Published in final edited form as:

J Immigr Minor Health. 2013 February ; 15(1): 172–181. doi:10.1007/s10903-012-9596-4.

High-Risk Sexual Behavior, HIV/STD Prevalence, and Risk Predictors in the Social Networks of Young Roma (Gypsy) Men in Bulgaria

Yuri A. Amirkhanian^{a,b}, Jeffrey A. Kelly^a, Elena Kabakchieva^c, Radostina Antonova^c, Sylvia Vassileva^c, Wayne J. DiFranceisco^a, Timothy L. McAuliffe^a, Boyan Vassilev^c, Elena Petrova^d, and Roman A. Khoursine^b

^aCenter for AIDS Intervention Research (CAIR), Department of Psychiatry and Behavioral Medicine, Medical College of Wisconsin, Milwaukee, Wisconsin, U.S.A

^bMunicipal Clinical Infectious Disease Hospital Named After S.P. Botkin, St. Petersburg, Russia

^cHeath and Social Development Foundation, Sofia, Bulgaria

^dDepartment of Dermatology and Venereology, Medical University of Sofia, Sofia, Bulgaria

Abstract

Introduction—Roma (Gypsies), the largest and most disadvantaged ethnic minority group in Europe, are believed to be vulnerable to HIV/AIDS. This study's aim was to examine HIV risk in 6 Roma male sociocentric networks (n=405 men) in Bulgaria.

Methods—Participants were interviewed concerning their risk practices and tested for HIV/STDs.

Results—High-risk sexual behaviors were common. Over 57% of men had multiple sexual partners in the past 3 months. Over one-third of men reported both male and female partners in the past year. Condom use was low. Greater levels of sexual risk were associated with lower intentions and self-efficacy for using condoms, drug use, having male partners, knowing HIV-positive persons, and having higher AIDS knowledge but no prior HIV testing. Two men had HIV infection, 3.7% gonorrhea, and 5.2% chlamydia.

Discussion—HIV prevention interventions directed toward high-risk social networks of Roma are needed before HIV infection becomes more widely established.

Keywords

HIV Risk Behavior; Sociocentric Social Networks; Ethnic Minorities; Roma; HIV/STD Prevalence

INTRODUCTION

Roma (Gypsies) are the largest and most disadvantaged ethnic minority population in Eastern Europe. Roma community health needs remain inadequately addressed (1). Concerns have especially been raised in the international public health arena about the presence of HIV epidemic enabling factors in the Roma community and the absence of models for reaching and engaging Roma communities in efforts to prevent human immunodeficiency virus (HIV) infection and sexually transmitted diseases (STDs) (2,3).

In countries of the former Soviet Union, the HIV epidemic was first fueled by widespread injection drug use (4). Other post-socialist countries in Eastern Europe such as Bulgaria have seen a much more gradual increase in HIV prevalence. Approximately 1,350 HIV infections, 18 per 100,000 of population, have been officially diagnosed in Bulgaria (5), and the large majority are attributable to sexual transmission, predominately heterosexual. As the largest ethnic minority population in Bulgaria and throughout Eastern Europe, Roma may be particularly vulnerable.

Roma tribes migrated to Eastern Europe beginning in the 1300s. Roma traditionally had nomadic lifestyles, although many have now settled and permanently reside in ethnically-segregated towns and neighborhoods. This pattern characterizes Bulgaria, where 750,000 Roma residents constitute 9% of the country's population (6). Roma maintain unique culture, traditions, languages, and customs, and Roma communities are self-regulated, closed, and distrustful of outsiders including governmental authorities. Discrimination hinders the integration of Roma communities with majority populations, resulting in widespread poverty, unemployment, poor living conditions, and vulnerability to communicable diseases (7, 8). Roma often have limited education and literacy (2). Bulgarian Roma community living conditions are substandard, and homes are often without electricity, access to clean water, and sewers. Roma neighborhoods in Bulgaria typically have poor health care infrastructure, limited access to health care facilities (9), and a life expectancy 10 years less than the country's national average (10).

Traditional Roma norms prescribe sexual freedoms for men and sexual monogamy for women (11). Roma men's behavior substantially determines HIV risk because men have greater relationship power, and it is much more common in Roma culture for men than for women to have casual, extramarital, and concurrent sexual partners (11). For these reasons, HIV prevention efforts in Roma communities must especially address men's behavior.

Several prior studies have examined levels of sexual risk behavior among Roma in Bulgaria. Most Roma men in a prior representative community sample were found to have multiple female partners, rarely use condoms, and often also engage in intercourse with other men (12). Using an egocentric network sampling approach that recruited friendship clusters surrounding an index (13), other research found similar levels of sexual risk and also established the influence of an individual's social network on risk behavior, likelihood of having an STD, and condom use (14).

Social network HIV prevention approaches have been used in the West to reach marginalized community populations (15–17). Network models have good cultural fit with

Eastern European cultures where persons have long relied on their social networks for trusted advice, services, and supports (18, 19). Network intervention approaches have proven feasible for HIV prevention among Roma (14, 20), perhaps because Roma are closely connected with one another but often distrustful of outsiders.

In the current study, six sociocentric networks of Roma men were recruited in large Roma settlements near Plovdiv and Sofia, Bulgaria. The purposes of this study were: (a) to identify HIV/STD prevalence; examine types of sexual partnerships, risk practices, and substance use; and characterize circumstances surrounding men's most recent sexual intercourse; (b) to identify multivariate predictors of unprotected intercourse occurrence, frequency, and number of partners with whom unprotected acts occurred; and (c) to explore the extent to which risk-related characteristics were intercorrelated within networks. This information is needed to guide the development of HIV prevention and reproductive health programs for Roma.

METHODS

Enrollment Procedures

This study was carried out from 2007 to 2010 in cooperation with a local Roma nongovernmental organization (NGO) with knowledge of local neighborhoods. Each of the six Roma sociocentric social networks was recruited by identifying an initial "seed" in a Roma neighborhood setting. The initial seed was the center of attention among others in his social circle based upon systematic ethnographic observation in the setting. The seed was interviewed and asked to identify members of his immediate friendship group, defined as others with whom you choose to spend time, are close, and are trusted friends. Named individuals were then also targeted for recruitment. This established the first wave of participants in the network. Seeds and their network members were eligible for participation if they were at least 16 years old, lived in the neighborhood, and provided informed consent. All willing members of the first wave were also interviewed and asked to identify members of their own friendship group beyond already-recruited network members. These individuals were in turn also asked to participate, and became the second recruitment wave. The same process was repeated to enroll the third recruitment wave. Some individuals were named as network members of multiple participants. In such cases, they were asked to indicate their social ties with all of the segments to which they belonged, not just with those from which they were initially identified. Thus, each sociocentric network was recruited by reaching out three waves from an initial seed, and the overall network was composed of multiple but interconnected friendship groups. Figure 1 illustrates one of the six Roma sociocentric networks. Participants in male seed-originated networks were always other men.

Networks ranged in size from between 37 and 89 men (total=405), reflecting participation by 95.8% of all eligible network members who had been identified in interviews. This high level of participation was likely due to the compact nature of Roma settlements, high unemployment and therefore stable physical presence of men in the neighborhood, and research partnership with a credible Roma NGO for recruitment. Sociocentric networks were composed of between 13 and 31 friendship groups, with a total of 136 friendship groups across all six sociocentric networks. 12 persons were ineligible because they were

under age 16 years or did not live in the geographic area. There was no overlap across the six sociocentric networks, probably because seeds were recruited in different neighborhoods and venues.

Network members came to a neighborhood research office, provided written informed consent, completed assessment interviews, and provided small samples of blood and urine for HIV/STD testing. Interviews were conducted in private sessions with an experienced interviewer and followed a structured protocol. Participants received an incentive payment equivalent to \$10. The study was approved by the institutional review boards (IRBs) of the Medical College of Wisconsin and the Health and Social Development Foundation in Sofia.

STD and HIV Specimen Collection and Analysis

HIV testing used HIV enzyme-linked immunosorbent assay (ELISA) followed by a Western Blot confirmatory test. Syphilis testing was performed by rapid plasma reagin and confirmed using the *Treponema Pallidum* particle agglutination test. After not urinating for at least 2 h, initial-stream urine was collected. *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (NG) DNA were extracted using Amplicor CT/NG specimen preparation kits (Roche Molecular Systems, Inc., USA) and were tested using Amplicor CT/NG polymerase chain reaction (PCR, Roche, Branchburg, NJ, USA). All STDs were treated following best practice guidelines, and participants with HIV infection were linked to medical care.

HIV Risk Assessment Interview

Study measures were administered in the format of one-on-one interviews in Bulgarian, and were additionally translated by study cultural mediators to Turkish or a Roma dialect for participants who spoke these languages. Measures were developed, translated from, and back-translated into English. Individual assessment interviews usually lasted less than 1 hour.

Participant characteristics—Respondents were asked to indicate whether they were employed, were in school, and also their numbers of completed school years. Using 5-point Likert scales, participants then indicated their sexual orientation and also reported whether they had female and also male partners in the past year. Additional questions asked whether participants ever had an STD and whether they knew someone with HIV.

Psychosocial scales—The interview included five acquired immune deficiency (AIDS)-related psychosocial scales. All measures were used or were adapted from scales employed in prior research with community populations in Eastern Europe and found to have sound reliability and validity (14, 20, 21). A 15-item scale measured *knowledge about AIDS risk reduction steps* (sample item: ‘If a man pulls out before orgasm, it protects from getting AIDS and venereal diseases’). Scores could range from 0 to 15, reflecting the number of correct answers. A seven-item scale measured perceptions about *safer sex peer norms* (sample item: ‘Condom use is accepted by my friends’). For each statement, respondents answered ‘yes’, ‘somewhat’, or ‘no’, yielding scores between 0 and 14 (Cronbach’s $\alpha=0.67$). The same response options were used to measure *attitudes towards condoms and safer sex* (10 items, sample item: ‘Using condoms interrupts the pleasure of sex,’ range

from 0 to 20, Cronbach's $\alpha=0.70$); *risk reduction behavioral intentions* to use condoms (12 items, sample item: 'A condom will be used if I have sexual intercourse with a casual partner,' range 0 to 24, Cronbach's $\alpha=0.64$); and *risk reduction self-efficacy* or confidence (9 items, sample item: 'I am sure that I can overcome my partner's objections to safer sex or condoms,' range 0 to 18, Cronbach's $\alpha=0.66$).

Sexual risk background and sexual practices during the past year, the past 3 months, and most recent intercourse with a female and a male—

For both lifetime and the previous year, participants reported their number of male and female sexual partners, and whether they had given or received money or valuables in exchange for sex. Participants then described specific sexual behaviors occurring during the past 3 months. Questions inquired about sexual practices with up to 5 female—and up to 5 male—of participants' most recent sexual partners, asking whether each partner was main or casual, number of anal and vaginal intercourse acts with each partner, and number of times condoms were used. Participants with more than 5 partners of either gender in the past 3 months summarized their behavior with all partners beyond the first five.

Finally, participants also described circumstances surrounding their most recent act of vaginal intercourse with a female partner and, if it was reported, anal intercourse with a male partner. These included type of sexual partner (exclusive, regular but not exclusive, casual, new, or commercial sex partners) and whether a condom was used; whether and how much alcohol was consumed before sex; and whether drugs were used prior to sex and, if so, the type of drug. Finally, participants estimated the extent to which they were drunk or high at the time of sex.

Substance use—Participants reported how many alcohol drinks they had in the past week. In addition, they responded to questions asking on how many days in the past month they used any alcohol, alcohol to intoxication, heroin, methadone, other opiates/analgesics, barbiturates, other sedatives/tranquilizers, cocaine, amphetamines, marijuana/hashish, hallucinogens, ecstasy, gamma hydroxybutyrate (GHB), inhaled nitrites ("poppers"), and Viagra. Street names were provided for the drugs when needed. Finally, respondents indicated on how many days in the past month they injected drugs.

Statistical Analyses

Mixed-effects regression analysis was used to examine the multivariate predictors of having any unprotected intercourse (UI), and number of UI occasions and number of UI partners in the past 3 months, in order to account for correlation among members within the same social network. There was no overlap between the 6 sociocentric networks. The correlation among members of a network is partially due to selection. Each member of a friendship group is linked to the member in the previous wave who identified them in their immediate social group (or to the first referring member if identified in multiple social groups). We anticipated relatively few participants in three waves would be identified as members of multiple friendship groups (115 of 405 or 28.4%). However, each participant's data were included only as part of the first friendship group into which he was recruited. To account for this non-independence, we include both network and friendship group as random factors

in regression analyses. In this hierarchical framework, mixed-effects logistic regression analysis was used to analyze having any UI. Poisson mixed-effects regression analyses were used to fit the data for counts—number of occasions of UI and number of partners—to the predictor models. Potential predictors were first tested in univariate analyses for each outcome. Predictors that achieved a p -value $<.10$ for at least one of the 3 outcomes were then entered in the multivariate analyses. These predictors included demographic background factors; substance use in the past 30 days; AIDS-related psychosocial scales; as well as other behaviors and experiences related to HIV/AIDS (previous HIV testing, acquaintance with someone living with HIV/AIDS, and frequency of communications with friends about HIV/AIDS and safer sex). The generalized linear mixed model statistical program GLIMMIX (SAS Institute) was used to perform the multivariate analyses. Because data for counts (such as number of UI acts) are often highly skewed, GLIMMIX adjusts the fit of the Poisson model for extra variation (over-dispersion) in the outcomes. The significance of multivariate predictors was tested with an alpha level of 0.05.

Members of an identified network or friendship group share something in common due to selection, interaction or other factors. The intraclass correlation (ICC) reflects the measureable degree of this commonality or non-independence. The analysis further examines the ICC for HIV/AIDS psychosocial behaviors within the social networks. The ICC represents the part of the variation in the behaviors attributable to the commonality within friendship group or network. Estimates of the ICC are shown as asymptotic 95% confidence intervals.

RESULTS

Participant Characteristics

The mean age of participants was 19.9 (median=19, range=16–39, $SD=3.4$) years, and men had completed a mean of 6.2 ($SD=3.2$) years of school. Two-thirds of men ($n=269$) were single and never married. Only 33.9% ($n=137$) were employed and 14.8% ($n=60$) were in school. Eight percent ($n=33$) of participants said they ever had an STD, and 6.2% ($n=25$) of participants said they personally knew someone with HIV infection or AIDS. With respect to their sexual orientation, 90.0% ($n=364$) described themselves as being completely or primarily heterosexual, 8.2% ($n=33$) as bisexual, and 1.7% ($n=7$) as completely or primarily homosexual.

HIV/STD Prevalence, Sexual Risk Behaviors, and Substance Use

HIV/STD Prevalence—Two men in the sample (0.5%) had positive HIV test results. Both HIV-positive participants were aware of their status prior to study testing. Twenty-two participants (5.2%) had positive laboratory tests for chlamydia, and 15 men (3.7%) had gonorrhea. No syphilis was detected.

Sexual partnerships during lifetime, the past year, and past 3 months—

Although very few men identified their sexual orientation as homosexual or bisexual, 51.9% ($n=210$) of men reported lifetime same-sex activities, and 34.8% ($n=141$) had sex with both men and women in the past year. Men reported a mean of 28.8 ($SD=68.0$) female and 5.8

(SD=13.3) male lifetime partners. With respect to the past year, men reported a mean of 7.1 (SD=17.7) female and 2.0 (SD=6.5) male partners. Virtually all participants (97.3%, n=394) reported female sexual partners in the past year, and 87.2% (n=353) of men had sex with multiple partners. Table I shows sexual risk patterns reported in the past 3 months and organized by partner type (main versus non-main). During this period, 56.8% (n=230) of men had multiple sex partners, and 21.7% (n=88) of men reported both female and male partnerships. Only about one-third of men had sex with a single partner, whether main or casual. Having sex with multiple partners and being concurrently engaged in both main and non-main partnerships were common patterns.

The interview's detailed partner-by-partner behavior questions were limited to a respondent's 5 most recent partners of both genders in the past 3 months. Ninety-one percent (n=373) of men had no more than 5 partners of a gender.

Sexual practices occurring during the past 3 months—Over 52% of men reported unprotected intercourse with either casual or with multiple partners during the past 3 months and—among men with non-main partners—40% of vaginal intercourse occasions with those casual partners were unprotected. A high proportion of men in the sample also reported having unprotected anal intercourse in the past 3 months with female (39.0% of men, n=158) and with male sexual partners (10.9%, n=44). Condoms were used in approximately half (SD=42.5) of participants' anal intercourse acts with partners of either gender. The number of unprotected vaginal and anal intercourse acts during the past 3 months with female partners was high (mean=29.4 [SD=42.2] UVI acts and 12.3 [SD=29.9] UAI acts respectively), and men reported a mean of 11.5 UAI acts (SD=23.4) with other men in the same time period.

AIDS-related psychosocial scale scores—On the scale assessing knowledge about AIDS risk reduction steps, participants correctly answered a mean of only 10.1 of the 15 items (SD=2.8, actual range=1–15). Mean scores on all other scales were near the respective scale values' midpoints. As such, the safer sex peer norms scale mean was 7.4 (SD=3.4, actual range=0–14); the attitudes towards condoms and safer sex scale mean was 10.7 (SD=4.5, actual range=0–20); the risk reduction behavioral intentions scale mean was 12.1 (SD=4.9, actual range=0–24); and the risk reduction self-efficacy scale mean was 11.8 (SD=4.2, actual range=0–18).

Substance use in the past month—The predominant substances used by Roma men in the sample were alcohol and marijuana. Almost 82% of men (n=330) drank alcohol in the past month and reported a mean of 5 drinking days (SD=7.1) in that time period. Twenty-three percent (n=93) of participants said they drank to intoxication in the past month, and 14.8% (n=60) participants said they used any other drug in the past month: 9.9% of men (n=40) marijuana or hashish; 4.0% (n=16) amphetamines; 1.5% (n=6) Viagra, 1.2% (n=5) ecstasy, 1.0% (n=4) injected heroin, and 1.0% (n=4) other drugs.

Protection and circumstances surrounding men's most recent intercourse with a female and with a male partner—Almost 58% (n=229) out of 396 men reported that the woman with whom they most recently had intercourse was their regular or main

partner, 27.8% (n=110) said the partner was new or casual, and 14.4% (n=57) of most recent heterosexual acts were with sex workers. The majority of most recent heterosexual acts involved vaginal intercourse (75.4%, n=298) although 17.5% (n=69) of men reported that they solely engaged in anal intercourse or in both vaginal and anal intercourse (7.1%, n=28) with their last female partner. Condoms were used in only 39.6% of men's most recent intercourse acts with female partners. Nearly 23% (n=90) men drank alcohol and 19% (n=75) said they were a little drunk or high at last heterosexual intercourse. Fewer than 3% reported using other substances prior to last heterosexual intercourse.

Out of the 205 men in the sample (50.6%) who described circumstances surrounding their most recent anal intercourse with a male, nearly two-thirds (n=130) said they received money or valuables in exchange for sex and the overwhelming majority reported being the insertive partner (94.1%, n=193). Condoms were used in 58.0% of most recent AI acts with male partners. Approximately 14% (n=29) men said they drank alcohol and 11.3% of men (n=23) reported having 3 or more alcohol drinks prior to most recent anal intercourse with a man. No men reported use of other drugs before last anal sex with a male partner.

Multiple Regression Predictors of Engaging in HIV Sexual Risk Practices

Multiple regression analysis examined predictors of high-risk sexual behavior during the past 3 months. As Table II indicates, significant predictors of having any unprotected sex were being married and having weak behavioral intentions to use a condom. Having sex with men in the past year and amphetamine use in the past month were trend-level predictors. We then examined multivariate predictors of number of unprotected intercourse occasions and number of different partners with whom unprotected intercourse acts took place. Weak behavioral intentions to use condoms and low risk reduction self-efficacy were significantly associated with both of these risk variables. However, higher risk was also associated with greater knowledge about AIDS risk reduction steps. In addition, greater number of UI acts was associated with being married, more days of alcohol use, and less frequent use of marijuana in the past month. Greater number of partners with whom UI was practiced was additionally predicted by having sex with a male in the past year, knowing someone HIV+, not having had an HIV test, older age, and using amphetamines in the past month.

Intraclass Correlations for HIV Risk-Related Psychosocial Scales and Sexual Risk Measures among Friendship Groups

We examined whether individuals shared similar risk characteristics with others in their friendship groups. In Table III, significant ICC coefficients denote a greater correlation among members of the same friendship group than in the sample as a whole. Members within a friendship group had significantly correlated knowledge about AIDS risk reduction steps, attitudes towards condoms and safer sex, risk reduction behavioral intentions, and risk reduction self-efficacy. Sexual risk behavior indicators such as number of unprotected intercourse occasions and partners with whom unprotected acts occurred were not correlated within friendship groups.

DISCUSSION

The study substantiates concerns raised in the international public health community regarding high HIV vulnerability in Roma communities (12, 22, 23). Young men in this sample had very high rates of unprotected sex. An overwhelming proportion of men had sex not only with main female partners but also with casual and multiple female and—often—male partners. In addition, men's high-risk sexual practices often included unprotected anal intercourse. Bisexual behavior including unprotected anal sex with other men was common in the sample, as was selling sex to other men. Prior studies with Roma men have found a similar pattern of engaging in sex with other men but not having a homosexual or bisexual identity (12, 14). This pattern appeared to largely reflect a pattern of impoverished men engaging in sex for money. Alternatively, it could be related sexual experimentation.

An innovative feature of the study is its sampling approach. There has been a recent interest in the use of network-based modalities for public health interventions. In the HIV field, network-based approaches provide a means to sample and also intervene to deliver prevention messages that can reach individuals otherwise hidden from conventional sampling in public venues alone. Social network models for HIV prevention intervention may be particularly useful in Roma communities that are often distrustful of outsiders but trusting of personally-known sources of advice.

Recruitment strategies in which persons are identified by referral from others who know them can potentially reach hidden community segments. Sociocentric network approaches of the kind used in this study provide a way to access more deeply into a community so that individuals most hard-to-reach and high-risk can also be impacted. Recruiting successive waves of individuals from a community by beginning with a single “seed” allows considerable coverage even when there are few physical community venues for recruitment. In HIV prevention research, accessing individuals from marginalized minority population groups remains a challenge. Internet-based and mobile modalities have proven feasible for recruiting individuals otherwise hidden to public health programs (24). As these technologies become more common in Roma communities, they may prove useful for enhancing the reach of HIV prevention programs.

In this study, behavioral intentions to use condoms were a strong predictor of all examined risk indicators, a finding consistent with behavioral theories (25–27). Among other significant predictors of risk were substance use practices. As such, more days of alcohol use predicted a greater number of unprotected intercourse acts. Any use of amphetamines was also associated with greater number of partners for unprotected sex. Several findings seemed counterintuitive. For example, use of marijuana or hashish in the past month was negatively associated with number of unprotected intercourse occasions in the past 3 month; participants with higher HIV knowledge reported greater numbers of both unprotected sex occasions and also partners; and knowing someone with HIV predicted greater number of unprotected sex partners. These findings may be because persons who are more risky in their behavior are more knowledgeable about HIV infection and likely to know other risky persons, some of whom were also HIV-positive. Men who used marijuana engaged in sex less frequently, which may have also resulted in them less often having unprotected sex.

Finally, safer sex peer norms were not predictive of risk behavior variables nor significantly correlated within friendship groups.

This study has several limitations. Direction of effects cannot be determined in correlational research. Face-to-face interview data collection method may result in a bias due to stigma or the sensitive nature of sexual behavior data. Retrospective reports of sexual and substance use behavior are subject to recall bias. Some of the psychosocial scales had only modest internal consistency. Biospecimens were not collected from oral/pharyngeal or rectal anatomical sites, potentially resulting in an underestimate of gonorrhea and chlamydia prevalence, especially among men who had sex with men. Approximately 9% of men in the sample had more than 5 partners of a gender in the past 3 months. Because detailed sexual practices were aggregated for these additional partners, some prediction precision was lost. Caution should be taken in interpreting associations of sexual risk with amphetamine and marijuana use because of the small number of participants who used some of these drugs. Each network in the study was limited to three recruitment waves from the initial seed, and more friendship connections between participants may have been discovered if additional waves were recruited. If so, the full network structure might have not been identified. In spite of these limitations, the study provides valuable information concerning Roma HIV risk vulnerability, community social structure, and possible intervention approaches.

HIV/ STD prevalence in the sample was low, possibly due to the social insularity of Roma communities. However, the very high prevalence of men's sexual risk behavior constitutes an epidemic enabling factor of great concern. If infections emerge in Roma neighborhoods, disease incidence may quickly accelerate. HIV prevention interventions are urgently needed in Roma communities in Eastern Europe. Interventions for Roma should address the most common risky behavioral practices, take into account gender and relationship power roles, and be tailored to Roma culture (11). The present study demonstrates the feasibility of using a sociocentric network recruitment and sampling method for reaching high-risk segments of the Roma community. Interventions directed to sociocentric networks have rarely been tested to date for reducing HIV risk behavior but provide a potentially useful avenue for intervention delivery. It will be important for future research to establish the feasibility and efficacy of network-level interventions for reaching Roma and other hard-to-access populations at elevated risk for HIV infection.

Acknowledgments

This research was supported by grant R01-DA023854 from the National Institute on Drug Abuse and grants P30-MH52776 and R24-MH082471 from the National Institute of Mental Health. The authors thank Ruzanna Aleksanyan, Kevin Brown, Vanya Pavlova, and Zina Popova for their assistance.

References

1. Hajioff S, McKee M. The health of the Roma people: a review of the published literature. *J Epidemiol Commun Health.* 2000; 54:864–869.
2. UNDP-Romania: Social Assessment of Roma and HIV/AIDS in Central and Eastern Europe. Bucharest, Romania: United National Development Program/Romania Country Office and Center for Health Policies and Services; 2003.

3. World Bank. Roma and the Transition in Central and Eastern Europe: Trends and Challenges. Washington, D.C: World Bank; 2000.
4. Kelly JA, Amirkhanian YA. The newest epidemic: a review of HIV/AIDS in Central and Eastern Europe. *Int J STD AIDS*. 2003; 14:361–371. [PubMed: 12816662]
5. Bulgarian National AIDS Program. Brief Current Information on HIV/AIDS Distribution in Bulgaria. Sofia, Bulgaria: Ministry of Public Health; 2011. Available at: http://www.aidsprogram.bg/static_info1.php?
6. Liégeois, J-P. Roma, Gypsies, and Travelers. Strasbourg, France: Council of Europe; 1994.
7. Puporka, L.; Zádori, Z. The Health Status of Romas in Hungary. Budapest, Hungary: Roma Press Centre; 1998. Available at <http://www.worldbank.org/eca/roma/data/romang.htm>
8. Barany Z. The Socio-economic impact of regime change in Eastern Europe: Gypsy marginality in the 1990s. *East Eur Polit Soc*. 2000; 15:64–113. [PubMed: 19172779]
9. European Forum for Democracy and Solidarity: Roma in Plovdiv. Dec 01. 2002 Available at <http://www.europeanforum.net/news/18>
10. National Statistical Institute. Sample Studies Vol. 6, Book 4. Sofia, Bulgaria: National Statistical Institute; 2001. Health State of the Population: Census 2001.
11. Kelly JA, Amirkhanian YA, Kabakchieva E, Csepe P, Seal DW, Antonova R, Mihaylov A, Gyukits G. Gender roles and HIV sexual risk vulnerability of Roma (Gypsy) men and women in Bulgaria and Hungary: an ethnographic study. *AIDS Care*. 2004; 16:231–245. [PubMed: 14676028]
12. Kabakchieva E, Amirkhanian YA, Kelly JA, McAuliffe TL, Vassileva S. High levels of sexual HIV/STD risk behavior among Roma (Gypsy) men in Bulgaria: Patterns and predictors of risk in a representative community sample. *Int J STD AIDS*. 2002; 13:184–191. [PubMed: 11860697]
13. Amirkhanian YA, Kelly JA, McAuliffe TL. Identifying, recruiting, and assessing social networks at high risk for HIV/AIDS: methodology, practice, and a case study in St. Petersburg, Russia *AIDS Care*. 2005; 17:58–75.
14. Kabakchieva E, Vassileva S, Kelly JA, Amirkhanian YA, DiFranceisco WJ, McAuliffe TL, Antonova R, Mihaylova M, Vassilev B, Khousesine RA, Petrova E. HIV risk behavior patterns, predictors, and sexually transmitted disease prevalence in the social networks of young Roma (Gypsy) men in Sofia, Bulgaria. *Sex Trans Dis*. 2006; 33:485–490.
15. Latkin CA, Sherman S, Knowlton AR. HIV Prevention among drug users: outcome of a network-oriented peer outreach intervention. *Health Psychol*. 2003; 22:332–339. [PubMed: 12940388]
16. Rothenberg R, Kimbrough L, Lewis-Hardy R, Heath B, Williams OC, Tambe P, Johnson D, Schrader M. Social network methods for endemic foci of syphilis: a pilot project. *Sex Trans Dis*. 2000; 27:12–18.
17. Broadhead RS, Heckathorn DD, Weakliem DL, Anthony DL, Madray H, Mills RJ, Hughes J. Harnessing peer networks as an instrument for AIDS prevention: results from a peer-driven intervention. *Public Health Rep*. 1998; 113(Supplement 1):42–57. [PubMed: 9722809]
18. Róna-Tas, A. Ustoychivost' sotsial'nykh setey v postkommunisticheskoy transformatsii Vostochnoy Evropy. In: Shanin, T., editor. *Neformal'naya ekonomika. Rossiya i mir* [Informal economy. Russia and the world]. Moscow, Russia: Logos; 1999. p. 396–411.
19. Wetherell C, Plakans A, Wellman B. Social networks, kinship and community in Eastern Europe. *J Interdiscipl Hist*. 1994; 24:639–663.
20. Kelly JA, Amirkhanian YA, Kabakchieva E, Vassileva S, McAuliffe TL, DiFranceisco WJ, Antonova R, Petrova E, Vassilev B, Khoursine RA, Dimitrov B. Prevention of HIV and sexually transmitted diseases in high-risk social networks of young Roma (Gypsy) men in Bulgaria: Randomized controlled trial. *Brit Med J*. 2006; 333:1098–1101. [PubMed: 17040924]
21. Amirkhanian YA, Kelly JA, Kabakchieva E, Kirsanova AV, Vassileva S, Takacs J, DiFranceisco WJ, McAuliffe TL, Khoursine RA, Mocsonaki L. A randomized social network HIV prevention trial with young men who have sex with men in Russia and Bulgaria. *AIDS*. 2005; 19:1897–1905. [PubMed: 16227798]
22. ASSA-M. Reproductive Behaviour, Family Planning, Contraceptive Usage (Empirical Sociological Survey). Sofia, Bulgaria: ASSA-M; 1996.

23. Gyarmathy VA, Ujhelyi E, Neaigus A. HIV and selected blood-borne and sexually transmitted infections in a predominantly Roma (Gypsy) neighbourhood in Budapest, Hungary: a rapid assessment. *Cent Eur J Public Health*. 2008; 16:124–127. [PubMed: 18935777]
24. Evans AR, Hart GJ, Mole R, Mercer CH, Parutis V, Gerry CJ, Imrie J, Burns FM. Central and East European migrant men who have sex with men in London: a comparison of recruitment methods. *BMC Medical Research Methodology*. 2011; 11:69. [PubMed: 21586121]
25. Bandura, A. *Social Foundation of Thought and Action: a Social-Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall; 1986.
26. Fishbein, M.; Ajzen, I. *Belief, Attitude, Intention, and Behavior: an Introduction to Theory and Research*. Reading, MA: Addison Wesley; 1975.
27. Fisher JD, Fisher WA. Changing AIDS Risk Behavior. *Psychological Bulletin*. 1992; 111:455–474. [PubMed: 1594721]

Figure 1. Sociocentric Network from the Study Sample. Data visualization: Borgatti SP: NetDraw: Graph Visualization Software. Harvard: Analytic Technologies; 2002

Key to symbols:

- The “seed”
- ▨ Wave 1 participants
- ▤ Wave 2 participants
- Wave 3 participants

Table I**Sexual Risk Practices Reported During the Past 3 Months by Roma Men in Bulgaria (n=405)**

Types of sexual relationships during the past 3 months, % (n):	
None	9.9% (40)
Had sex with a single main partner	24.7% (100)
Had sex with a single non-main partner	8.6% (35)
Had sex with both main and non-main partners	37.5% (152)
Had sex with multiple non-main partners	19.3% (78)
Proportion of participants reporting in the past 3 months, % (n):	
Any Unprotected Intercourse (UI)	72.1% (292)
UI with a main partner	51.6% (209)
UI with non-main partners	41.7% (169)
UI with multiple partners	44.4% (180)
Any Unprotected Vaginal Intercourse (UVI)	64.7% (262)
Any Unprotected Anal Intercourse (UAI)	43.0% (174)
Any UAI with female partners	39.0% (158)
Any UAI with male partners	10.9% (44)
Mean (SD) frequency of unprotected intercourse acts in the past 3 months (computed only for those participants reporting unprotected intercourse with a given type of partner, as shown below):	
UI acts with any partner (n=292)	34.7 (58.1)
UI acts with a main partner (n=209)	24.2 (37.5)
UI acts with non-main partners (n=169)	8.0 (18.3)
UVI acts with any partner (n=262)	29.4 (42.2)
UAI acts with any partner (n=174)	14.0 (31.9)
UAI acts with any female partner (n=158)	12.3 (29.9)
UAI acts with any male partner (n=44)	11.5 (23.4)
Mean (SD) percent of intercourse acts in the past 3 months protected by condoms (computed only for those participants reporting each intercourse activity/partner type, as shown below):	
Any intercourse with any partner (n=364)	40.9 (39.9)
Any intercourse with a main partner (n=251)	28.9 (38.7)
Any intercourse with non-main partners (n=258)	56.8 (40.7)
Vaginal intercourse with any partner (n=333)	39.5 (40.5)
Anal intercourse with any partner (n=250)	50.1 (42.5)
Anal intercourse with any female partner (n=227)	46.8 (43.8)
Anal intercourse with any male partner (n=182)	52.0 (44.8)

Table II

Multivariate Predictors of Whether One Engaged in Unprotected Vaginal or Anal Intercourse (UI), Number of UI Occasions, and Number of UI Partners in the Past 3 Months: Mixed Logistic and Linear Regression Models for 405 Roma Participants Recruited into 6 Sociocentric Networks and 136 Friendship Groups

Predictor ^a	Had Any UI In the Past 3 Months		Number of UI Occasions in Past 3 Months		Number of UI Partners in Past 3 Months	
	<i>t</i> -value ^b	<i>p</i>	<i>t</i> -value ^b	<i>p</i>	<i>t</i> -value ^b	<i>p</i>
Age (in years)	0.28	n.s.	1.87	.0624	2.31	.0217
Married or living with partner	4.71	<.0001	7.31	<.0001	0.81	n.s.
Had sex with another male in past year	1.79	.0751	1.28	n.s.	5.99	<.0001
Ever had an HIV test	0.48	n.s.	-0.19	n.s.	-3.19	.0016
Knows 1 or more HIV-positive persons	0.94	n.s.	0.41	n.s.	3.58	.0004
No. of days drank alcohol in past month	1.02	n.s.	3.97	<.0001	1.39	n.s.
Intoxicated from drinking in past month	0.84	n.s.	-0.64	n.s.	-1.73	.0852
Used marijuana/hashish in past month	0.53	n.s.	-2.08	.0389	-0.37	n.s.
Used cocaine in past month	1.42	n.s.	-0.47	n.s.	0.79	n.s.
Used amphetamines in past month	1.48	.0612	1.66	.0982	2.22	.0274
Used any street drug in past month	-1.03	n.s.	1.54	n.s.	1.60	n.s.
Knowledge about AIDS risk reduction steps	0.65	n.s.	2.79	.0058	2.61	.0095
Risk-reduction behavioral intentions	-4.04	<.0001	-3.14	.0019	-5.14	<.0001
Attitudes towards condoms and safer sex	-1.29	n.s.	-1.37	n.s.	-0.69	n.s.
Risk reduction self-efficacy	-1.08	n.s.	-2.71	.0071	-1.99	.0479
Safer sex peer norms	-1.14	n.s.	0.11	n.s.	-1.22	n.s.

Notes:

^aDemographic factors, substance use measures, psychosocial scales, and other HIV-related variables were tested in a series of univariate mixed models. All predictors that achieved a *p*-value < .10 in any of these regressions were then entered in the multivariate models for all 3 outcomes.

^bThe sign for each *t*-value indicates the direction of the relationship between the predictor and outcome.

Table III

Intraclass Correlations (ICC) and 95% Confidence Intervals for HIV Risk-related Psychosocial Scales and Sexual Risk Behavior Measures among Participants Within 6 Sociocentric Networks and 136 Friendship Groups

Variable	ICC Coefficient- ρ	95% CI ^a
HIV/AIDS Risk-Related Psychosocial Scales:		
Knowledge about AIDS risk reduction steps	0.169	0.026 0.232
Risk-reduction behavioral intentions	0.132	0.001, 0.203
Attitudes towards condoms and safer sex	0.146	0.010, 0.215
Safer sex peer norms	0.042	−0.058, 0.137
Risk reduction self-efficacy	0.140	0.006, 0.210
Unprotected Vaginal and Anal Intercourse (UI) and Condom Use in the past 3 months:		
Number of UI occasions ^b	0.075	−0.037, 0.161
Number of UI partners ^b	0.029	−0.066, 0.127

^a Confidence intervals that include zero are not statistically significant.

^b Count data were transformed into square roots to reduce the skewness of the distribution prior to computing the coefficients.