CONNECTIONS 24(2): 76-81 http://www.sfu.ca~insna/Connections-Web/Volume24-2/242-Ellen.pdf

Social Network Centrality and Sexual Experience Among a Household Sample of Urban African American Adolescents[1]

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Little is known about whether adolescents' sexual behavior is influenced by their place in their social networks. Adolescents who are central to a network may be affected differently by peer norms than a more peripheral network member. The objective of this study was to test the hypothesis that urban African American youth who are well-integrated into their peer networks, i.e., those with higher closeness centrality, would be more likely to be sexually experienced. The sample consisted of a probability based household telephone sample of African American adolescents (index participants) and three of their social friends. We enrolled 86 index adolescents and 111 close friends. We did not find an association between closeness centrality and sexual experience among the index adolescents. However, we did find an association among the friends ($p<.05$). Fifty percent of those with low closeness scores were sexually experienced while 74% of those with high closeness scores were sexually experienced. Adolescents' location in their social world is associated with sexual behavior among the close friends of a household sample of urban African American youth.

INTRODUCTION

The biological, emotional, and psychological vulnerability of adolescence accentuate potential negative outcomes of sexual activity, such as sexually transmitted diseases and unwanted pregnancy. Efforts intended to delay onset of sexual behavior would benefit from additional information about determinants of this behavior. One important area of investigation in this area is the role peers play in

[1]Funded, in part, by NIMH grant ROI MH 57234 and NIAID grant RO1 AI 36986

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the onset of sexual behavior (oral, anal, or vaginal intercourse). Studies show that adolescents' perceptions and attitudes about their peers' behaviors as well as the peers' self-reported behaviors are influential. Adolescents who perceive that their peers have actually engaged in sexual intercourse and those who perceive that their peers are accepting of sexual intercourse are more likely to be sexually experienced (Dolcini and Adler 1994; Ennett, Bailey, and Federman 1999; Ennett and Bauman 1996; Ennett, Bauman, and Koch 1994; Fletcher, Darling, and Dornbusch 1995; Sionean and Zimmerman 1999; Urberg *et al.* 1995; Wasserman and Faust 1994).

Little is known, however, about whether adolescents' sexual behavior is reflected by their place in the social network. Adolescents who are central to a network may be impacted by their friends' attitudes and behaviors differently than more peripheral network members. Information about the extent to which degree of integration into the social network impacts sexual behavior would provide valuable data for network based interventions (Hawkins *et al.* 1999; Latkin *et al.*, 1996).

Closeness centrality provides a meaningful way to assess adolescents' integration into the social network (Valente and Foreman 1998). Closeness centrality is defined as the sum of the number of steps it takes to get from the index person to all other people in their network and reflects how quickly information originating in the social network can reach the index person (Wasserman and Faust 1994). Thus, the first objective of this study was to test the hypothesis that young people who are well integrated into their peer networks, i.e., those with higher closeness centrality, would be more likely to be sexually experienced. Notably, we have chosen to study the networks of a community-based sample of adolescents because adolescents live in multiple worlds. Recent studies have concentrated on school-based social networks (Ennett, Bailey, and Federman 1999; Ennett and Bauman 1996; Ennett, Bauman, and Koch 1994; Urberg *et al.* 1995; Wasserman and Faust 1994). In reality, social networks are not limited to the school setting, and fellow students are may not necessarily be the peers of greatest influence (Way and Chen 2000).

The current paper presents an approach that randomly selects participants from a probability household population and then uses these index participants as the starting point for the recruitment of additional social network members. A potential bias associated with this methodology is that the procedures for recruiting participants may inflate centrality scores. The index participants are randomly selected and are a random mixture of central and non-central group members. However, participants recruited through the index participants are more likely to be well-integrated members of their social network because they were nominated as a friend and not randomly selected. Any association between centrality and sexual activity must first be adjusted for the artificial upward bias of centrality scores in the friends recruited through the index group. Another important confounder may be the age of the adolescent. Older adolescents may be more likely to be sexually experienced and older adolescents may also have had more time to develop friendship groups and become better integrated into these groups. Thus, our second objective was to examine the effects of index status and age on the relationship between closeness and sexual activity.

METHODS

Sample and Procedures

The sample consisted of a probability based household telephone sample (random digit dialing) of African American adolescents (telephone coverage in San Francisco is estimated to be between 95-100% (Lavrakas 1987)) and their social friends. Parental/guardian consent was obtained for those under 18 years of age and youth consent/assent was obtained for all participants. We initially screened household on residence (zip code), ethnicity (African American), and age eligibility (one adolescent household member). The cooperation rate for the initial household screening was 70%. All households meeting initial eligibility and consenting requirements continued with a fifteen-minute second screening that determined "friendship eligibility" (i.e., final eligibles had to have at least two close friends aged 13-21 living in or adjacent to the study neighborhood). In order to determine friendship

eligibility, participants were asked how many friends they had. Respondents who reported having more than one friend were then asked, "Now we would like to ask about your close friends. When we say close friends, we mean friends you may hang out with more than others, or trust more than others. How many close friends would you say you have?" Subsequent to this, youth were asked a series of questions about up to five or six close friends (Dunphy 1963) including information on friend's age, gender, and place of residence (by city and neighborhood within study city).

One hundred and sixty-four African American adolescents completed the telephone screening interviews. Seventy-three percent of initially eligible adolescents were subsequently eligible based on the friendship screening (n = 119). There were no statistically significant differences between the respondents meeting this final eligibility criteria and ineligible youth with respect to age, gender, school status, job status, or having a parent living in the household.

Next we conducted in-person interviews at our field office located in the study neighborhood. Index participants were asked to recruit up to three friends to participate in the study. Enrolled friends also completed an interview. Eighty-six of the eligible indexes completed the face-to-face interview and named 330 close friends (mean named = 3.6 friends, standard deviation = 1.4). One hundred eleven friends were successfully recruited into the study. We examined potential biases between indexes who recruited all the friends they attempted (46%), those who recruited some (38%), and those who recruited no friends (16%). There were no differences in success of recruitment by gender. Those who were unable to recruit any friends were somewhat older (16.7 years) than those who recruited all friends (15.6 years), $p = .05$, but did not differ in age from those who recruited some friends. Those who recruited some friends had listed more friends than those who recruited all their friends, $p = .05$.

Measures

The face-to-face interview covered multiple topics including demographic characteristics, sexual and other health compromising behaviours, and friendship issues. We present details of relevant measures below. The complete instrument is available from the authors.

Demographic Characteristics. We obtained the following demographic information: birth date, ethnicity, whether or not respondent was currently in school, level of education (highest grade completed), and whether or not respondent had a job.

Sexual Behavior. After a series of questions about non-coital sexual behaviours, we defined three types of sexual intercourse (vaginal, anal, and oral) and then we asked, "Some people have sex when they are teenagers and other people wait to have sex until they are older, and others never have sex. Have you ever had sex? Remember, that includes vaginal, anal, or oral sex."

Analysis

All friendship pairs (dyads), regardless of whether they were reciprocated or not, were used to create the relational matrix which was symmetrized and analyzed for closeness in UCINET 5.0. Data were then imported into SPSS 9.0 where we first examined the association between sexual activity and age, closeness, and index status (index vs. friend). Following this, we examined the association between closeness, age, and index status. Finally, in order to determine whether index status or age confounded or moderated the relationship between closeness and sexual activity, we stratified by index status and age to examine the association between closeness and sexual activity.

RESULTS

Of the 197 participants (indexes and friends), 110 (55.8%) were male. The mean age was 16.3 years (SD=1.5); 77.2% were between 13-16 years old (younger adolescents) and 22.8 were between 17-23 years old (older adolescents and young adults). Approximately 66% of participants were sexually experienced and of these 89% had been active within the past year. Thirty percent of participants had

closeness scores of .16 and 70% had scores of .17. Figures 1a and 1b are examples of components containing a low and high centrality score participants, respectively.

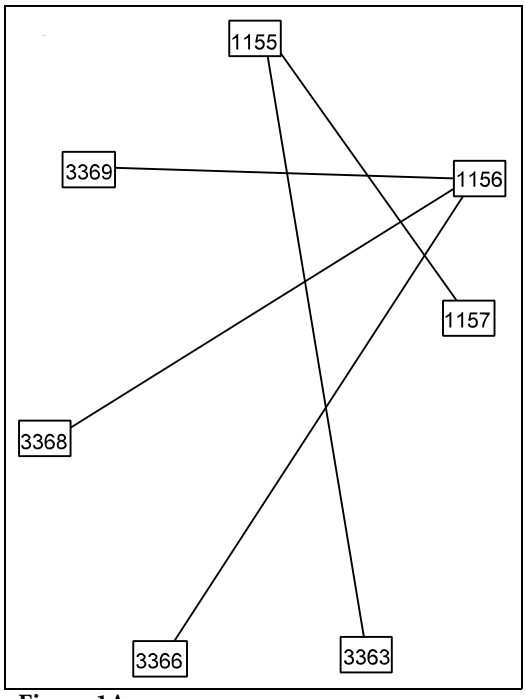

Figure 1A
Component with low centrality participants.

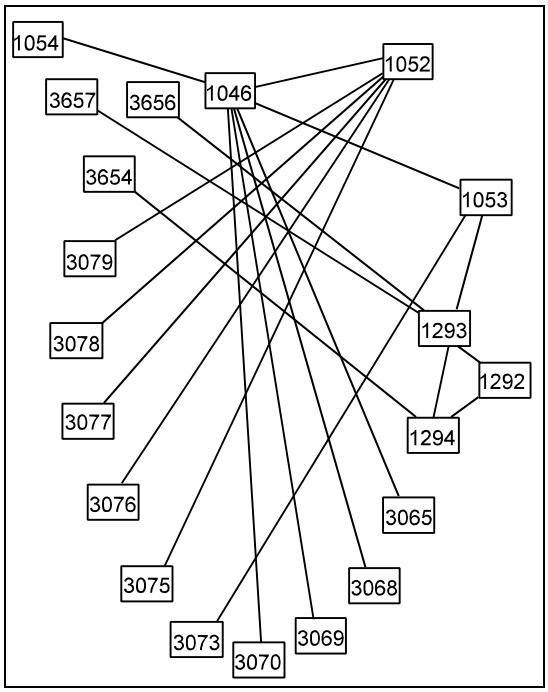

Figure 1B
Component with high centrality participants.

Table 1. The association between closeness and a history of having engaged in vaginal, anal, or vaginal sex stratified by index status (N=197)

		Sexually Experienced, %(n)		
Index Status	Closeness	Yes	No	p-value
Index	.16	68.6 (24)	31.4 (11)	
	.17	56.9 (29)	43.1 (22)	.273
Friend	.16	50.0 (12)	50.0 (12)	
	.17	73.6 (64)	26.4 (23)	.028

We found that older participants were more likely to be sexually experienced ($p<0.01$); 95.6% of participants aged 17 years and above were sexually experienced compared with 56.6% of participants aged 16 years and below. Neither index status nor closeness was related to sexual activity. We did find an association between index status and closeness ($p<0.01$). We found that 58.8% of index participants had closeness scores of .17 and 79% of friend participants had closeness scores of .17. In addition, we did not find an association between older age and closeness.

In order to further explore the relationship between closeness and sexual activity, we examined the relationship between closeness and sexual activity stratified by index status (index vs. friend). We found that index status moderated this relationship (Breslow-Day Test < 0.1). Among the index participants, there was not a significant relationship between closeness and sexual experience but among friend participants there was a significant association ($p<0.5$). Among friend participants, 50% of those with low closeness scores were sexually experienced while 74% of those with high closeness scores were sexually experienced. Finally, age did not moderate nor confound the relationship between closeness and sexual experience.

Next, we explored the extent to which our study procedures might have limited the range of closeness scores. First, we examined the size of all the network components. By definition, the size of the component is strongly correlated with the closeness scores of its members. Our study procedures — recruiting and interviewing only independently sampled index participants and up to three friends — clearly put some constraints on the size of the components. Thus, the greater the correlation between component size and closeness score, the more likely that our procedures limited the range of closeness scores. Both inspections of the graphs and quantitative analysis reveal that adolescents' closeness scores were related to size of their component. All adolescents with low centrality score were in smaller components (7 people or less) while all adolescents with high centrality scores were in larger components (8-36 people). When we tested whether component size confounded our results, we did not find a significant relationship between sexual activity and component size, overall and separately for indexes and friends ($p>.1$).

DISCUSSION

This study found that among nominated close friends of a random household sample of urban African American adolescents, those with higher closeness centrality scores are more likely to be sexually experienced. However, no such association exists among those in the household sample. The significant association among close friends supports our hypothesis that adolescents and young adults who are more highly connected to their peers are more likely to have engaged in sexual intercourse and is consistent with the previous studies showing popular students are more likely to have engaged in sexual intercourse (Dolcini and Adler 1994). As with all cross-sectional studies, it is difficult to determine cause and effect. It maybe that sexually experienced adolescents become more connected (e.g., popular) as a result of having had sex. Or, it might be that being more connected to their friends are more influenced by peer norms. We did not directly assess peer norms in this analysis, but our findings would suggest that in this population the norms favor engagement in sexual intercourse. Longitudinal studies are necessary in order to elucidate the pathway more clearly.

The difference in findings between the household sample of index adolescents and their close friends may be related to differences in recruitment procedures, which may have ultimately be related to difference in the characteristics of the adolescents in the two cohorts. One plausible but untested hypothesis is that adolescents recruited from their home are monitored by their parents more carefully than nominated friends (the household sample have to be at home to be enrolled in the study while the friends do not). Parental monitoring, in turn, may have mitigated the influence of peer networks on behavior, as more highly monitored adolescents would have fewer opportunities to engage in sexual behavior despite their centrality in their social network (Li, Stanton, and Feigelman 2000; Li, Feigelman, and Stanton 2000; Stanton *et al.* 2000).

While our study furthers the literature by using a community-based sample of urban adolescents at risk for STDs and HIV and a sociometric approach to explore the relationship between social network integration and sexual behavior, it is not without limitations. Limitations of this study are the low sample size and the lack of information on persons named in friendship grids who could not be contacted. In addition, the fact that we only recruited one generation of friends may have over or under estimated the actual centrality of each participant and the size of the components.

Our findings imply that an adolescent's location in their social world is associated with their behavior. Future studies of the determinants of adolescent sexual behavior would be served by adopting a social network approach, as this will increase our understanding of how peer networks influence adolescent sexual behavior.

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