Social Networks and HIV Testing among Latino Men and Transgender Women in a New Destination Community: Insights from a Mixed-Method Study

Background

Latinos in the United States are disproportionately affected by HIV. [1] In North Carolina, HIV diagnosis rates among Latinos are more than three times as high as rates among non-Latino whites. [2] The number of reported cases, however, may represent a small fraction of the HIV burden among Latinos due to low rates of testing. [3] Latinos in North Carolina are more likely than non-Latinos to present with a late HIV diagnosis. [2,4] In a qualitative study, Mexican men living with HIV in North Carolina described delayed testing due to denial or lack of access to services, frequently getting diagnosed in the emergency room. [5] In response to the biomedical discovery of HIV "treatment as prevention," [6] there is an urgent need to reduce barriers to asymptomatic HIV screening and facilitate timely linkages to care among Latino men.

Traditional HIV testing strategies may not effectively reach foreign-born Latino men and transgender women, who are often mobile, socially isolated, and reluctant to use health services. [7] Respondent-driven sampling (RDS) is a recruitment technique that has been effective in expanding the reach of HIV testing among at-risk populations. With this approach, individuals within a well-defined target population are recruited and typically receive a dual incentive to 1) undergo testing, and 2) recruit a fixed number of additional participants from their existing social network to also be tested. RDS has been implemented worldwide for biological and behavioral surveillance of HIV, especially among populations that are disproportionately affected by HIV including sex workers, men who have sex with men, transgender persons, and individuals who inject drugs. [8–10] RDS is increasingly being used to promote HIV testing among Latinos [11,12] and deliver community-based HIV interventions in traditional migrant destinations. [13,14] To our knowledge, RDS has been employed in only one other study to recruit Latinos for HIV research in North Carolina. [15]

The utility of RDS in reaching individuals at elevated risk of HIV and unaware of their status is dependent on the composition and structure of local social networks, the distribution of HIV-related risk behaviors within them, and communication patterns between peers.[16–21] Additionally, the context in which these networks function can also influence the efficiency and reach of these methods. [22,23] Therefore, in-depth understanding of network composition, structure, and dynamics as well as contextual factors that may influence the process of network referrals is essential.

In this formative, mixed-methods study we sought to: 1) improve understanding of the social networks of Latino men and transgender women in Durham, North Carolina and 2) identify how networks may be leveraged to improve access to early and routine HIV testing.

Methods:

Study setting

North Carolina has the seventh fastest growing Latino population in the country. [24] More than 14% of Durham's population identifies as Hispanic or Latino, up from 8.6% in 2000. [25] Durham County has the fourth highest HIV disease rate in North Carolina.[2] This study was conducted in collaboration with a community-based organization dedicated to strengthening the Latino community and improving the quality of life of Latinos in and around Durham.

Design and sample

We used a mixed-methods approach including qualitative in-depth interviews, a quantitative survey, and HIV testing with pre and post-test counseling to obtain a richer and more comprehensive understanding of individual behaviors and community and contextual dynamics than we could obtain from any single method.[26] While we initially intended to complete all of the qualitative interviews first and then initiate the survey, we had to modify our study schedule due to timing and logistical considerations. As a result, we completed several qualitative interviews prior to starting the survey, and used the information obtained to refine our survey instrument, while the majority were conducted with individuals who also participated in the survey. This overlap between the two samples allowed us to combine both qualitative and quantitative data from the same participants in our understanding of participant's networks and HIV-related behaviors.

Both in-depth interview and survey participants were foreign-born Latino men or transgender women 18 years of age or older who lived or spent time in Durham. As our aim was to reach individuals at elevated risk of HIV, participants were initially eligible only if they also reported one of the following behaviors in the last 12 months: having at least one episode of binge drinking or illicit drug use; having anal sex with a man; providing or receiving money for sex; or consuming two or more alcoholic drinks per day in the last 30 days. Stalled recruitment chains led us to relax these behavioral criteria during the data collection period, though the overall sample exhibited a high prevalence of HIV-related risk behaviors.

Recruitment and data collection

Staff at our partner organization for this study identified initial participants for the in-depth interviews. Subsequent in-depth interview participants were identified through the survey population. In these interviews (n=17), we elicited a social network inventory by asking participants to make a list of the people who were most important in their lives, with whom they spoke with the most, and counted on for support. We probed about the nature of ties with each network member as well as the structure of the network and cohesion among network members. We also asked participants to describe their communication regarding HIV with their network members. In-depth interviews were conducted in Spanish or English, per the participants' preference, audiotaped, and transcribed verbatim (only one participant preferred English).

Survey participants (n=47) were recruited through a network-based referral system, guided by traditional RDS methodology. Through consultation with our partner organization, study staff selected "seed" participants who had large social networks and who were motivated to promote study participation within them. Seeds were also purposively chosen to ensure participants reflected the diversity of gender identities and sexual orientations of the Latino population in the area. Upon successful enrollment and completion of study procedures, each participant received a gift card and coupons to invite up to three additional individuals from his/her network to participate in the study, provided they met the eligibility criteria. Participants could then return to the study site to claim an additional gift card for each of their invitees who enrolled in the study. Unlike studies that use RDS to provide parameter estimates representative of an underlying network, our primary interest was reaching individuals who had not recently accessed other HIV testing services. All survey participants completed a questionnaire administered by a trained interviewer. Participants were interviewed in English or Spanish per their preference, though as with the in-depth interviews, the vast majority of surveys were conducted in Spanish (one survey was completely done in English, and two others in a mix

of English and Spanish). All but two participants consented to rapid HIV testing. One participant had a preliminary positive HIV test result, but refused confirmatory testing.

Survey measures and risk network measurement

The survey was designed to capture a detailed profile of participants' demographic backgrounds, existing social networks and sources of support, and HIV-related behaviors. Demographic questions captured information about current sources of income, living arrangements, and lifetime migration history. We collected a detailed sexual history, including number and gender of sexual partners, experience of forced and transactional sex, and recent condom use. We also assessed recent sexual concurrency based on the presence of temporal overlap in two or more sexual partnerships in the last 12 months. Participants also reported exposure to HIV education/prevention programming, whether they had been tested for HIV (ever tested, and tested in the last 12 months), personal motivations and/or barriers to undergoing HIV testing, and history of other sexually transmitted infections. We adapted items validated in similar populations to quantify social support and experiences of discrimination. [27,28]

We assessed risk network size using a series of questions adapted from standardized surveys using that used RDS for surveillance of populations at high risk for HIV.[29] Participants initially reported the number of men and transgender women they knew that spent time in Durham. They were then asked to enumerate successive subsets of that group who were at least 18 years old; who engaged in at least one of the behaviors that initially defined our target population (binge or problem drinking; illicit drug use; transactional sex; or sex with other men); and who they had seen at least once in the last 30 days. This latter subset -- the number of individuals that the participant had seen in the last 30 days who met the study eligibility criteria -- was defined as the risk network size.

Data Analysis

Analysis of qualitative and quantitative data occurred simultaneously.[30] Our analysis of the qualitative data was informed by Maxwell and Miller's theory of qualitative data analysis.[26] We integrated both categorizing (i.e. systematic thematic coding) as well as connecting (i.e. narrative analysis) techniques to develop a holistic and contextualized understanding of social networks and HIV testing.[26] Following multiple readings of the in-depth interview transcripts, we prepared a "social network summary" for each participant describing the composition and nature of ties.[31] Building from these summaries, we coded all of the transcripts around key HIV-related behaviors, and in particular around HIV testing. We then constructed matrices to compare themes and experiences throughout the study population and identify illustrative quotes.

Due to the small survey sample (n=47) and relatively large number of "seed" participants (n=14), the data derived from the survey did not allow for standard RDS analysis that incorporates participants' social network size and cross-recruitment ties to produce weighted population-based proportions of parameters of interest. Instead, it was treated as a convenience sample, as the unweighted data produced a useful profile of the participants. Wilcoxon's signed rank test, Pearson's chi-squared test, and Fisher's exact test were used to identify statistically significant correlates of receiving an HIV test in the last 12 months and ever having received an HIV test, respectively. One observation was dropped from the analysis due to incomplete survey data, yielding a final analytic sample of n=46. Data were analyzed using Stata version 12.1.

Results

We first describe the survey population to give an overall sense of the socio-demographic characteristics, followed by bivariate associations between these characteristics and HIV testing behaviors (ever and in the last 12 months). We then describe the composition, nature of ties and structure of personal networks elicited in the qualitative interview. Finally we compare the risk networks elicited in the survey and the personal networks elicited in the in-depth interviews and consider determinants of the referral process.

Description of survey population

The median age of survey participants was 32.5 years (range 18-66). The majority were born in Mexico (71.7%) and had lived in the United States at least 10 years (65.2%). Most participants had more than primary education (76.1%). The majority identified as male (80.4%) and the most common sexual orientation was heterosexual (56.5%), followed by gay or homosexual (28.3%) and bisexual (8.7%). Over half (58.7%) were currently in a relationship. Median monthly income was $1200 (range 0-6000), and most reported being underemployed (63.0%). With regard to social network characteristics, the median risk network size was 5.5 (range 0-50), and most (84.8%) reported having at least one friend or family member they could ask to accompany them to health services. At the structural level, 41.3% of participants had experienced discrimination based on race, ethnicity or skin color.

The prevalence of recent HIV-related risk behaviors was substantial. Over half of participants (52.2%) reported binge drinking in the last year and 19.6% had at least two drinks daily in the last 30 days, while illicit drug use in the last 12 months was less common (10.6%). Only one participant reported ever using injection drugs. The median number of sex partners in the last 12 months was two (range 0-25) with 41.3% reporting two to five partners. Nearly one-third of participants had concurrent partnerships in the last year. Condom use was inconsistent, with 80.0% reporting inconsistent condom use across all types of partners, and 17.4% reporting inconsistent condom use with non-stable partners in the last three months. Half of the sample engaged in sex with a man in the last 12 months. Thirteen percent reported providing money for sex in the last 12 months, while 15.2% reported receiving money for sex. Fifteen percent had previously been diagnosed with a sexually transmitted infection (STI), 19.6% had one or more STI symptoms within the last year, and one participant had been diagnosed with an STI within that time. The majority of participants had previously been tested for HIV (76.1%), but only 45.7% had been tested in the last year.

We examined bivariate associations between socio-demographic, social and structural factors and HIV-related risk behaviors and HIV testing (Table 2). Compared to participants who had never tested for HIV, participants who had ever been tested for HIV had significantly larger risk networks (12.2 vs. 5.3 persons), and a greater number of sexual partners over their lifetime (19.0 vs. 5.3) and in the last 12 months (5.0 vs. 1.1). Those who had ever been tested were also less likely to have been born in Mexico and less likely to identify as male. Ever-testers were less likely to have engaged in binge drinking or in concurrent sexual partnerships in the last year, and were less likely to have had sex without a condom in the last three months.

There were no statistically significant demographic or behavioral correlates of receiving an HIV test in the last 12 months. However, consistent with comparisons of ever- and never-testers, risk networks were larger (11.8 vs. 9.4 persons) and the number of lifetime (18.1 vs 13.8) and recent (4.6 vs. 3.7) sexual partners was greater among those who had recently been tested for HIV compared to those who had not. Those who had recently been tested were more likely to have at least one peer who could accompany them to health services, and were less likely to ever have experienced discrimination based on race, ethnicity, or skin color.

Personal social networks

We examined the personal network inventory provided in the qualitative interviews to obtain a holistic understanding of participant's social context and resources to aid in our interpretation of the risk network provided in the survey, as well as the feasibility of using an RDS approach to promoting HIV testing in this population.

Participants completing in-depth interviews named between one and eight contacts in the social network inventory; four was the modal number of contacts nominated. The composition of networks varied based on gender and sexual identity, as we have seen elsewhere.[32] For example, family members were less prominent in the networks of men who have sex with men and transgender participants. Only five participants included an intimate and/or sexual partner in their social network, perhaps reflecting the way we elicited the personal network inventory but also perhaps reflecting the lack of meaningful intimate partnerships among participants (Table 3).

Networks included both United States-based and transnational ties. Of the 17 participants, 10 described networks that were located entirely in the United States, most of which were exclusively based in North Carolina. Five participants described networks with both domestic and transnational ties, and two described networks that were all outside the Unites States. One of the participants with only transnational ties was a Mexican transgender woman, whose only network member was her mother in Mexico (though she also indicated having other family and a child in Mexico). She indicated that she could not trust anyone in Durham and, therefore, stayed on the "periphery" of social groups:

> *In our [the transgender] scene, I don't like it because people are really gossipy, and here I don't like it. And I also don't like when a person comes and says to me "look, did you know this and that", like gossip. I don't like it when people tell me [others people's gossip], or for people to tell others what I told them, that I don't like. And so I try to avoid these things. I stay on the periphery of people.*

A heterosexual participant from Honduras who had a fairly large (n=5) and well-connected network, including family, friends and his partner, still explained that meeting people in the Unites States was different than in his home country:

> *It's different with friends that you meet here because you don't what family they come from, you don't know what they are, if they have killed, robbed, you know what I mean? And there [in Honduras], [when] you make friends in your country, you know what family they come from, you practically know all about their lives…*

These quotes highlight the salience of *confianza*, or trust, which for some was not easily established in the context of North Carolina, where really knowing people was considered more difficult. They also underscore how the context of in which social connections are made shapes the quantity and nature of these ties.

These experiences and perspectives stood in contrast to a male gay-identifying participant who named six people in his network, including a mix of both family and friends, who were all in North Carolina. This participant came out as gay after moving to Durham and prior to that did not have any gay friends. For him, moving to Durham expanded his peer network and provided more freedom to form friendships with other gay men. It is also noteworthy that this participant's family was accepting of his sexuality,

which created an environment in which he could safely express himself and expanded his network ties, in contrast to participants who lacked family or friends due to their sexual and/or gender identities. However, this participant did not recruit anyone else into the study, which we discuss at greater length below.

Generally, respondents provided financial or material support to at least one person in their network (usually immediate family members); and received emotional support from at least some of their contacts. We found few examples of dense or cohesive networks; aside from family members who knew each other, network members were generally not closely acquainted with each other, nor did they have a group identity. One exception was an actual network that came to participate in the study together that included several siblings and shared male friends. While the "seed" participant of this group did not consider his social network to be highly cohesive, several members came together to participate in the study, and afterward indicated they were eager to discuss their testing experience and results with their peers.

We found that while participants usually received social support from friends and family, regular and/or open dialogue about HIV and/or HIV testing was limited among friends with whom they felt closest. Participants often stated they did not feel comfortable discussing HIV or their testing history with parents or siblings, even if they were close. Previous HIV-related conversations among close social ties were often portrayed as superficial – there may have been discussion of the importance of "protecting oneself" (i.e. using condoms), but specifics regarding individual HIV status, testing experiences, and HIV prevention methods were rarely articulated. One participant with a transnational network indicated that he sent condoms to family members in his country of origin, but he did not necessarily discuss HIV or sexual behavior with them.

Differences in "risk" and "personal" networks

Fourteen participants completed both the survey and qualitative interview, which allowed us to compare their "risk" and "personal" networks (Table 3). In conducting this comparison, it became clear that many of the networks described through the in-depth interviews were incongruous to the "risk networks" as defined by survey participants. In the survey, participants were asked to indicate the number of men or transgender women they knew in Durham with whom they had contact in the last 30 days who engaged in at least one of the risk behaviors necessary for study eligibility. Risk network size ranged from 0 to 50 (median 5.5, mean 10.5). In ten of the fourteen cases for which we have both quantitative and qualitative data, risk networks were larger than personal networks. In the four cases that had larger personal networks than risk networks, the personal networks were mostly composed of family members who resided in Durham, as opposed to friend-based networks or transnational networks. For example, a male heterosexual participant who had no risk network had a personal network composed of four people--- his wife and three family members living in North Carolina.

We found contrasting examples of the potential mechanisms that may drive effective network referral among Latinos migrants in a new settlement setting. The transgender female bisexual participant quoted above, who only included her mother in Mexico in her personal network, indicated having a risk network of 12, and recruited 3 of these individuals for participation in the study (two of whom were also transgender women). In contrast, the male heterosexual participant quoted above, with a fairly cohesive personal network of 5 (including friends and family) and a risk network of 4, also recruited 3 participants. While the first participant tapped into a network of peers based on a shared identity, but not necessarily close or trusted relationships, the second participant essentially brought his whole network to the study as a group based on their close connection.

In addition to the role of trust, we have both anecdotal and survey evidence that many participants did not feel comfortable inviting all of the potentially eligible members from their risk networks. In the survey, we asked participants how many people from their local risk network they thought they could invite to the study. Nearly half reported they would not be able to invite everyone that was eligible to participate. This was in spite of more than 40% of participants acknowledging at least some members of their risk network had never had an HIV test and 26.1% reporting that no one in their risk network had ever been tested. There was frequent reporting of having peers who provided money for sex, and occasional reporting of peers who used illicit drugs, but participants stated some of these peers would not be willing to get tested for HIV.

Time and geographic dispersion may also have made study participation and recruitment challenging. As stated above, several participants had transnational networks with limited numbers of social contacts in North Carolina. Some participants did not frequently see the peers they wanted to recruit, which made delivering coupons in person a challenge within the limited time frame of the study (3.5 months). Our participants resided in a 30-40 mile radius in the Research Triangle area, and some lacked regular access to private transportation. Most worked long hours and at least some evenings, and thus had difficulty finding time to participate themselves. As we have observed elsewhere, some participants felt they could only successfully recruit peers if they personally accompanied them to the study site, which may have been difficult to coordinate.

Discussion

Using an incentivized, network referral sampling approach, we reached a sample of Latino men and transgender women with substantial HIV-related risk behaviors. Recent HIV testing was not common, which echoes findings from previous studies with Latinos in North Carolina and highlights the need to diversify and strengthen HIV testing promotion strategies.[5,7] Individuals with larger risk and sexual networks were more likely to have ever tested or tested in the last year. This finding confirms the importance of improving our understanding of these networks in order to identify effective strategies to engage with them to promote early and routine HIV testing.

Our experience using an RDS-inspired recruitment approach was quite slow, and we did not achieve our desired minimum target sample of 100 participants. In the only other study we are aware of that used RDS to recruit Latino men who have sex with men for a behavioral survey in North Carolina, nine months were required to recruit 190 participants.[15] In contrast, RDS has been a highly efficient and effective way to recruit individuals and conduct HIV testing in dense urban settings across the countries of origin of our participants. [29,33,34] Taken together, our findings suggest that RDS may not be as efficient in a relatively new destination for Latino immigrants in the United States, compared to urban settings, due to the impact of migration on networks and the context in which migrant networks exist in Durham.[21,35]

We found that most participants had fairly small personal networks that were not cohesive and included both local and transnational ties. While personal networks could include individuals in North Carolina and in the participants' countries of origin, risk networks were only local, limiting the potential pool of referrals. While many participants had established ties with friends and family in North Carolina, it is possible that these relationships were not as meaningful as those maintained with people in their countries of origin, and were not as conducive to this type of engagement.[5] For a limited number of participants, friendship networks expanded after migrating to the United States, especially those who came out connected with a gay community for the first time once they were residing in the United States. This process could represent another layer of what Viruell-Fuentes (2009) has described as identity support to create not only a positive ethnic identity, but also a positive gender and sexual

identity.[22] It is worth noting that over half of the participants in the in-depth interviews had networks that were exclusively based in North Carolina, which reflects that our sample had been in the United States for a substantial amount of time as well as the impact of current immigration policies, which have limited our participants' ability to return home and maintain relationships.[36]
Another reason for our slow recruitment may be related to our diverse study population. Traditional RDS studies rely on the assumption that the target population is connected through an existing underlying social network.[37] Given the variety of risk behaviors of interest in our study, it is unlikely that we met this assumption. The lack of cohesion of local personal networks as described in the in-depth interviews support this notion. This lack of an underlying network could have challenged the success and efficiency of RDS, as many referral chains were unproductive. We tried to include potentially disparate risk groups into our study due to our interest in identifying strategies that could be applied to the "real world" context of HIV prevention in North Carolina, but future efforts to use RDS should improve the definition of the target networks and communities, and be sensitive to how distinct "Latino" networks and communities may interact with each other. Additionally, dense networks perform better in RDS study by ensuring that clusters of peers will become saturated with participants, such that the same individual may have several people reminding them to get tested/participate,[21] and also because participation and visiting the study site can become a pleasant social event. While we did observe that coming to the study site facilitated a social opportunity for some participants, lack of saturation of networks limited the development of more effective referral chains.

In our comparison of risk and personal networks, we found distinct patterns of network composition and referrals. Referrals were made from personal networks that overlapped with risk networks as well as from large risk networks with no overlap. These distinct patterns of network overlap and referral productivity suggest that drivers of referral include both affinity-based connections (e.g. closeness and trust between ties) as well as identity-based connections that expose people to larger numbers of people even if their connections are not close. And, while risk networks in Durham appeared large, they may have been comprised of weak ties through which health-promotion messaging and social influence may not have been as effective. Theoretical and empirical evidence suggest that weak ties are important for widespread diffusion and adoption of new health behaviors or routines,[38] but there is perhaps a threshold of contact or intimacy that must be present.

Another challenge to recruitment was that HIV-related behaviors and testing were not common topics of conversation within these networks, which could have limited their effectiveness for a network-based referral strategy to promote testing. Participants also reflected that the practice of getting an HIV test itself is still not normative in their communities and many did not feel comfortable promoting this practice to people in their risk networks. Therefore, even when networks existed, the stigma around HIV testing was a barrier to referrals. Also, the limited overlap between "risk" and "personal" networks may have limited opportunities to reach out to peers who could be eligible but are not people that participants saw on a regular basis.

In addition to understanding the networks themselves, it is important to understand the context in which these operate as it can affect how people are able to take advantage of their network resources.[23,39,40] Key contextual factors, including the large geographic catchment area of the study and participants' work demands, hindered the feasibility of reaching the testing site to participate, delivering coupons to peers, and accompanying referrals to their study visit. Another contextual factor that may shape opportunities for network referral is the experience of ethnic and racial discrimination.[40] Participants described high levels of experiences of racial or ethnic discrimination, which could limit their ability to make social connections and create barriers to testing through processes of "othering."[40]

Our findings suggest several avenues for exploration in future research and/or programming. Our study site was situated within the office of a well-known community-based organization serving the Latino population in and around Durham. Gaining buy-in and promoting study activities more widely among staff, volunteers, and participants at the outset would likely expand the reach of similar prevention research efforts.[41] Establishing clear and concise eligibility criteria might mitigate confusion in the peer recruitment process. Finally, expanding access within the geographic catchment area through the inclusion of multiple testing sites, or targeting of venues where risk behaviors occur, may further increase access for those who are harder to reach through a more traditional respondent-driven approach. Future efforts at peer recruitment within this population that is both socially and geographically sparse may be improved through the incorporation of electronic or mobile recruitment invitations[42] and/or having multiple study sites or times of day to accommodate participants.

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Table 1: Description of Study Population Recruited through RDS (n=46)

	N	Median (range) or %
Age		32.5 (18-66)
Time in US		
Less than 10 years	16	34.8
10 or more years	30	65.2
Education		
Primary education or less	11	23.9
More than primary education	35	76.1
Place of Birth		
Mexico	33	71.7
Other LAC country	13	28.2
Gender		
Male	37	80.4
Other	9	19.6
Sexual Orientation		
Heterosexual	26	56.5
Homosexual/Gay	13	28.3
Bisexual	4	8.7
Other	3	6.5
Current Relationship Status		
Single	19	41.3
In relationship	27	58.7
Monthly Income ($)		1200 (0-6000)
Underemployed		
Yes	29	63.0
No	17	37.0
Social network		
Size of risk network		5.5 (0-50)
Have at least one friend/family member you could ask to accompany you to get health services		
Yes	39	84.8
No	7	15.2
Ever experienced discrimination based on race, ethnicity or skin color	19	41.3
Alcohol and drugs		
Binge Drinking in last 12 months	24	52.2
2+ alcoholic drinks daily in last 30 days	9	19.6
Use of illicit drugs in last 12 months	5	10.6
Sexual partners in last 12 months		2 (0-25)
0-1	19	41.3
2-5 partners	19	41.3
6-10 partners	4	8.7
11+ partners	4	8.7

Sex without condom with any partner in last 3 months	28	80.0
Sex without condom with non-stable partner in last 3 months	8	17.4
Sexual risk behaviors in the last 12 months		
Sex with a man	23	50.0
Concurrent sexual partnerships	15	32.6
Provided money for sex	6	13.0
Received money for sex	7	15.2
Sexually transmitted infection history		
Ever diagnosed with STI	7	15.2
STI symptoms in last 12 months	9	19.6
Diagnosed with STI in last 12 months	1	2.2
HIV Testing history		
Ever tested for HIV	35	76.1
Tested for HIV test in last 12 months	21	45.7

Table 2. Bivariate comparisons of demographic and behavioral characteristics by HIV testing history (n=46)

	Tested for HIV in last 12 months		Ever tested for HIV	
Demographic characteristics	**Yes (n=21)**	**No (n=25)**	**Yes (n=35)**	**No (n=11)**
Mean age	35.2	35.1	36.0	31.2
	N (%)			
Less than 10 years in the Unites States	7 (33.33)	9 (36.0)	11 (31.4)	5 (45.5)
Primary education or less	3 (14.3)	8 (32.0)	8 (22.9)	3 (27.3)
Born in Mexico	14 (66.7)	19 (76.0)	24 (68.6)	9 (81.8)
Male	15 (71.4)	22 (88.0)	27 (77.1)	10 (90.9)
Currently Single	8 (38.1)	11 (44.0)	14 (40.0)	6 (54.6)
Underemployed	14 (66.7)	15 (60.0)	24 (68.6)	5 (45.5)
Mean income	1172	1395	1314	1227
Network, behavior, and sexual history				
Mean size of risk network	11.8	9.4	12.2	5.3*
Median size of risk network	8	5	7	3
At least one friend/family member you could ask to accompany you to get health services	19 (90.5)	20 (80.0)	6 (17.1)	1 (9.1)
Ever experienced discrimination based on race, ethnicity or skin color	7 (33.3)	12 (48.0)	14 (40.0)	5 (45.4)
Binge drank in last 12 months	11 (52.4)	13 (52.0)	17 (48.6)	7 (63.6)
2+ drinks daily in last 30 days	3 (14.3)	6 (24.0)	7 (20.0)	2 (18.2)
Used of illicit drugs in last 12 months	4 (19.0)	1 (4.0)	5 (14.3)	0 (0.0)
Mean lifetime sexual partners	18.1	13.8	19.0	5.3 *
Median lifetime sexual partners (range)	10 (0-80)	10 (0-100)	10 (0-100)	5 (0-12)
Mean number of sexual partners in last 12 months	4.6	3.7	5.0	1.1**
Median recent sexual partners (range)	3 (0-20)	1 (0-25)	3 (0-25)	1 (0-3)
Reported sex without condom in last 3 months	13 (72.2)	15 (88.2)	20 (74.1)	8 (100.0)
Reported sex without condom with non-stable partner in last 3 months	4 (19.0)	4 (16.0)	28 (80.0)	10 (90.1)
Ever diagnosed with STI	3 (14.3)	4 (16.0	6 (17.1)	1 (9.1)
STI symptoms in last 12 months	3 (14.3)	6 (24.0)	7 (20.0)	2 (18.2)
In last 12 months…				
Sex with man	13 (61.9)	4 (17.4)	19 (54.3)	4 (36.4)
Concurrent sexual partnerships	13 (61.9)	18 (72.0)	22 (62.9)	9 (81.8)
Provided money or gifts for sex	4 (19.0)	2 (8.0)	6 (17.1)	0 (0.0)
Received money or gifts for sex	4 (19.0)	3 (12.0)	6 (17.1)	1 (9.1)

* $p<0.05$

** $p<0.01$

Table 3.Integration of risk network data from survey and qualitative social network inventory (n=14)

Gender	Sexual Orientation	Risk network size	Number recruited*	Personal Network		
				Size	Composition	Location**
Trans female	Bisexual	12	3	1	Mother	Country of origin
Male	Heterosexual	0	0	4	Brother, Friend, Father, Wife	NC and country of origin
Male	Heterosexual	4	3	5	2 Friends, Brother, Mother, Friend	NC and country of origin
Trans female	Homosexual/Gay	4	3	3	Mother, Father, Partner	NC and country of origin
Male	Homosexual/Gay	30	0	8	Mother, Step-father, Friend/sex partner, 2 Friends, 2 family friends, Workmate	All NC
Trans female	Heterosexual (has sex with men)	12	2	4	Ex-partner, Sister, Brother-in-law, Best friend	NC and other US states
Male	Heterosexual	50	0	6	Mother, Sister, 4 Friends	NC and country of origin
Male	Homosexual/Gay	8	0	4	Mother, Friend, Other Family	NC and country of origin
Male	Heterosexual	2	2	2	Friend, Brother	NC and other US states
Male	Heterosexual	5	1	6	Nephew, 3 Sisters, Brother-in-law, Pastor	All NC
Male	Homosexual	40	1	6	3 Friends, Brother-in-law, Uncle, Co-worker	All NC
Male	Heterosexual	8	2	4	Mother, Cousin, Brother, Girlfriend	All NC
Male	Heterosexual	3	0	3	Father, Mother, Daughter	All country of origin
Male	No response	3	1	4	2 friends, Mother, Brother	All NC

* Number of additional participants individual successfully recruited into survey arm of study

**NC=North Carolina