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## Association of childhood emotional, physical, and sexual abuse with the structure and content of homeless women's social networks

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### Introduction

More than 3.5 million individuals experience homelessness within a given year in the United States (National Law Center on Homelessness and Poverty, 2007), with women comprising nearly 45% of this population (U.S. Conference of Mayors, 2007). Compared to low-income housed women, those who are homeless are more likely to engage in drug and alcohol abuse (Riley et al., 2007; Wenzel, Tucker, Elliott, & Hambarsoomians, 2007; Wenzel et al., 2004), victimization (Wechsberg, Lam, Zule, & Hall, 2003; Wenzel, Koegel, & Gelberg, 2000; Wenzel et al., 2007), and other HIV-related risk behaviors (Kilbourne, Herndon, Andersen, & Wenzel, 2002; Wechsberg et al., 2003; Wenzel et al., 2007; Wenzel et al., 2004).

Prior research has identified a number of proximal (adult) and distal (childhood) risk factors for such problems among women. One of the more commonly examined distal risk factors is childhood abuse, which has been linked to a wide range of negative sequelae among women including social isolation (Bolger & Patterson, 2001), alcoholism (Spatz-Widom & Hiller-Sturmhofel, 2001), substance use and addiction (Dube et al., 2003; Stein, Leslie, & Nyamathi, 2002), HIV risk (Arriola, Loudon, Doldren, & Fortenberry, 2005; Miller, 1999; Testa, VanZile-Tamsen, & Livingston, 2005), and—particularly relevant to this study—

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homelessness (Davies-Netzley, Hurlburt, & Hough, 1996). Childhood abuse is widespread among homeless women. One study of women living in temporary shelters found that 78% reported having been the victim of childhood abuse; of those with an abuse history, 55% report sexual abuse, 67% physical abuse, and 90% emotional abuse (Anderson, Boe, & Smith, 1988; Browne & Bassuk, 1997; National Center on Family Homelessness, 2004; Wenzel, 2005). The prevalence of childhood abuse is substantially higher among these women than in the general population, where 32.3% of women reported childhood sexual abuse and 19.5% of women reported childhood physical abuse (Briere & Elliott, 2003).

### **Childhood Abuse and Adult Risk Behavior: The Role of Social Networks**

Although childhood abuse has been linked to risk behaviors and other negative outcomes for homeless women, there is little understanding of the mechanisms through which it may have its long-term adverse effects. A theoretical model developed by Miller (1999) to examine the association between childhood abuse (specifically, childhood sexual abuse) and women's HIV risk proposed that this early life experience affects the development of women's social networks and works through these networks to lead to behaviors that increase women's risk of infection. One key contribution of Miller's model is the recognition that childhood sexual abuse affects women's social network characteristics which may then increase or decrease the chances of subsequent exposure to HIV risk situations including partner abuse and substance use, which may further affect women's social network characteristics (Miller 1999). Other research corroborates that network characteristics may be related to subsequent exposure to violence, substance abuse and HIV risk situations (Biegel, Katz, Tracy, & Townsend, 2007; La Greca, Prinstein, & Fetter, 2001; Laird, Jordan, Dodge, Pettit, & Bates, 2001; Testa et al., 2005; Tracy & Biegel, 2006; Tracy & Johnson, 2007).

However, as Miller argues, the next logical step in the process of understanding the relationship between sexual abuse and HIV risk among women is the scientific evaluation of the pathway between childhood sexual abuse and women's social networks. Although not developed specifically to explain risk behavior among homeless women or to explain other types of childhood abuse, Miller's theoretical model nonetheless provides a useful framework for understanding how adverse childhood experiences like childhood abuse more generally may contribute to later risk behavior by shaping the social networks of women in at-risk populations such as the homeless.

A limited amount of research has examined how social network characteristics and social support may differ for women with and without a history of childhood abuse. In general, those who have experienced childhood abuse tend to have smaller, less connected, and lower-functioning networks with less perceived and received social support (Bolger & Patterson, 2001; Gibson & Hartshorne, 1996; Salzinger, Feldman, Hammer, & Rosario, 1993; Salzinger, Rosario, & Feldman, 2007; Westermeyer, Thuras, & Waaijer, 2004). These findings suggest that childhood abuse leads women to find themselves embedded in (or to perceive themselves embedded in) networks that cannot provide adequate social support, due to sparsely connected networks or the presence of risky individuals as network members. They are thus less resistant to other risk factors. Investigating how childhood abuse is related to social network structure and composition among women becomes an important first step in determining the mechanisms by which networks impact these risk factors. Investigating this in the context of an at-risk population of women with a high prevalence of childhood abuse and related risk factors allows us to consider how we might intervene in a population that will most benefit from this new knowledge.

Network studies can investigate the content of networks (e.g., proportion of drug users) or the structure of networks (e.g., the density of ties among network members), or both.

However, the existing studies examining how childhood abuse is associated with social network characteristics rarely do either, a significant methodological limitation. Our review of this literature revealed only six articles that based social network findings on data collection methods that compute measures of social network structure, built from elicitation of relational ties among network members (Bolger & Patterson, 2001; Gibson & Hartshorne, 1996; Noll, Trickett, & Putnam, 2000; Salzinger et al., 1993; Salzinger et al., 2007; Westermeyer et al., 2004). Most studies ask respondents to evaluate their friendships in general, to describe their 'best friend' relationships, or to provide information only on romantic partnerships (e.g., Gibson & Hartshorne 1996 or Biegel et al. 2007). Thus, most of these studies investigate network effects such as reciprocity and negative affect with summary measures or at the simple, dyadic level (interactions between the respondent and her best friend or her romantic partner), and do not extend analyses to the larger social context available when researchers elicit larger and more complete social networks. Though network interconnectivity, size, and risky membership (composition) may be important correlates of health and risk behavior (Cochran & Brassard, 1979), existing studies have not measured network structure (interconnectedness) and composition (diversity) simultaneously. In fact, most studies did not collect data of the sort that could be used to calculate any social network structural measures.

The most common measure of network structure is density, the ratio of ties that are reported relative to the total possible number of ties among network members. Even this simple ratio cannot be calculated given the data most studies have collected. One study focused on social networks past the level of the relationship dyad, but stopped at consideration of network size and overall network complexity (a count of network subgroups) (Westermeyer et al., 2004). Thus, most studies of childhood abuse fail to move past simple concepts of network structure and content, relying largely on summary or dyadic investigations as proxies for understanding larger-scale network effects. Simply put, these measures do not provide a sufficiently sophisticated conceptualization of women's social networks to gain an understanding of how those networks may be affected by a history of childhood abuse.

Integrating multiple indicators of network structure and content allows us to understand women's networks more clearly and allows us to classify women into groups based on their network characteristics, creating the 'typology' we investigate here. We expanded the notion of social networks beyond the dyad to include women's evaluations of interactions among their network members and beyond simple, summary measures of network structure and risky network membership to include structural measures of network density and centralization, and network membership measures associated with a variety of risky behaviors often seen as sequelae of childhood abuse: proportion of individuals thought to use drugs, drink to intoxication, or participate in risky sexual behaviors.

This study investigates the social networks that women perceive themselves to be surrounded by. We apply a personal network perspective in this study for two reasons. First, the fragmented nature of the research population and the study design make the personal network approach, which focuses on the networks surrounding each respondent, most relevant. Second, the personal network approach allows women to report on the risky and protective individuals they perceive to be in their networks and those relationships they perceive to exist among their network members and themselves. These perceived social networks are, in effect, social reality for these women (Thomas & Thomas, 1928).

Although most research on childhood abuse focuses on sexual abuse, childhood physical abuse is actually more commonly reported among homeless women (Browne & Bassuk, 1997; National Center on Family Homelessness, 2004; Wenzel, 2005). Thus, we expanded the scope of our analyses to include not only childhood sexual abuse but also physical and

emotional abuse. Because abuse is often linked to interpersonal problems, social isolation and avoidant coping strategies (Gibson & Hartshorne 1996 report this for university women; Westermeyer et al. 2004 report this for substance abusers; Bolger & Patterson 2001 report this among matched samples of abused and non-abused children; Salzinger et al. 1993 report this in a matched sample of abused and non-abused adults), we hypothesized that childhood abuse would be associated with low levels of interconnectedness in homeless women's networks, measured by low density and moderate centralization (Cochran & Brassard 1979 suggest the possibility that neglected and abused children would develop low density networks; Gibson & Hartshorne 1996 report lower density networks among abused university women). Further, we expected that abuse would be associated with larger proportions of risky members in women's networks, such as possible alcohol and substance abusers and sexual risk-takers, based on research conducted with a general female sample (Beadnell, Baker, Morrison, & Knox, 2000; Davis, Combs-Lane, & Jackson, 2002; Wingood, DiClemente, McCree, Harrington, & Davies, 2001) and with drug users (C. A. Latkin, Mandell, & Vlahov, 1996; Neaigus et al., 1996).

Chronic alcohol and drug use are not only associated with childhood abuse (Dube et al., 2003; Spatz-Widom & Hiller-Sturmhofel, 2001; Stein et al., 2002), but are important correlates of social network structure and content themselves (Homish & Leonard, 2008; Manuel, McCrady, Epstein, Cook, & Tonigan, 2007; Panchanadeswaran et al., 2008; Tracy & Biegel, 2006; Zywiak, Longbaugh, & Wirtz, 2002). Intimate partner abuse is also associated with childhood abuse (L. Bensley, Van Eenwyk, & Simmons, 2003; Moeller, Bachmann, & Moeller, 1993; Silva, McFarlane, Soeken, Parker, & Reel, 1997), and is also related to social network structure and content, at least among at-risk populations of women (el-Bassel, Gilbert, Rajah, Foleno, & Frye, 2001; Levendosky et al., 2004). While not the only factors likely to affect homeless women's social networks, their prevalence among the populations leads us to believe that substance abuse and intimate partner abuse are highly salient. We hypothesized that because they are more proximal factors associated with women's network structure and content, these factors would show associations with network features in models that contain childhood abuse, past year substance abuse, and intimate partner abuse variables, possibly eliminating any associations with childhood abuse.

## The Present Study

This study of childhood abuse and social networks among sheltered homeless women had the following three aims: The first aim was to develop a classification system for the social networks of homeless women based on multiple measures of network structure and risky network membership, addressing the methodological limitations just discussed. The second aim of the study was to investigate whether homeless women with a history of childhood abuse differed from other homeless women in terms of the type of social network they report. The third aim of this study was to determine whether any relationships between childhood abuse and network type would remain after accounting for women's past year substance abuse and intimate partner abuse.

## Method

### 1. Study participants

Participants in this study were 428 homeless women randomly sampled and interviewed in temporary shelter settings in the central region of Los Angeles County for a study of the social context of substance use and sexual risk (Wenzel et al., 2009). The research protocol was approved by the institutional review board of RAND. A Certificate of Confidentiality was obtained from the U.S. Department of Health and Human Services. Data were collected between June 2007 and March 2008. Women were eligible if they were at least age 18, had

vaginal or anal sex with a male partner in the past 6 months (due to the larger study's focus on HIV risk behavior), spoke and understood English as their primary language, and did not have significant cognitive impairment. Of the 472 women who screened eligible for the study, 5 women were later found to be ineligible because they reported having had only oral sex with a partner in the past six months. Of the remaining 467 women, 451 women participated in computer-assisted face-to-face interviews by trained female interviewers. Women were paid twenty dollars for their participation in the one hour and 15 minute long interview. Of these 451 women, 18 women were excluded because they did not complete the entire interview, leaving a sample size of 428 women and a response/completion rate of 91.6% (428/467) for this particular study. Participants in this study were 19% white, 45% African American, and 36% Hispanic. Women ranged in age from 18 to 67, with the average age being 36. Further information on the sample characteristics can be found elsewhere (Wenzel et al., 2009).

## 2. Study design

Women were sampled from facilities with a simple majority of homeless residents. Our goal was to achieve a sample of women representative of those living in the diverse array of temporary shelter settings available within Los Angeles County. Women were drawn from 51 eligible facilities in Los Angeles County and selected by means of a stratified random sample, with shelters serving as sampling strata. A strict proportionate-to-size (PPS) stratified random sample would have been overly burdensome on the larger facilities. Thus, small departures were made from PPS and corrected with sampling weights.

Women in this study completed a personal network survey. This type of survey has four modules. First, a woman provides information about herself such as age, gender, etc. In this module we also collected information on childhood abuse, drug use, and drinking behaviors and attitudes (among other variables), providing us with the non-structural variables used in our study. Second a woman provides us with a list of her network members, following standard personal network data collection methods (Campbell & Lee, 1991; McCarty, 2002; McCarty, Bernard, Killworth, Shelley, & Johnsen, 1997; McCarty, Kilworth, & Rennell, 2007). To address ethical concerns associated with the ability to identify those who appear as secondary participants via the profiles women provided in the social network section of our survey, we requested that women provide only first names for 20 adult network members that would be recognizable to them for the length of the study. Previous research with this population has shown that sheltered homeless women, on average, name only 4 network members (out of 20) whom they met in a shelter (Tucker et al., 2009). Thus, it is unlikely that the women in this study are mostly reporting on other women in their shelters. Rather, they focus on family members, friends of friends, and individuals they met on the street. In the third survey section, a woman provides us with information about her network members, including but not limited to demographics, provision of social support, and the respondent's perceptions of the network members' engagement in substance use and risky sex behaviors. In the final module, a woman reports her perception of the level of interaction among her network members. The third and fourth modules provide us with the data we use to calculate risky network membership and network structure measures.

## 3. Measures

The classification variables in our analyses are measures of social network structure and risky network membership combined via cluster analysis into a network type variable. The remaining variables fall into three categories: indicators of childhood abuse (physical, sexual, and emotional); adult risk factors, including past year drug abuse and probable alcohol use disorder (dichotomous measures based on the AUDIT and DAST scales) and recent intimate partner abuse; and demographic characteristics (race/ethnicity, education,



age, marital status, and parenting status). We acknowledge that social networks and behaviors and attitudes co-evolve, and as such some risk behavior variables (particularly alcohol and drug abuse) and some demographic variables (such as marriage) will co-evolve with network features over time. However, the portion of the theoretical model we test focuses on the association between childhood abuse and network structure and risky network content, where childhood abuse precedes adult social network structure and risky network content. We continue in that vein, next incorporating drug and alcohol abuse and recent partner abuse variables, cognizant that this approach presents only one side of the possible co-evolutionary relationship. The following study variables have been weighted to account for known sampling and stratification features of the data set.

**Social Network Structure**—These measures, taken directly from graph-theory, include network density and centralization. Density refers to the proportion of ties each woman reported in her personal network relative to the total proportion possible. Centralization refers to the degree to which one or a few people maintain most of the network ties, which is a measure of variation in the distribution of network ties among network members (Wasserman & Faust, 1994).

**Risky Network Membership**—Based on women's reports for each network member (sometimes called an alter), we calculated the percent of network members that each woman believes drink to intoxication, use drugs (including illegal drugs like crack or marijuana as well as over the counter drugs used as intoxicants), and participate in risky sex (such as multiple partners; sex with someone unknown to them, unprotected sex with a new partner).

**Substance Abuse/Dependence**—The Alcohol Use Disorders Identification Test (Babor, Biddle-Higgins, Saunders, & Monteiro, 2001; Saunders, Aasland, Babor, dela Fuente, & Grant, 1993) was used to screen women for a probable alcohol use disorder during the past year. The measure contains questions on alcohol consumption, drinking behavior and dependence and consequences of drinking. In this study we dichotomized the continuous AUDIT score to achieve an indication of probable alcohol use disorder. A score greater than eight is indicative of alcohol use disorder based on previous studies examining the sensitivity and specificity of the AUDIT in identifying a diagnosis of such a disorder in the past year (Maisto, Carey, Carey, Gordon, & Gleason, 2000). The Drug Abuse Screening Test (DAST; Skinner, 1982) was administered to screen women for past year drug use disorder. We dichotomized the continuous DAST score, with a score greater than three indicating probable drug use disorder based on a study examining the sensitivity and specificity of the instrument in identifying a diagnosis (Maisto et al., 2000).

**Intimate Partner Abuse.** Recent intimate partner abuse was measured with two items, one indicating physical abuse, the other indicating psychological abuse. Women were asked to identify which of their recent sexual partners had ever punched or hit them with something that could hurt, like a fist or object; choked or burned them; beat them up; kicked or bit them; threatened them with a knife or a gun; thrown them against the wall; or done other similar behaviors (Straus, Hamby, Boney-McCoy, & Sugarman, 1996). In a second item, women were asked to identify which of their recent partners had made them feel unsafe in the relationship, tried to keep them from doing things to help themselves, treated them like they were lower than he was (inferior) or stupid, made them tell him where they'd been and what they'd been doing, or called her names or swore at her (Tolman, 1999). Based on these responses, we created a dichotomous indicator of whether a woman had experienced physical or psychological abuse from any recent partner in her network. The measure was dichotomized to harmonize it with measures of recent drug and alcohol abuse.

**Childhood Abuse**—Brief assessments of abuse are recommended when assessing a wide range of behaviors and attitudes in one study (Aalsma, Zimet, Fortenberry, Blythe, & Orr, 2002). In our study, women answered three items asking whether they had ever experienced emotional abuse, physical abuse, or sexual abuse before the age of 18, similar to single item indicators of child abuse that have been used in previous studies (L. S. Bensley, Van Eenwyk, Spieker, & Schoder, 1999; Luster & Small, 1997; Thompson, Potter, Sanderson, & Maibach, 1997). The items used in our study were based on items from the Conflict Tactics Scale (Straus et al., 1996), the National Women’s Study (Kilpatrick, Edmunds, & Seymour, 1992), and the Psychological Maltreatment of Women Survey (Tolman, 1999), and have been used in previous studies involving homeless women (Golinelli, Longshore, & Wenzel, 2009; Rayburn et al., 2005; Wenzel, Hambarsoomian, D’Amico, Ellison, & Tucker, 2006; Wenzel et al., 2000). We acknowledge that while these measures may not provide as comprehensive an understanding as other, longer scales might, the items have been constructed to contain the key content of longer, more comprehensive scales. The emotional abuse item asks women if adults called them names, swore at them, or made them feel stupid or worthless. The physical abuse item asks women whether an adult hit them with a fist or other object, kicked them, beat them up, choked them, burned them, or used a knife or gun on them. The sexual abuse item asks women whether adults touched their private parts in a sexual way, made them do something sexual, or made them have sex. Information solicited from women about abuse occurring during childhood and during adulthood was consistent to ease respondent burden.

**Demographic Characteristics**—These measures included race/ethnicity (African American, Hispanic, or White/Other), whether the respondent had completed high school (or GED), whether she had any children, and whether she was married at the time of the interview. Demographic variables were used as controls in our models.

#### 4. Analyses

Analyses were completed in two steps. First, women were grouped into categories based on their social network characteristics using k-means cluster analysis. Second, multinomial logistic regressions were used to measure associations between membership in a particular category and measures of childhood abuse, substance use, intimate partner abuse, and demographics.

The first step in these analyses was to create relevant and meaningful clusters of women based on this set of social network structure and risky network membership variables: personal network density, personal network centralization, percent of alters thought to drink to intoxication, percent of alters thought to use drugs, percent of alters thought to participate in risky sex using an approach similar to that used by Shaw et al. (Shaw, Shah, Jolly, & Wylie, 2008). First, we created a woman by woman proximity matrix based on squared Euclidean distance using these network measures. The resulting proximity matrix was used in subsequent cluster analyses. The MATLAB Cluster Analysis toolbox used for these analyses first identifies the best linear arrangement of women based on their distances to each other (Hubert & Koehn, 2007; Hubert, Koehn, & Steinley, 2009). Then, the toolbox calculates partitions and objective functions for all possible clusters of women (from two to fifty-one) using k-means clustering algorithm, an approach that assigns women to the cluster with the closest mean. The K-means clustering algorithm minimizes intra-cluster variance and thus produces clusters of women with high levels of within-group similarity with respect to network composition and structure and low levels of between-group similarity. When combined with the best linear arrangement created in the first step, the toolbox returns the optimum clustering solutions (Steinley & Hubert, 2008). Objective function values corresponding to all possible partitions were recorded and graphed. The optimal number of

clusters was determined by identifying the greatest change in the objective function and by visual inspection of a scree plot of the function values. The women's cluster membership was then integrated into the larger dataset for analysis purposes.

The second step was to determine the variables associated with cluster membership using weighted multinomial logistic regressions. In these regressions, the three indicators of childhood abuse, dichotomous DAST and AUDIT indicators, indicators of intimate partner abuse, and demographic variables were investigated. Whereas the modal age of first report of childhood abuse is 9 years (Putnam, 2003), alcohol and drug abuse and intimate partner abuse are typically initiated later in adolescence or emerging adulthood (Coker, Smith, McKeown, & King, 2000; DeWitt, Adlaf, Offord, & Ogborne, 2000; SAHMSA, 2002). Based on these statistics, models were tested that first only included childhood abuse variables, then included substance use and intimate partner abuse variables<sup>1</sup>. All the analyses conducted using the *surveymlogit* procedure Stata version 8.0 use the sampling weights derived to account for departures from a proportionate-to-size stratified random sample and hence to eliminate the potential bias due to the differential inclusion probabilities.

## Results

Table 1 presents basic descriptive statistics for each of the three clusters identified as well as for the sample overall. For ease of discussion, each of the groups is given a name: low risk; dense, risky; and sparse, risky. The low risk network group reported the lowest proportion of network members who drink to intoxication (13.34%), use drugs (5.35%) and have risky sex (8.41%). They also report the highest network connectivity (density; 34.77%) and the lowest network centralization (15.91%). The dense, risky network group reported the highest proportion of network members who drink to intoxication (55.11%), use drugs (58.34%) and have risky sex (52.06%). They also reported the highest network density (29.33%) and centralization (21.33%) within the risky groups. The sparse, risky network group reported moderate proportions of network members who drink to intoxication (35.55%), use drugs (27.52%) and have risky sex (31.64%). These women reported the lowest network density (25.88%) and centralization (17.86%) within the risky groups (the lowest density of all three groups, actually). ANOVAs reveal highly significant differences across all five measures of risky network membership and network structure associated with the three network types. Post-hoc tests reported in Table 1 indicate which pairwise differences account for the significant ANOVAs. All three groups are significantly different with respect to risky network membership variables. The sparse, risky network had significantly lower network density than the low risk group. The dense, risky network group had significantly higher centralization than the other groups.

Table 2 presents descriptive statistics for the women in each cluster and overall. Table 3 presents the results of the multinomial regressions that reveal which individual characteristics of these homeless women are associated with having a particular network type. The table presents results of a baseline model that includes only demographic characteristics and the three indicators of childhood abuse (Model 1). This is followed by results of a model that also includes measures of recent drug and alcohol abuse and intimate partner abuse (Model 2). A likelihood ratio test comparing Model 2 to Model 1 is significant, suggesting that model 2 represents an improvement with respect to Model 1. In these models, the comparison group is the low-risk network group.

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<sup>1</sup>In earlier models, we investigated shelter type as possibly associated with network type. It showed no relationship to network type and thus, for the sake of simplicity, we chose not to discuss it here.



Model 1 shows that the single variable related to membership in the dense, risky network relative to the low risk network is age. The older a homeless woman is, the less likely she is to be in the dense, risky network group. Marital status and childhood physical abuse are related to membership in the sparse, risky network group relative to the low risk network group. Thus, single women who have experienced childhood physical abuse are more likely to be in the sparse, risky network group. Model 2 shows that past year drug abuse is related to membership in both risky network groups (sparse and dense) relative to the low risk group. Women who report past year drug abuse are more likely to be in the dense, risky network group. Childhood abuse and marital status are related to membership in the sparse, risky network group relative to the low risk group. Single women who report past year drug abuse and childhood physical abuse are more likely to be members of the sparse, risky network group.

To summarize, multinomial regression results indicate that women who do not report a history of physical abuse or past year drug abuse have a higher probability of being members of the group of women with low risk, well connected networks. With respect to demographic factors, age and marital status emerge as possible protective factors. That is, being married is consistently related to membership in the low risk network group. Being older is marginally related to membership in the low risk network group. Intimate partner abuse is not associated with membership in any particular network group.

## Discussion

The goals of this study were to develop a classification scheme for homeless women based on their social networks, to examine whether women with a history of childhood emotional, physical, or sexual abuse differ from those without a history of childhood abuse with respect to their social network structure and risky network membership, and to determine whether these differences remain after controlling for past year substance use and intimate partner abuse. We found that indeed homeless women's networks tend to fall into three categories: low risk networks; dense, risky networks; and sparse, risky networks. Further, we found that childhood abuse, particularly childhood physical abuse rather than emotional or sexual abuse, is more likely to be associated with women having sparse, risky social networks. Women who reported emotional and sexual childhood abuse were no more or less likely to be members of groups with particularly risky networks. We also found that past year drug abuse is related to women having risky networks (dense or sparse), but that childhood physical abuse remains related to membership in sparsely connected, risky social networks for homeless women. Women who reported recent intimate partner abuse were no more or less likely to be members of groups with particularly risky networks. The regressions reveal other important trends. In general, age and (most importantly) marital status seem to be protective, with older, married women more likely to report low-risk networks.

With respect to our investigation of childhood abuse, we initially hypothesized that childhood abuse would be related to lower levels of interconnectedness in women's networks, measured by low density and centralization overall (Cochran & Brassard, 1979; Gibson & Hartshorne, 1996). Further, childhood abuse would be related to larger risky subpopulations in women's networks such as alcohol and substance users and sexual risk-takers (Beadnell et al., 2000; Davis et al., 2002; C. A. Latkin et al., 1996; Neaigus et al., 1994; Neaigus et al., 1996; Wingood et al., 2001). Indeed, childhood physical abuse was related to high proportions of risky network members and lower density and centralization, supporting our hypotheses.

The importance of childhood physical abuse in these analyses is slightly counter to what we see in most literature on childhood abuse, where physical abuse is less frequently examined

and researchers tend to focus more attention on the sequelae of childhood sexual abuse (compare Salzinger et al. 2007, which focused on childhood physical abuse to the myriad of studies such as Miller 1999; Noll et al. 2000; Noll et al. 2003 (Noll, Trickett, & Putnam, 2003) which focus on childhood sexual abuse). This may be due to a stronger focus on childhood sexual abuse as a cause of subsequent life changes for most populations, possibly because childhood sexual abuse is considered more egregious than childhood physical abuse. However, research has shown that childhood physical abuse has important long-term effects on women's psychological health, including dissociative and reactive attachment disorders (De Bellis & Thomas, 2003; Springer, Sheridan, Kuo, & Carnes, 2007) that would likely impact women's social functioning, leading to the association between childhood abuse and sparse networks in adulthood via mechanisms similar to those expected for childhood sexual abuse. Further, childhood physical abuse has emerged as equally if not more important in certain circumstances than childhood sexual abuse (McHolm, MacMillan, & Jamieson, 2003).

Our findings suggest that other types of childhood abuse, particularly childhood physical abuse, might be especially important to investigate in the context of homeless women. The potential importance of childhood physical abuse to homeless women's social networks is highlighted given its significant association with network characteristics regardless of women's substance abuse and experiences of intimate partner abuse. At least among homeless women, physical abuse seems to have a stronger association with a woman's social context, ultimately affecting her ability to access social support and protect herself from risks. It may be that childhood physical abuse experienced by women who are now homeless is especially severe and thus especially influential with respect to certain social contexts.

Certain features of this study must be considered. First, only sexually active women were surveyed due to the primary focus of the larger study on the relationship between HIV risk behaviors and the social context of homeless women's lives. Although this may limit the generalizability of our findings, there is little reason to believe that the associations examined in this study would differ among women who did or did not have a sexual partner in the past 6 months. Second, the study would be strengthened by having a more comprehensive measure of child abuse. Although single item measures of childhood abuse are useful in broadly focused studies, they lack the specificity and detail important in fully understanding the scope of childhood abuse and its later effects. Third, the social network methodology employed, the personal network approach, could have led women to report on each other during the study. However, based on our random selection process and our prior work with this population (Tucker et al., 2009), we believe that women reported on relatively few of their fellow shelter residents and thus it is not a problem of sufficient magnitude to warrant adjustments in our analyses. Finally, our results may not generalize to homeless women who are unsheltered or live in other geographic areas.

We believe these findings support theories that argue that childhood abuse has an effect on women's social networks (e.g., Miller, 1999). However, our findings suggest that childhood physical abuse may be more closely linked to network features than emotional or sexual abuse. Our models show that the association of childhood physical abuse with network characteristics remains even when drug and alcohol use are controlled for. Given other research on the sequelae of childhood sexual abuse, it may still be directly affecting women's social networks and indirectly affecting women's social networks through the influences of drug abuse (among other factors shown to be related to childhood sexual abuse) (C. Latkin et al., 1995; Manuel et al., 2007; Miller, 1999; Panchanadeswaran et al., 2008; Russell, Booth, Reed, & Laughlin, 1997; Toro, Tulloch, & Ouellette, 2008; Tracy & Biegel, 2006; Zywiak et al., 2002). Subsequent research with a larger and more

representative sample of women should explore the complex inter-relationships among childhood abuse, social networks, substance use, sexual risk behaviors, and intimate partner abuse. A more targeted study should also explore whether women who suffered childhood abuse perceive their networks differently, actively modify their networks, or passively 'end up' in their adult networks. That is, does childhood abuse lead to observable differences in network structure or to psychological differences (such as a propensity toward feeling isolated) in women that affect only their perception of their networks. It may be that women who have been the victims of childhood abuse have network structures very similar to anyone else, but perceive the structures very differently as a result of their abuse. They may also have the same access to protective network members as others, but may perceive that they are more unreachable than other, riskier, network members.

These findings have implications for policy and risk reduction interventions for homeless women. Protecting girls from childhood abuse, important in its own right, may be a first step toward reducing the probability that homeless women will develop sparsely connected risky social networks. For those homeless women with a history of childhood abuse, individual-level interventions focused on reducing traumatic stress, depression, and other psychological effects resulting from these experiences may lessen the likelihood that abuse will become a central feature of their lives. These interventions could focus on developing the individual skills necessary for overcoming the social impacts of childhood abuse. For example, women with a history of childhood abuse may be more likely to have sparsely connected networks because of their reliance on avoidant coping strategies. If this is the case, then an intervention might focus on behavioral changes to reduce avoidant strategies, thereby increasing interaction between women and their network members and thus leading to better connected and hopefully more protective social networks.

Encouraging homeless women to avoid risky network members or replace them with protective network members, as a means to improve network health and create a more protective social context, seems an almost foregone conclusion. This is a feature of many existing network-based interventions that aim to increase the number of protective network members to address variety of issues from depression care to HIV risk reduction among drug users (Barsh, Moore, & Hamerlynck, 1983; Brand, Lakey, & Berman, 1995; Eggert, Thompson, Hertin, Nicholas, & Dicker, 1994; Gottlieb & Coppartd, 1987; C. A. Latkin, Sherman, & Knowlton, 2003; Miklowitz et al., 2007; Mittelman, Ferris, Shulman, Steinberg, & Levin, 1996; Neaigus, 1998). However, this recommendation may be particularly challenging in the case of homeless women given that high-risk network members may often be relied upon to provide women with basic necessities, physical protection, and emotional support (Falkin & Strauss, 2003; Padgett, Henwood, Abrams, & Drake, 2008; Wenzel et al., 2009).

Other network based interventions might target changes in network structure. Relationship-focused interventions could be developed that help homeless women develop well-connected, low-centralization networks, ultimately protecting them from risky behaviors like drug use and risky sexual practices. These interventions might encourage women to bring their existing network members together allowing them to develop relationships, making a previously sparse network more densely connected, in effect weaving a safety net within the social network. In this way, network-based interventions (those that encourage the creation and strengthening of network ties among protective members) may have long-term protective effects for homeless women and other at-risk populations of women. Certainly, interventions that target both risky network content and sparse social networks are would be the preferred. However, regardless of the intervention approaches chosen, the high proportion of homeless women who report childhood abuse (particularly physical abuse), relative to its prevalence among women in general and relative to sexual and emotional

abuse, suggests that these interventions may differentially improve the lives of some of the most at-risk women in America.

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**Table 1**  
 Descriptive Statistics, ANOVAs and Pairwise Comparisons for Cluster Membership and Overall Sample: Network Structure and Risky Network Membership

Network Structure and Risky Network Membership Variables	Low Risk (n = 144) Mean (S.E.)	Sparse, Risky (n = 149) Mean (S.E.)	Dense, Risky (n = 135) Mean (S.E.)	Overall (n=428) Mean (S.E.)	F Statistic (df = 2, 426)
Network Density	34.77 (2.22) <sup>a</sup>	25.88 (1.14) <sup>a</sup>	29.33 (1.58)	29.99 (1.00)	8.55 <sup>***</sup>
Network Centralization	15.91 (0.83) <sup>a</sup>	17.86 (0.66) <sup>b</sup>	21.33 (1.09) <sup>ab</sup>	18.28 (0.50)	10.71 <sup>***</sup>
% Network Members Who Drink to Intoxication	13.34 (1.21) <sup>a</sup>	35.55 (1.19) <sup>a</sup>	55.11 (1.76) <sup>a</sup>	34.08 (1.17)	52.91 <sup>***</sup>
% Network Members Who Use Drugs	5.35 (0.67) <sup>a</sup>	27.52 (1.28) <sup>a</sup>	58.34 (1.69) <sup>a</sup>	29.58 (1.34)	457.51 <sup>***</sup>
% Network Members Who Have Risky Sex	8.41 (1.21) <sup>a</sup>	31.64 (1.26) <sup>a</sup>	52.06 (1.79) <sup>a</sup>	30.09 (1.23)	224.82 <sup>***</sup>

\* p<0.05,  
 \*\* p<0.01,  
 \*\*\* p<0.001

Matching superscript letters indicate significant differences of p<0.05 between groups

**Table 2**

Descriptive Statistics for Cluster Membership and Overall Sample: Women's Individual Characteristics

<b>Individual Characteristics of Cluster Members</b>	<b>Low Risk (n = 144) Mean (S. E.)</b>	<b>Sparse, Risky (n = 149) Mean (S. E.)</b>	<b>Dense, Risky (n = 135) Mean (S. E.)</b>	<b>Overall (n=428) Mean (S. E.)</b>
<i>Demographics</i>				
% African American	51.31 (4.35)	42.76 (4.17)	40.73 (4.48)	45.04 (2.51)
% Hispanic	33.11 (3.97)	41.61 (4.13)	34.56 (4.22)	36.51 (2.38)
% with GED or Higher	67.71 (4.00)	66.56 (3.98)	66.25 (4.21)	66.86 (2.34)
Age	38.77 (1.01)	35.52 (0.92)	34.41 (1.09)	36.28 (0.59)
<i>Family Status</i>				
% Married	23.88 (3.95)	11.71 (2.53)	10.42 (3.11)	15.46 (1.93)
% with Child(ren)	33.55 (3.99)	31.59 (3.84)	28.09 (4.00)	31.16 (2.27)
<i>Childhood Abuse</i>				
% Reporting Emotional Abuse	59.68 (4.35)	77.28 (3.41)	70.63 (4.16)	69.20 (2.34)
% Reporting Physical Abuse	39.71 (4.24)	62.10 (4.07)	52.00 (4.50)	51.32 (2.51)
% Reporting Sexual Abuse	38.90 (4.26)	46.85 (4.24)	45.49 (4.48)	43.72 (2.50)
<i>Recent Partner Abuse</i>				
% Reporting Intimate Partner Abuse	52.08 (8.64)	55.70 (8.45)	67.41 (8.38)	58.18 (4.94)
<i>Past Year Substance Abuse</i>				
Probable Alcohol Use Disorder	13.66 (2.84)	20.98 (3.33)	31.53 (4.19)	21.78 (2.03)
Drug Abuse	33.23 (4.01)	62.35 (4.08)	80.16 (3.58)	57.98 (2.49)



**Table 3**  
Results of Multinomial Logistic Regressions Comparing Low-Risk and Risky Network Clusters

Variable	Model 1			Model 2		
	RRR	95% C. I.	t statistic	RRR	95% C. I.	t statistic
Nonrisky v. Dense, Risky						
Black	0.77	0.41, 1.44	-0.83	1.06	0.54, 2.06	0.16
Hispanic	0.72	0.34, 1.34	-1.03	0.78	0.40, 1.52	-0.72
High School or Better	1.03	0.60, 1.76	0.10	1.32	0.75, 2.33	0.96
Any Child	0.70	0.39, 1.27	-1.17	1.45	0.73, 2.87	1.06
Married	0.48	0.21, 1.08	-1.78	0.47	0.19, 1.15	-1.66
Age	0.96	0.94, 0.99	-2.54*	0.97	0.94, 1.00	-1.69
Childhood Emotional Abuse	1.16	0.60, 2.22	0.44	1.09	0.55, 2.15	0.25
Childhood Physical Abuse	1.32	0.73, 2.42	0.92	1.28	0.70, 2.35	0.80
Childhood Sexual Abuse	1.07	0.62, 1.88	0.27	0.96	0.54, 1.70	-0.13
Intimate Partner Abuse				1.35	0.75, 2.42	1.01
Probable Alcohol Use Disorder				1.47	0.81, 2.69	1.27
Past Year Drug Abuse				6.19	3.20, 11.99	5.43***
Nonrisky v. Sparse, Risky						
Black	1.06	0.56, 2.01	0.19	1.22	0.64, 2.31	0.61
Hispanic	1.25	0.68, 2.30	0.74	1.35	0.72, 2.52	0.94
High School or Better	1.04	0.60, 1.81	0.14	1.23	0.70, 2.16	0.71
Any Child	0.94	0.53, 1.67	-0.22	1.4	0.75, 2.63	1.05
Married	0.47	0.23, 0.94	-2.14*	0.47	0.23, 0.97	-2.06*
Age	0.98	0.96, 1.01	-1.34	0.99	0.96, 1.02	-0.80
Childhood Emotional Abuse	1.42	0.76, 2.68	1.09	1.46	0.77, 2.78	1.16
Childhood Physical Abuse	2.00	1.10, 3.65	2.27*	1.97	1.07, 3.62	2.20*
Childhood Sexual Abuse	0.92	0.54, 1.58	-0.31	0.87	0.50, 1.50	-0.52
Intimate Partner Abuse				0.9	0.54, 1.53	-0.38
Probable Alcohol Use Disorder				1.05	0.59, 1.87	0.17
Past Year Drug Abuse				2.84	1.56, 5.13	3.46***

\* <0.05,

\*\* p<0.01,

1000>4  
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