (49.0)	...
Annual, legal income, No. (%)				.696				.672
No income	39 (10.8)	3 (13.6)	36 (10.7)	...	120 (17.9)	4 (12.1)	116 (18.2)	...
Up to \$5,000	211 (58.6)	11 (50)	200 (59.2)	...	358 (53.4)	19 (57.6)	339 (53.2)	...
Over \$5,000	110 (30.6)	8 (36.4)	102 (30.2)	...	192 (28.7)	10 (30.3)	182 (28.6)	...
Cocaine dependence, past year, No. (%)				.036				.002
No	265 (73.6)	12 (54.5)	253 (74.9)	...	452 (67.5)	14 (42.4)	438 (68.8)	...
Yes	95 (26.4)	10 (45.5)	85 (25.1)	...	218 (32.5)	19 (57.6)	199 (31.2)	...
Crack dependence, past year, No. (%)				.099				.004
No	238 (66.1)	11 (50.0)	227 (67.2)	...	474 (70.7)	16 (48.5)	548 (86.0)	...

	Total	SIPVAW	No SIPVAW	p-value	Total	SIPVAW	No SIPVAW	p-value
	SIPVAW Victimization Among Women (N=360)				SIPVAW Perpetration by Men (N=670)			
Yes	122 (33.9)	11 (50.0)	111 (32.8)	...	196 (29.3)	17 (51.5)	179 (28.1)	...
Heroin dependence, past year, No. (%)				.157				.984
No	274 (76.1)	14 (63.6)	260 (76.9)	...	468 (69.9)	23 (69.7)	445 (69.9)	...
Yes	86 (23.9)	8 (36.4)	78 (23.1)	...	202 (30.1)	10 (30.3)	192 (30.1)	...
Alcohol dependence, past year, No. (%)				.004				.164
No	323 (89.7)	15 (68.2)	308 (91.1)	...	555 (85.4)	21 (75.0)	534 (85.9)	...
Yes	37 (10.3)	7 (31.8)	30 (8.9)	...	95 (14.6)	7 (25.0)	88 (14.1)	...
Income from theft or conning in past 6 months, No. (%)				.062				.298
No	299 (84.2)	15 (68.2)	284 (85.3)	...	534 (79.8)	24 (72.7)	510 (80.2)	...
Yes	56 (15.8)	7 (31.8)	49 (14.7)	...	135 (20.2)	9 (27.3)	126 (19.8)	...
Income from dealing drugs in past 6 months, No. (%)				.109				.014
No	308 (85.6)	16 (72.7)	292 (86.4)	...	521 (77.9)	20 (60.6)	501 (78.8)	...
Yes	52 (14.4)	6 (27.3)	46 (13.6)	...	148 (22.1)	13 (39.4)	135 (21.2)	...
Childhood physical abuse by parent/guardian, No. (%)				.123				.0002
No	234 (65.2)	11 (50)	223 (66.2)	...	459 (68.5)	13 (39.4)	446 (70.0)	...
Yes	125 (34.8)	11 (50)	114 (33.8)	...	211 (31.5)	20 (60.6)	191 (30.0)	...
Witnessed mother physically abused <18 years old, No. (%)				.058				.0003
No	215 (60.1)	9 (40.9)	206 (61.3)	...	472 (70.4)	14 (42.4)	458 (71.9)	...
Yes	143 (39.9)	13 (59.1)	130 (38.7)	...	198 (29.6)	19 (57.6)	179 (28.1)	...
Anxiety/depression, mean (SD)				.043				.033
Age of partner, Mean (SD)	3.3 (0.9)	3.6 (0.6)	3.3 (0.9)	...	3.1 (0.8)	3.4 (0.7)	3.1 (0.8)	...
Weeks involved with partner, Mean (SD)	42.0 (10.3)	39.7 (9.7)	42.1 (10.3)	.296	36.4 (10.4)	36.1 (10.8)	36.4 (10.4)	.865
Relationship dominance, Mean (SD)	351.3 (370.3)	366.0 (331.4)	350.3 (373.1)	.851	302.7 (372.4)	234.6 (229.2)	306.2 (378.0)	.105
	1.0 (0.4)	0.8 (0.6)	1.1 (0.4)	.042	1.0 (0.4)	0.9 (0.5)	1.0 (0.4)	.138

Table 2

Adjusted Associations among Neighborhood-level Characteristics and Sexual Intimate Partner Violence Against Women (SIPVAW): IMPACT Study, New York 2004–2008^a

Neighborhood-level Factor	OR (95% CI)	
	SIPVAW Victimization among Women (N=360) ^b	SIPVAW Perpetration by Men (N=670) ^c
Factor 1: Low education, not professional job	1.49 (0.64, 3.46)	0.77 (0.46, 1.28)
Factor 2: Immigrant concentration/isolation	1.40 (0.75, 2.61)	1.12 (0.76, 1.66)
Factor 3: External physical disorder	1.11 (0.91, 1.37)	1.00 (0.89, 1.13)
Factor 4: Internal physical disorder	1.39 (0.89, 2.18)	0.96 (0.74, 1.24)
Factor 5: Ethnic heterogeneity	0.32 (0.12, 0.88) *	0.96 (0.49, 1.91)
Factor 6: Residential stability	0.61 (0.21, 1.76)	1.81 (0.87, 3.79) ^d
Factor 7: Collective efficacy	1.01 (0.45, 2.25)	1.69 (1.02, 2.80) *
z-score of social cohesion	0.89 (0.49, 1.62)	1.21 (0.84, 1.74)
Informal social control	1.16 (0.56, 2.38)	1.95 (1.14, 3.32) *
Intervene in IPV dispute	0.81 (0.38, 1.73)	0.92 (0.60, 1.42)
Intervene in general violence dispute	0.77 (0.31, 1.91)	1.44 (0.82, 2.53)

^a Models of SIPVAW victimization among women use mixed multilevel regression models; models of SIPVAW perpetration among men use logistic regression models. All models include the following neighborhood-level controls including: median household income, murder rate, and victimization/burglary index

^b Models of SIPVAW among women include the following individual-level factors: age, race/ethnicity, education, income, alcohol dependence, and relationship dominance.

^c Models SIPVAW perpetration among men include the following individual-level factors: age, race/ethnicity, education, income, cocaine dependence, childhood physical abuse, and witness of maternal abuse

^d Model excludes race/ethnicity due to instability of model.

* p<.05

Table 3

Final Mixed Model of Neighborhood-level Ethnic Heterogeneity and SIPVAW Victimization among Women: IMPACT Studies, New York 2004–2008 (N=360)

	OR (95% CI)
Individual-level factors	
Age	1.03 (0.97, 1.09)
<i>Race/ethnicity^a</i>	
Hispanic	0.35 (0.09, 1.34)
White	0.61 (0.06, 5.99)
Other	0.90 (0.09, 9.18)
<i>Education</i>	
High School degree or more	0.84 (0.31, 2.31)
<i>Income^b</i>	
No income	1.10 (0.23, 5.30)
Up to \$5,000	0.53 (0.18, 1.59)
Alcohol dependence	3.83 (1.27, 11.60)*
Relationship Dominance	0.18 (0.06, 0.53)*
Neighborhood-level factors	
Median household income	1.26 (0.44, 3.64)
Murder rate	0.59 (0.21, 1.65)
Victimization and burglary index	1.56 (0.92, 2.65)
Ethnic Heterogeneity	0.32 (0.12, 0.88)*
<i>Fit Statistics</i>	
-2 Residual Log Likelihood	2236.81
Generalized Chi-Square	278.92
DF	0.81

^a referent category is Black

^b referent category is \$5,000 and over

* p<.05

† p<.10

Table 4

Final Logistic Model of Neighborhood-level Collective Efficacy and SIPVAW Perpetration among Men: IMPACT Studies, New York 2004–2007 (N=670)

	OR (95% CI)
Individual-level factors	
Age	1.01 (0.97, 1.05)
<i>Race/ethnicity^a</i>	
Hispanic	0.43 (0.18, 1.05) [†]
White	0.53 (0.06, 5.15)
Other	1.33 (0.33, 5.39)
<i>Education</i>	
HS or more	1.42 (0.64, 3.15)
<i>Income^b</i>	
No income	0.77 (0.21, 2.80)
Up to \$5,000	1.14 (0.49, 2.65)
Cocaine dependence	3.37 (1.55, 7.31) [*]
Childhood physical abuse by parent/guardian	2.81 (1.27, 6.24) [*]
Witnessed mother physically abused <18 years old	2.47 (1.12, 5.42) [*]
Neighborhood-level factors	
Median household income	0.52 (0.19, 1.41)
Murder rate	0.96 (0.60, 1.53)
Victimization and burglary index	1.06 (0.78, 1.44)
Collective efficacy	1.69 (1.02, 2.80) [*]

^a referent category is Black

^b referent category is \$5,000 and over

^{*} p<.05

[†] p<.10