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Levels and Predictors of Sexual HIV Risk in Social Networks of Men who Have Sex with Men in the Midwest

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Abstract

Past studies have primarily focused on individual-level of factors influencing the HIV risk practices of gay or bisexual men. The role of one's social network has been less explored. This study identified 75 indexes in venues frequented by men who have sex with men and then recruited all willing persons named as members of each index's egocentric social network. 255 unique network members completed assessments of risk-related characteristics and also sociometric measures that were used to identify the influence leader of each network. White and African American networks were composed primarily of men of the same race. Over 70% of men reported recent casual sexual partners. About one-fourth of men engaged in unprotected anal intercourse (UAI) with a casual partner or with multiple partners in the past 3 months. The social network to which a man belonged, weaker risk reduction intentions, and greater substance use independently predicted a range of high-risk sexual behaviors. There were modest but significant correlations between the risk-related characteristics of network members and network leaders. Social network-level approaches are feasible for reaching hidden subgroups of MSM at high risk for contracting HIV.

The use of improved testing algorithms for better distinguishing recent from longstanding infections recently led the CDC to revise upward its estimate of annual HIV incidence from approximately 40,000 to 57,000 cases (Hall, Song, Rhodes et al., 2008). Thus, HIV incidence in the United States is over 40% greater than had long been believed. However, unchanged since the time when HIV first appeared in the United States is the disproportionate toll taken by the disease on men who have sex with men (MSM), who continue to account for more than half of newly-diagnosed infections in the country (Centers for Disease Control, 2009). In much of the United States, including in the Midwest, gay or bisexual men account for an even greater proportion of HIV infections. In Wisconsin, a state typical of many others in the region, 68% of new HIV infections reported in 2009 were among MSM (Wisconsin Annual HIV Surveillance Report, 2010). MSM of color—and especially African Americans—contract HIV infection at highly disproportionate rates (Centers for Disease Control, 2008). In 2007, Black MSM constituted 25% of new HIV

infections reported in the United States (Centers for Disease Control, 2009). Efforts to reduce the scope of HIV infection will be successful only when the incidence of sexual disease transmission between MSM is reduced and when these reductions can be sustained.

Considerable attention has been directed to the study of factors that influence the extent to which gay or bisexual men engage in high-risk sexual behavior practices or, conversely, adopt risk reduction behavior changes. Much of this prior research has enrolled samples or cohorts of MSM and has examined the role of individual-level cognitive psychological variables such as risk knowledge, condom attitudes, behavior change intentions, risk perception, and other factors such as substance use on sexual behavior practices. Collectively, this body of research has led to important advances in our understanding of individual psychological characteristics and situational circumstances that are associated with high-risk behavioral practices among gay and bisexual men. However, sampling has often been based on men recruited from gay-identified community venues. Less is known about the behavior and characteristics of MSM who do not appear in such venues, may be more hidden, and may be accessible primarily through their social or sexual network connections.

The identification of individual-level characteristics provides an incomplete picture of the social context surrounding HIV risk behavior and persons' efforts to reduce their risk (Kelly, 1999). In particular, one's social network—persons with whom one spends time and feels close—is likely to also play an important role that can either contribute to risk or support efforts to minimize it. Prior research with injection drug users (IDUs) has established that social network structure and characteristics influence the riskiness of their injection practices, and that network-level HIV prevention interventions can reduce risky needle use practices (Broadhead, Heckathorn, Weakliem, et al., 1998; Friedman, Bolyard, Mateu-Gelabert et al., 2007; Friedman, Curtis, Neaigus et al., 1999; Latkin, Donnell, Metzger et al., 2009; Latkin, Donnell, Celentano et al., 2009; Neaigus, 1998; Trotter, Bowen, Baldwin et al., 1996).

Given past findings showing the strong influence of social networks on injection risk practices among IDUs, it is surprising that little empirical attention has yet been directed to the study of network-level approaches to prevent sexually-transmitted HIV infection. This issue is particularly important because epidemiological research has shown that outbreaks of sexually transmitted diseases (STDs) cluster within sexual networks, and the spread of STDs is strongly influenced by sexual network structure, composition, and mixing patterns (Catania, 1996; Fichtenberg, Muth, Brown et al., 2009; Rothenberg, Kimbrough, Lewis-Hardy et al., 2000; Rothenberg, Potterat, Woodhouse et al., 1998). For these reasons, it is important that the research field move beyond examining factors associated with sexual risk behavior practices of persons viewed as independent units in isolation from others, and attend much more closely to how others in the socially-significant environment—including members of one's own social network—influence vulnerability to sexually-transmitted HIV infection.

Prior research has examined the influence of social network characteristics on riskiness of sexual behavior practices among MSM and also ethnic minority Roma (Gypsy) social

networks in post-socialist countries in Eastern Europe. In community samples of both MSM in Russia (Amirkhanian, Kelly, Kirsanova et al., 2006) and Roma men in Bulgaria (Kabakchieva, Vassileva, Kelly et al., 2006), an individual's AIDS-related attitudes, intentions, and perceived condom use norms—as expected—predicted recent levels of high-risk sexual practices. However, the single strongest predictor of sexual risk behavior was the social network to which an individual belonged, a factor that carried greater variance for predicting persons' levels of risk behavior than any other characteristic examined.

Several mechanisms probably account for the influence of social networks on the behavior of network members. Peers who are close and well-liked function as behavioral models in daily life (Bandura, 1986). The attitudes, views, and values held by members of one's social reference group serve to establish norms and provide information about actions that are likely to be reinforced, supported, and accepted within that network (Amirkhanian, Kelly, & McAuliffe, 2005; Friedman et al., 2007). Network members may share similar attitudes, values, and day-to-day experiences involving alcohol use, substance use, types of sexual partnerships, and sexual behavior preferences. Because persons often engage in shared activities with others who belong to the same social network, they may encounter similar sexual situations, and network members may exert normative influence on one another's behavior in such situations (Latkin, Donnell, Celentano et al., 2009). Even in the United States, homosexuality is still stigmatized, particularly in communities of color. For that reason, MSM may especially interact with and be behaviorally influenced by personally-known gay and bisexual friends rather than outsiders, particularly in matters related to sexual practices. Thus, examination of the roles that are played by social networks on the sexual risk levels of network members is a promising but understudied area for understanding the interpersonal contexts of HIV risk.

The purpose of the present study was to recruit a racially and ethnically-diverse community sample of gay or bisexual men in the U.S. Midwest. In contrast to the more traditional approach of recruiting a sample composed of independent individuals, the current investigation sought to study social networks of MSM, groups of persons who are already socially linked with one another. The aim of the research was to characterize sexual risk practices in the sample and to identify factors predicting levels of sexual risk or safety, especially the influence of social network factors. We particularly sought to identify factors relevant to the development of social network-level HIV prevention interventions for MSM.

Methods

Setting, Network Recruitment Methods, and Participants

The study followed a protocol that was approved by the Medical College of Wisconsin IRB. This research was undertaken in 2006 in Milwaukee, Wisconsin, a city with a metropolitan population of approximately 1.2 million. Wisconsin has moderate HIV prevalence. Nearly 11,000 persons have been diagnosed with HIV infection, mostly in the Milwaukee area (Wisconsin Department of Health Services, 2009). The epidemiology of HIV/AIDS in Milwaukee is typical of the Midwest, with most infections among gay or bisexual men and with disproportionate disease rates among racial and ethnic MSM.

During a formative research phase, study staff carried out in-depth interviews with key informants, gatekeepers, and community members to identify venues that were believed to be social gathering settings for high-risk MSM including bars, clubs, cafes, coffeehouses, and neighborhood hangout spots. We particularly sought to ensure representation of community venues frequented by minority MSM. The first part of the study protocol was the enumeration of venues that could serve as points for accessing high-risk segments of the MSM community. Field staff were individuals experienced in work in multi-ethnic MSM communities, and field staff members made systematic observations in the venues, unobtrusively observing for the presence of “social circles” (Kadushin, 1966), groups of MSM who congregated, socialized together, and appeared socially cohesive with one another. In venues where such cohesive social circles were noted, field teams returned for index recruitment, the second phase of the study protocol.

During an index recruitment visit, two-person study field staff teams again observed for the presence of social circles among men gathered in or near a venue. The staff team randomly chose one circle for further observation, and unobtrusively sought to identify the group’s center of attention, the individual who appeared to be the center of positive social attention received from and directed to others in the circle. When both of the observing field staff arrived at consensus about who was the center of attention within a social circle, this central individual—the index or “seed”—was approached by the team and asked to participate in a brief, private interview in which the study was explained and interview consent was obtained. Indexes were informed that the study involved HIV prevention research and that we sought to identify and gain the participation of groups of friends. As part of the initial interview, indexes were asked to think of their closest “gay life” friends, persons with whom they most liked to spend time, talk, and hang out. Indexes indicated the first name and last name initial of each friend, information recorded by the staff interviewer. This group of people was collectively defined as the index’s egocentric network.

Indexes were asked to give a study information packet to each network member who he had named. The packet included an explanation about the study, participation benefits, and information including the project’s office location and telephone number. In this way, we recruited indexes directly and then enlisted the assistance of each index in also recruiting the network members that he had initially named. All members of each network—including the index and the named network members of the index—attended assessment sessions at the study’s office site. Invitations given by an index to his social network members were coded to permit the matching of all members of a network with the index who named them, and the network recruitment procedures are described in greater detail in Amirkhanian et al., 2005 [b]. 62% of indexes identified and approached in venues agreed to participate in the initial social network identification interview. These 75 interviewed indexes collectively provided the names of 418 potential network members. The recruited networks ranged in size from 3 to 10 persons, including the index (mean = 5.7 individuals per network). A total of 296 network indexes and members attended the baseline interview; however, 41 persons were named as network members by more than one index. To avoid duplication, they were counted only as a member of the network of the first index who named them. This left us with 255 unique individuals, of whom 40 participants were females included in the friendship groups of MSM, often lesbian friends of some indexes. Because of the study’s

focus on MSM risk behavior, we did not include these females in the analyses. The sample size for analysis was 215 men.

Measures

Although the study recruited social networks, participants were individually interviewed in private during 60- to 90-minute sessions. Because audio computer-administered self-interviews (A-CASI) modalities yield more accurate reports of stigmatized behaviors (Turner, Ku, Rogers et al., 1998), interviews used A-CASI administration except for the social network structure component of the assessment. The A-CASI interview showed the participant each question while it was also read aloud to him over earphones, and participants entered their responses on a laptop keyboard.

Demographic and background characteristics—Participants reported their age, race and ethnicity; highest level of education completed; and whether they were employed or in school. They also described their sexual orientation using a 5-point scale (from exclusively homosexual to exclusively heterosexual) and reported whether they ever had an HIV test, whether they ever had an STD, and—if so—how often they had an STD in their lifetimes and in the past year. Participants were also asked if they had received money or valuables in exchange for sex, or provided money or valuables to someone else for sex, in their lifetimes and in the past year.

AIDS-related psychosocial scales—The assessment measured psychosocial characteristics expected to relate to HIV risk behavior based on social-cognitive (Bandura, 1986) and reasoned action (Fishbein & Ajzen, 1975) theories. *HIV risk reduction knowledge* was assessed with 15 items to which respondents answered “yes,” “no,” or “don’t know,” yielding a score that could range from 0 to 15 and reflected the number of items correctly answered (sample item: “If a man pulls out before orgasm, does it protect him from getting AIDS and sexually transmitted diseases?”). *Risk reduction behavioral intentions* were measured with 12 items, each answered using a 3-point scale reflecting strength of endorsement (sample item: “Would you have intercourse anyway if a condom is not available and your sex urge is strong?”, potential scale score range = 0–24, Cronbach’s alpha = 0.81, present sample). *Condom attitudes* were assessed with a 10-item scale using the same response format (sample item: “Do condoms make sex boring?”, range = 0–20, Cronbach’s alpha = 0.77), *perceived safer sex norms* were measured with a 7-item scale (sample item: “Is condom use popular among your friends?”, range = 0–14, Cronbach’s alpha = 0.74), and perceived *risk reduction self-efficacy* was assessed with 9 items (sample item: “Is it hard for you to suggest condom use to a partner that you had unprotected sex with before?”, range = 0–27, Cronbach’s alpha = 0.68). Items constituting each scale were interspersed together, with some items reverse-keyed to control for acquiescent response bias.

Sexual partnerships and behavioral practices—Participants indicated their number of male and female sexual partners in the past year and in the past 3 months. An in-depth sexual risk practices assessment then focused on behavior occurring during the 3 previous months, an interval long enough to detect relatively low-frequency events but short enough

to permit accurate recall (Kauth, St. Lawrence, & Kelly, 1991). The assessment employed a timeline followback method (Weinhardt, Carey, Maistrom et al., 1998), in which participants were first asked to think about various life activities during the past 3 months, places visited, and people met. They were then asked detailed questions about activities occurring with each of up to 5 male partners in the time period beginning with the most recent. For each partner, the A-CASI program elicited information about whether the individual was a main or a nonmain (casual) partner; the number of times the respondent had receptive and insertive anal intercourse with the partner in the past 3 months; and the number of acts of each kind when condoms were used. These data were elicited for up to 5 male partners. Participants with more than 5 male partners collectively summarized their sexual behavior for all additional partners. The interview used the same partner-by-partner format to assess sexual practices (vaginal intercourse and anal intercourse, with and without condoms) occurring with female partners during the past 3 months, again using in-depth questions about behavior with up to the 5 most recent female partners and collective summarization of practices with any female partners beyond the most recent 5.

Substance use—Participants were presented with a list of substances including alcohol, marijuana, hallucinogens, ecstasy, heroin or other opiates, cocaine, and other substances. They were asked to indicate whether each substance was used and—if so—the number of days of use in the past 3 months. Participants were also asked on how many days in the past 3 months they injected any drugs. To more fully assess recent alcohol use, participants were asked how many beers, wines, or distilled liquor beverages they consumed during the past week.

Social network leadership structure—The social leadership structure of each network recruited into the study was determined following procedures that we have described elsewhere in detail (Amirkhanian et al., 2005 [b]). Each participant was shown a list of the first names and last name initials of all other members of the same network. Participants indicated whether and for how long they knew each other network member. The participant was then asked who—among all identified network members—was most preferred (a positive sociometric nomination) and who was least preferred (a negative sociometric nomination) along a total of 5 dimensions (e.g., trust, discussing important matters, spending time together). Thus, each member of each network assigned positive or negative nominations in 5 activity or role dimensions to all other network members. A sociometric software analysis program (LeDis Group, 2003) was used to determine the network member who received the greatest number of positive nominations and the fewest number of negative citations from others in the same network across the 5 dimensions. This individual was designated as the network's sociometric leader.

Statistical Methods

Our initial analysis examined differences across race/ethnicity categories for socio-demographic background, HIV/AIDS-related psychosocial factors, and sexual risk characteristics. To assess the significance of pairwise differences between race/ethnicity groups while accounting for network-based variances, we conducted general linear models (GLM) in which network was entered as a random factor. Next, we conducted a series of

non-parametric correlations (Spearman ρ) comparing network leaders and members on each sexual risk variable in order to estimate the level of within-network consistency of risk behavior. Lastly, we examined the relative contributions of individual demographic background, substance use, and psychosocial risk-related characteristics in predicting sexual risk behavior, controlling for social network. GLM models were fitted to the data for each sexual risk outcome, with social network entered as a random (grouping) factor. A non-parametric approach for modeling all numerical data as ranks was used to mitigate the impact of skewness in the count data on behavioral outcomes. A backward stepwise procedure was used to remove predictors, except for social network, that did not achieve a p-value of at least $p < .10$. Partial η^2 coefficients measured the variance in sexual risk explained by each predictor.

Results

Participant Demographic and Background Characteristics

Social networks recruited into the study were racially and ethnically diverse. Among the 215 men, and including both indexes and their network members, 61 (28%) were African American, 32 (15%) were Latino, 114 (53%) were White, and 8 (4%) were of other races or ethnicities. Participants' mean age was 29 years (median = 26 years), 31% ($n = 66$) had not more than a high school education, 66% ($n = 142$) were employed, and 25% ($n = 53$) presently attended school. Most of those attending school were in college and a smaller number were in high school or GED programs. 95% of men ($n = 204$) reported having same-sex activity during the past year. The large majority of men (84%, $n = 180$) described themselves as mainly or exclusively homosexual. 28% ($n = 17$) of African American men defined themselves as bisexual, mainly heterosexual, or exclusively heterosexual relative to 11% ($n = 13$) of White and 15% ($n = 5$) of Latino men.

Although the overall sample was racially and ethnically diverse, individual social networks tended to be relatively uniform in their racial makeup. Of 39 networks recruited through a White index, 76% of his male egocentric network members were also White. Similarly, 66% of male network members identified by the study's 19 African American indexes were also African American. Networks of Latino indexes were more diverse. 20% of the male network members of 11 Latino indexes were other Latinos. Four indexes were of other races or ethnicities.

The large majority of men in the sample (95%, $n = 201$) reported having had an HIV test. As Table 1 shows, 38% of participants had an STD in their lifetime, with a past STD significantly more common among Black (48%) than either White (38%) or Latino (22%) MSM. 14% of participants had an STD in the past year. Overall, 26% of men said that they had received money or valuables in exchange for sex in their lifetime, 14% in the past year. During the past year, 26% of African American and 22% of Latino MSM said they received money or valuables for sex relative to 7% of White MSM, a significantly lower percentage. Only 2% of participants ($n = 5$) reported illicit drug injection during the past 3 months.

Levels of Sexual Risk Behavior

As also shown in Table 1, most men in the sample were sexually active with other men and most had nonexclusive partners. Overall, 84% of participants had only male partners during the past year (mean = 8.2 different male partners, median = 3), and a much smaller number of men reported both male and female (8%) or only female partners (5%) during the prior year. Racial or ethnic minority men in the sample were not significantly more likely to report having partners of both genders in the past year than were White men.

During the past three months, the retrospective period for the in-depth assessment of sexual behavior practices, 29% of participants said they had sex with only a single main partner, while 27% of men had sex with both main and casual male partners. 23% of men reported no main partner but had multiple casual male partners in the past 3 months, 11% had one casual male partner, and 9% said they did not have sexual partners during the time period. Men had a mean of 3.3 (median = 1) male partners in the past 3 months.

With respect to the riskiness of their sexual practices, Table 1 shows that 38% of men engaged in unprotected anal intercourse (UAI) during the past 3 months and—among men reporting UAI—engaged in the act a mean of 19.3 (median = 8) times. While 13% of men in the sample engaged in UAI only with a single main partner, 15% did so with a single casual partner and over 9% engaged in UAI with multiple partners in the past 3 months. Thus, more men in the sample (24%) engaged in UAI outside of exclusive main partner relationships than within them (13%), confirming the high-risk nature of networks in the recruited sample. Condoms were used during a mean of 64% of all anal intercourse (AI) occasions during the past 3 months, including 51% of AI acts with main partners and 78% of AI acts with casual partners.

Multivariate Predictors of High-Risk Sexual Behaviors

Table 2 presents findings of general linear models predicting sexual risk behaviors in the sample. As the table shows, the social network to which a man belonged was a significant independent predictor of his total number of male sexual partners during the past 3 months and also of whether the respondent ever received or gave money or drugs in exchange for sex. In addition to the significant influence of social network, men's number of male partners in the past 3 months was also significantly predicted by the use of cocaine, while receiving money for sex was additionally predicted by the use of any street drug. In addition to the independent influence of social network, lower strength of men's risk reduction behavioral intentions and being of African American race predicted giving money or drugs for sex during the past 3 months. Across other indicators of recent risky behavior—including having UAI with multiple male partners in the past 3 months, number of different partners with whom UAI occurred, and number of UAI occasions—lower strength of risk reduction behavioral intentions was the most consistent predictor of risk, with cocaine use and being employed also significantly contributing to some risk outcomes. In general, strength of risk reduction intentions, the social network to which an individual belonged, and recent use of illicit substances were the most salient influences on the riskiness of men's recent sexual practices.

Correspondence in HIV Risk Characteristics Between Social Network Sociometric Leaders and Members of the Same Networks

Significant correlations were found between sociometric leaders and members of the same networks on scales measuring strength of risk reduction behavioral intentions ($\rho = .30$, $p < .001$), perceived safer sex norms ($\rho = .33$, $p < .001$), and risk reduction self-efficacy ($\rho = .20$, $p < .02$). In addition, significant but modest correlations were found between network leaders and network members in number of UAI acts during the past 3 months ($\rho = .19$, $p < .02$) and for ever giving or receiving money or drugs in exchange for sex ($\rho = .19$, $p < .02$).

Discussion

MSM continue to account for a majority of the HIV infections that are contracted in the United States. Just as risk for HIV is not equally balanced across the entire American population, it is also not uniform within the gay community. A number of prior studies have established the much higher HIV risk vulnerability of African American MSM and of MSM who are young or who use illicit substances (Centers for Disease Control, 2008; Drumright, Strathdee, Little et al., 2007; Koblin, Chesney, Husnik et al., 2003; Lemp, Hirozawa, Givertz et al., 1994; Millett, Flores, Peterson et al., 2007; Stall & Purcell, 2000). The present research further establishes the role of an individual's social network as an influence on levels of sexual risk behaviors among MSM, illustrates the use of a recruitment strategy for reaching high-risk social networks of MSM in the community, and provides insights about the composition and characteristics of high-risk MSM social networks.

Like previous studies of MSM social networks carried out in the international arena (Amirkhanian et al., 2005 [a]; Amirkhanian et al., 2005 [b]; Amirkhanian et al., 2006; Kelly et al., 2006), the present research showed that it is feasible to reach and engage social networks of MSM through an approach that works through the friendship links of an initially-identified index. Unlike most previous uses of respondent driven sampling (RDS) or chain referral recruitment methods, the current study sought to enroll *all* members of entire, intact egocentric social networks. Using the methods described here, we were able to enroll and assess a high proportion of the men named as friends of each index. Further, by administering sociometric questionnaires to all network members, it was possible to empirically identify the person with the highest social standing in the eyes of other members of the same network (Amirkhanian et al., 2005 [b]).

Social networks of MSM recruited in this way were high in their overall level of sexual risk based on number of male sexual partners in the past year and past 3 months, their nearly 40% lifetime prevalence of STDs, the finding that over 70% of men reported casual partnerships during the past three months, and the proportion of men who engaged in UAI with casual or with multiple partners during this period. The social network to which an individual belonged was a strong independent predictor of his number of male sexual partners in the recent past and also whether he traded sex for money or drugs. A man's behavioral intentions to practice safer sex, the social network to which he belonged, and recent illicit drug use were the most consistent predictors of sexual risk across a range of indicators, with race or employment status relevant to several risk characteristics. While

most of the individual-level predictors identified in this study are consistent with findings of prior research, the influence of social network has not previously been established among MSM in the United States. Significant correlations found between some risk-related characteristics of the influence leader of each network with the same characteristics in other members of the same network further support the relevance of social networks to patterns of HIV sexual risk behaviors.

A critical challenge in efforts to reduce HIV incidence is the targeting of HIV prevention efforts to population segments that are at greatest risk. Network-based methods carry considerable promise for targeting community segments high in sexual risk in much the same way they have been used in the past to reach IDUs. The fact that social networks of MSM indexes were composed primarily of other MSM of the same race or ethnicity—and especially that Black indexes primarily identified other African American men as members of their close MSM friendship groups—illustrates the potential utility of social network methods for reaching hidden networks of minority MSM in the community including those who may be socially connected with other same-race MSM but do not necessarily appear in gay-identified venues. Prior research has shown that Black MSM generally do not report higher levels of sexual risk practices than White MSM yet have much greater HIV incidence (Millett et al., 2007), a finding increasingly being attributed in part to characteristics of their social and sexual networks (Peterson, Rothenberg, Kraft et al., 2009). This particularly underscores the potential importance of network-level interventions to reach minority MSM

Although it is plausible that social network or network leader characteristics influence the sexual risk behavior of network members, the present study does not definitively establish this direction of effect. It is also possible that people who share life experiences and values related to sexual behavior seek out and then form friendships with others who are similar to themselves. The present study enrolled and studied egocentric social networks, those persons who compose the friendship group close to an index. A fuller picture will be gained through the study of sociocentric networks that capture relationships and reciprocal interconnections within larger social units and that are composed of multiple and often overlapping friendship groups. The present study is limited by the fact that we measured social networks and did not assess the extent to which social network members may have also been sexual partners with one another. Our assessment also did not measure HIV concordance or discordance between respondents and their sexual partners in relation to the occurrence of unprotected anal intercourse. Future research will benefit by further addressing these questions. Finally, this study was carried out in a single Midwestern city. Cities with larger or smaller gay communities, cities more liberal or more conservative, and cities with different minority populations may have different MSM networks.

Most HIV prevention interventions undertaken with MSM in the United States have involved face-to-face risk reduction counseling delivered in individual, small-group, or workshop formats. A smaller number of interventions have been directed toward gay communities. It is possible to envision a social network level of intervention that is intermediate between working with individuals and working with entire communities, and that uses an outreach-based network methodology in order to reach and intervene with high-risk clusters of MSM. Such approaches have shown positive outcomes in international

research for changing network-level sexual behavior norms and practices (Amirkhanian et al., 2005 [a]; [b]; Kelly et al., 2006), and merit further study as an HIV prevention modality in the United States. Interventions directed toward social networks of MSM have the potential to strengthen safer behavior norms within persons' immediate social environment, target HIV prevention to community segments at greatest risk, and reach persons who are hidden and do not appear in visible gay community venues but can be accessed through their social connections with others in the community.

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Table 1
HIV Risk Characteristics Among Male Members of All Study Social Networks Broken Down by Participant Race/Ethnicity

Characteristic or Variable ^a	Full Sample (n = 215)	White/Other (n = 122)	Black (n = 61)	Latino (n = 32)	Significance of Race/ Ethnicity Difference ^b
MEAN AIDS-RELATED SCALE SCORES:					
HIV Risk Reduction Knowledge	13.5 (14)	13.8 (14)	13.3 (14)	13.0 (13)	—
Risk Reduction Intentions	17.8 (19)	17.5 (18.5)	18.8 (19)	17.1 (18)	—
Condom Attitudes	14.1 (15)	13.5 (15)	15.3 (16)	14.4 (15.5)	B > W
Perceived Safer Sex Norms	11.3 (12)	11.5 (12)	10.9 (11)	11.2 (12)	—
Risk Reduction Self-Efficacy	15.1 (16)	15.1 (16)	15.6 (16)	14.2 (15.5)	—
HISTORY OF RECEIVING MONEY OR VALUABLES FOR SEX:					
Received money for sex, lifetime	25.6% (55)	20.5% (25)	36.1% (22)	25.0% (8)	—
Received money for sex, past year	14.4% (31)	6.6% (8)	26.2% (16)	21.9% (7)	B, L > W
Paid money for sex, lifetime	10.7% (23)	6.6% (8)	16.4% (10)	15.6% (5)	—
Paid money for sex, past year	5.1% (11)	3.3% (4)	8.2% (5)	6.3% (2)	—
STD HISTORY:					
Ever had an STD	38.1% (82)	37.7% (46)	47.5% (29)	21.9% (7)	B > W, L
Had an STD in the past year	14.0% (30)	12.3% (15)	19.7% (12)	9.4% (3)	—
SEXUAL PARTNER GENDER, PAST YEAR:					
Had only male partners	84.2% (181)	85.2% (104)	80.3% (49)	87.5% (25)	—
Had only female partners	5.1% (11)	4.1% (5)	8.2% (5)	3.1% (1)	—
Had male and female partners	7.9% (17)	8.2% (10)	8.2% (5)	6.3% (2)	—
Number of male partners	8.2 (3)	9.3 (4)	6.2 (2)	7.7 (3)	—
Number of female partners	0.8 (0)	0.4 (0)	1.8 (0)	0.7 (0)	—
SEXUAL PARTNER GENDER, PAST 3 MONTHS:					
Had only male partners	79.1% (170)	77.9% (95)	77.0% (47)	87.5% (28)	—
Had only female partners	6.0% (13)	4.9% (6)	9.8% (6)	3.1% (1)	—
Had male and female partners	5.6% (12)	5.7% (7)	6.6% (4)	3.1% (1)	—
Had no partners	9.3% (20)	11.5% (14)	6.6% (4)	6.3% (2)	—
SEXUAL PARTNER TYPES, PAST 3 MONTHS:					
Had 1 main male partner	29.3% (63)	27.9% (34)	29.5% (18)	34.4% (11)	—
Had main and other male partners	27.4% (59)	29.5% (36)	23.0% (14)	28.1% (9)	—

Characteristic or Variable ^a	Full Sample (n = 215)	White/Other (n = 122)	Black (n=61)	Latino (n=32)	Significance of Race/ Ethnicity Difference ^b
Had 1 casual male partner	11.2% (24)	7.4% (9)	21.3% (13)	6.3% (2)	—
Had multiple casual male partners	22.8% (49)	23.8% (29)	19.7% (12)	25.0% (8)	—
Had no partners	9.3% (20)	11.5% (14)	6.6% (4)	6.3% (2)	—
Number of male partners	3.3 (1)	3.4 (2)	3.0 (1)	3.5 (1)	—
SEXUAL BEHAVIOR PRACTICES WITH MALE PARTNERS, PAST 3 MONTHS:					
Any unprotected anal intercourse	37.7% (81)	39.3% (48)	32.8% (20)	40.6% (13)	—
If "yes," number of UAI acts	19.3 (8)	19.4 (9.5)	16.5 (6)	23.6 (8)	—
UAI with 1 main partner only	13.0% (28)	11.5% (14)	16.4% (10)	12.5% (4)	—
UAI with 1 casual partner	14.9% (32)	15.6% (19)	11.5% (7)	18.8% (6)	—
UAI with multiple partners	9.3% (20)	9.8% (12)	4.9% (3)	15.6% (5)	—
Mean % condom use, main partners	50.6 (50)	43.5 (14)	60.5 (83)	60.7 (82)	B > W
Mean % condom use, casual partners	78.0 (100)	78.7 (100)	81.1 (100)	67.8 (93)	—
Mean % condom use, all partners	64.4 (96)	58.2 (77)	76.0 (100)	63.9 (84)	—

^aFor variables expressed as percents, the value in parentheses is the number of participants. For variables expressed as numerical values, the table shows the mean (median).

^bB = Black MSM, W = White/Other MSM, L = Latino MSM. Differences shown were statistically significant at $p < .05$ or lower.

Table 2

Significant Multivariate Predictors of Sexual Risk Behavior in the Past 3 Months Among Men who Have Sex with Men in the Study Sample

<u>Risk Outcome/Predictors</u>	<u>Partial Eta²</u>	<u>F (df)</u>	<u>Significance</u>
Total number of male sexual partners:			
Social network	.43	1.45 (72)	.03
Cocaine use	.11	5.40 (1)	.02
Ever received money or drugs for sex:			
Social network	.45	1.60 (72)	.009
Any street drug use	.06	9.65 (1)	.002
Ever gave or received money or drugs for sex:			
Social network	.48	1.79 (72)	.002
Risk reduction behavioral intentions scale	.03	4.64 (1)	.03
African American race	.02	3.37 (1)	.07
Total number of male partners with whom UAI took place:			
Social network	.36	1.10 (72)	n.s.
Risk reduction behavioral intentions scale	.23	42.51 (1)	< .001
Currently employed	.03	4.97 (1)	.03
Number of UAI occasions:			
Social network	.39	1.23	n.s.
Risk reduction behavioral intentions scale	.23	37.80 (1)	< .001
Had UAI with multiple male partners:			
Social network	.37	1.12 (72)	n.s.
Risk reduction behavioral intentions scale	.05	7.11 (1)	.009
Currently employed	.06	8.64 (1)	.004
Cocaine use	.03	4.57 (1)	.03