The Positive Role of Social Networks and Social Networking Technology in the Condom-Using Behaviors of Homeless Young People

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SYNOPSIS

Objective. To examine the impact of condom-using peers in the social networks of homeless young people, differences in behaviors were assessed based on the social location of ties (home-based vs. street-based) and how those ties are maintained (face-to-face vs. via social networking technology).

Methods. "Ego-centric" social network data were collected from 103 currently sexually active homeless young people aged 16–26 years in Los Angeles, California. Associations between condom use and the condom-using behaviors of social network influences were assessed using standard logistic regression.

Results. About 52% of respondents had a street-based peer who was a condom user. Having such a peer was associated with a 70% reduction in the odds of having unprotected sex at last intercourse. About 22% of respondents had a condom-using, home-based peer with whom they communicated only via social networking technology. Having such a peer was associated with a 90% reduction in risky sexual behavior and a 3.5 times increase in safer sex behavior.

Conclusion. The study revealed several implications for new human immunodeficiency virus-prevention interventions that mobilize these networks and social networking technologies.

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There are a total of more than 1.6 million runaway and homeless young people each year.[1] The risk of human immunodeficiency virus (HIV) infection is a serious concern for this population, with prevalence rates ranging from 2% to 11%, depending on the urban center under investigation.[2–4] Negative peer influences in the social networks of homeless young people have been implicated in their HIV risk-taking behaviors.[5–9] Typically, the culture of adolescent homelessness has been described as largely filled with problematic influences, and the risk-taking behaviors of homeless young people have been thoroughly documented.[5,8–17] Of particular concern is that engagement with these problematic peers, primarily other homeless young people, has repeatedly been shown to be associated with increased HIV risk for homeless young people.[5–9]

Most research depicts the social networks of the young homeless population as small, transient, and homogeneous, comprised almost exclusively of other homeless young people.[13,18,19] Recently, however, a few studies have begun to acknowledge that the social networks of homeless young people are more complex than previously reported.[20–22] Johnson and colleagues found that more than 80% of their sample reported having at least one current network relationship formed prior to their life on the streets.[20] Likewise, Rice and colleagues found that 73% of their sample of newly homeless young people (i.e., those homeless for fewer than six months) claimed that most or all of their friends attended school regularly, 24% claimed that most or all of their friends had jobs, and 50% claimed that most or all of their friends got along with their families. Moreover, presence of these pro-social peers reduced HIV risk behaviors over time.[21] In a second study, Rice et al. examined young people living on the streets for longer than six months and found that networks containing pro-social peers were associated with a reduction in the likelihood of engaging in sexual risk-taking, while networks containing peers who were engaged in HIV risk-taking behaviors were associated with increased HIV risk-taking behaviors among homeless young people.[22]

What remains unclear in these studies is which peers were the source of positive influence. Were the pro-social peers other young people living on the street, or were they home-based peers (i.e., relationships formed prior to life on the streets)? Street-based peers have been shown to provide essential emotional and street-survival support,[23–25] but can they also provide other positive influences (e.g., a reduction in sex and drug risk behaviors), or are the positive influences reported in adolescent homeless networks[21,22] a result of continued engagement with pro-social, home-based peers? Without more sophisticated social network data, it is impossible to fully understand the nature of these pro-social influences.

Access to social networking technology (e.g., the Internet, cellular telephones, and text messaging) may improve the sexual health of homeless young people. There is an emerging body of work that debates the health benefits of Internet access for adolescents in the general population.[24–31] For homeless young people, the health benefits of social networking technology are likely to be related to the people with whom they are communicating. Insofar as social networking technology facilitates maintaining contact with pro-social, home-based peers, who have been shown to reinforce healthy sexual behaviors,[21,22] the use of social networking technology to communicate with these peers should be associated with healthier sexual behavior.

Given the ubiquity of social networking technology in the lives of adolescents,[27–29] it is entirely likely that the young homeless population, though resource poor, will use social networking technologies to maintain their relationships with home-based peers. Indeed, one study of homeless young people in Los Angeles reported that they accessed the Internet an average of 4.4 days each week, and used social networking websites such as MySpace and Facebook about 3.3 days each week to connect with friends, family, and employers.[32]

The purpose of this study was to assess the condom-using behaviors of homeless young people and to explore the associations between condom use and social network characteristics. In particular, this study used condom use among peers as an indicator of pro-social behaviors. Using detailed "ego-centric" network data,[33] the study explored how connections to condom-using peers from different social network positions are associated with condom-using behaviors of homeless young people. In particular, this analysis explored differences in home-based vs. street-based network ties and face-to-face ties vs. ties maintained through social networking technologies. As such, this study provides unique insights into which peers provide support for condom use and how social networking technology may help maintain pro-social connections, lending new insights to possible HIV-prevention strategies for the young homeless population.

METHODS

Sample

A sample of 136 young people (aged 13–24 years) was recruited between June 19 and August 21, 2008, in Los Angeles, California, at one drop-in agency serving homeless young people. Any client aged 13–24

years receiving services at the agency was eligible to participate. In 2008, the agency saw 1,860 individual young people who visited a total of 30,575 times. Clients were divided evenly along gender lines, and 200 of the young people served in 2008 were younger than 18 years of age. Clients were 41% African American, 22% Caucasian, 19% Latino, 2% Asian/Pacific Islander, 9% mixed ethnicity, and 7% other ethnicity. During this time period, the agency saw 617 young people.

This study used a convenience sample including a subset of the 103 currently sexually active young people. Young people volunteered to participate in the survey at the same time they signed up to receive services (e.g., a shower, clothing, or case management) at the agency. A consistent set of two research staff members was responsible for all recruitment to prevent young people from completing the survey multiple times. Signed voluntary informed consent was obtained from each youth, with the caveats that physical or sexual abuse as well as suicidal and homicidal feelings would be reported. Informed consent was obtained from youth aged 18 years and older. For minors, consent was obtained *in loco parentis* from an agency staff member, who was not part of the research team, and informed assent was obtained from participants. Interviewers received approximately 40 hours of training, including lectures, role-playing, mock surveys, ethics training, and emergency procedures.

Procedures

All surveys were conducted in a private space at the agency. The survey consisted of two distinct parts. Both parts of the interview lasted approximately 60 minutes in total. All participants received a $20 gift card as compensation for their time. Survey items and procedures were approved by the University of California at Los Angeles Institutional Review Board.

Part one was a computer-administered self-interview in which the participants answered survey items pertaining to demographics, sex and drug risk-taking behavior, living situation, service utilization, and mental health. Part two was a face-to-face network mapping interview conducted by a trained interviewer that collected egocentric network data from each participant.[33] First, interviewers explained that they were interested in collecting information about the person's social network in the previous month. The following text was read aloud: "Think about the last month. Now I am going to draw a map of your network. We are interested in the people you interact with. We're interested in the people you talk to, people you hang out/kick it/chill with, people you have sex with or hook up with, people you party with, or drink or use drugs with."

Next, the interviewer wrote the person's name in the center of a large piece of white paper. The interviewer then read a series of prompts to the participant to elicit network nominations. After each prompt, interviewers recorded nominations on the paper in a large arc around the person's name. The following prompts were always read: "friends; family; people you hang out with/chill with/kick it with/have conversations with; people you party with—use drugs or alcohol with; boyfriend/girlfriend; people you are having sex with; baby mama/baby daddy; case worker or agency staff; people from school; people from work; old friends from home; people you talk to (on the phone, by e-mail); people from where you are staying (squatting with); people you see at this agency; other people you know in Hollywood."

After participants finished nominating people, a series of questions about type of ties and attributes of each nomination were then asked. The interviewers were trained to ask the respondents about each attribute of every nomination on the page and record all responses. Responses were then entered into a database by a research assistant and checked for quality assurance by another research assistant after the interview. This technique yielded standard ego-centric network data.[33] This mapping activity, however, provided a visual stimulus that enhanced the person's ability to focus on providing a large quantity of social network data, while simultaneously reducing participant burden.

Measures

All demographic variables were coded from self-reported data. Sexual-risk items were drawn from the Centers for Disease Control and Prevention's Youth Risk Behavior Study.[34] Sex risk was assessed via two questions: "During the past three months, with how many people did you have sexual intercourse?" and "The last time you had sexual intercourse, did you or your partner use a condom?" The sample was limited to those young people who reported one or more partners in the past three months. Three dummy variables were coded from these two items and subsequently used as the dependent variables in the multivariate analyses; the first two were coded for risky sexual behaviors, while the final was coded for safer sexual behavior:

1. Unprotected sex at last intercourse: coded 1 for those who reported "no" to condom use at last intercourse,
2. Unprotected sex and multiple partners: coded 1 for those who reported "no" to condom use at last intercourse and two or more sex partners in the previous three months, and

3. One partner and condom user: coded 1 for those who reported "yes" to condom use during last intercourse and reported only one partner in the previous three months.

Social network variables were coded independently for each respondent based on that respondent's ego-centric network data. All parent and case worker/agency staff nominees were removed from the data to focus the analysis on peer influences. Network size was coded based on the total number of remaining nominees. Two types of network ties were recorded: face-to-face ties (i.e., "who do you spend time with face-to-face, hanging out, chilling with, or have conversations with") and electronic ties (i.e., "who do you only communicate with by phone, e-mail, or texting in the past month").

Several attribute variables were also created. Participants were asked from where they knew each nomination (e.g., "home, before you became homeless" or "Hollywood, after you became homeless"). Finally, the respondents were asked which of their peers were sexually active, and then of those who were sexually active, who was a regular condom user. Three dummy variables were created from the tie and attribute data to describe the presence of condom-using peers of different types. Home-based, electronic condom user was coded 1 for those who had at least one nominee whom they knew from home, with whom they only had electronic interactions, and was believed to be a regular condom user. Home-based, face-to-face condom user was coded 1 for those who had at least one nominee whom they knew from home, with whom they had face-to-face interactions in the previous month, and was believed to be a regular condom user. Street-based, face-to-face condom user was coded 1 for those who had at least one nominee whom they knew from street life, with whom they had face-to-face interactions, and was believed to be a regular condom user.

Analysis

Because ego-centric network data assess the social network of each individual respondent independently of one another, they can be transformed into variables that can be incorporated into standard linear modeling techniques. For this study, we ran three separate multivariate logistic regression models, assessing the associations among sex risk, network properties, and demographic characteristics of homeless young people. Network composition variables were entered in all three models, as were demographic characteristics (i.e., gender, age, race, living situation, sexual identity), which have been associated with sex-risk behaviors among homeless young people in previous studies.[6–10]

RESULTS

Table 1 presents the demographic profile of the 103 sexually active young people under investigation. Most respondents were older than 18 years of age and slightly more males were surveyed than females. There was a diversity of racial/ethnic groups, with no group having a simple majority. Although the respondents' housing situations were diverse, the vast majority of the young people were either actively homeless or living in a precarious housing situation. Fewer than half

Table 1. Demographic profile of homeless young people[a] (*n*=103), Los Angeles, 2008

Demographic characteristics	N	*Percent*
Gender		
Female	43	41.8
Male	60	58.3
Sexual orientation		
Gay, lesbian, or bisexual	12	11.7
Race/ethnicity		
African American	34	33.0
Latino	24	23.3
White	21	20.4
Mixed race/ethnicity	17	16.5
Other	7	6.8
Current living situation		
Family home	6	5.9
Relative's home	3	2.9
Friend's home	15	14.7
Family group home	2	2.0
Shelter	15	14.7
Hotel, motel	8	7.8
Own apartment	8	7.8
Street, squat, abandoned building	35	34.3
Other	10	9.8
Education and employment		
Currently employed	20	19.6
High school graduate	41	39.8
GED	19	18.4
Currently enrolled in school	22	21.6
System involvement history		
Foster care	34	33.0
Child protective services	26	25.2
Juvenile probation	27	26.2
Adult probation	26	25.2
Group home	35	34.0
Sex and condom use		
Sexually active, previous 90 days	103	100.0
Unprotected sex at last intercourse	57	55.3
Multiple sex partners, previous 90 days	45	43.7
One partner and condom user	27	26.2
Unprotected sex and multiple partners	26	25.2

[a]Respondents ranged in age from 16 to 26 years, with a mean age of 20.9 years (standard deviation = 2.2).

GED = general equivalency diploma

of the respondents were high school graduates, and only 20% were employed at the time of the interview. Approximately one-third of the respondents had been in foster care and one-third had also experienced living in a group home.

Table 2 presents the social network characteristics of the sample. The relatively large standard deviation for network size suggests a great diversity in the size of networks reported. Attributes of network members, however, showed more homogeneity. Almost every respondent reported having one or more street-based peers in his/her network. Likewise, nearly three-fourths of the respondents reported having a home-based peer with whom they had face-to-face interactions in the past month, and slightly more than half of the respondents reported having interacted with a home-based peer via social networking technology (i.e., the Internet, phone, or texting). The number of young people reporting at least one condom user among these various peer types was substantially less. Approximately half reported having a street-based tie, 38% reported a face-to-face home-based tie, and only 22% reported an electronically maintained home-based tie, who they perceived to be a condom user.

All of the respondents in this sample were sexually active in the three months prior to being surveyed. More than half (55%, $n=57$) of the respondents reported having sex without using a condom at their most recent sexual encounter. Moreover, 25% ($n=26$) of the respondents reported having multiple sex partners in the previous three months and not using condoms at their last sexual intercourse. Conversely, 26% ($n=27$) reported having a single sex partner in the previous three months and condom use at last intercourse (Table 1).

Table 2. Social network characteristics of ego-centric networks of homeless young people (*n*=103), Los Angeles, 2008

Characteristics	*Mean*	*Standard deviation*
Total network size	13.3	8.0
Network density	0.2	0.2
Number of network ties by tie type		
Street-based, interpersonal	7.4	6.9
Home-based, interpersonal	2.9	3.3
Home-based, electronic	1.5	2.0
Number of condom-using peers by tie type		
Street-based, interpersonal	2.3	3.7
Home-based, interpersonal	0.9	2.0
Home-based, electronic	0.3	0.6

Table 3 presents the multivariate logistic regression models. Across all three models, social network variables were consistently associated with condom use among the homeless young people under investigation. In Model 1, having at least one street-based, condom-using peer was associated with a 70% reduction in the odds of reporting unprotected sex at last intercourse. In Model 2, having at least one home-based, condom using peer with whom the respondent interacted via electronic media was associated with a 90% reduction in the odds of unprotected sex and multiple partners. Heterosexual young people, relative to gay, lesbian, and bisexual young people, were less likely to have unprotected sex and multiple partners. In Model 3, having at least one home-based, electronically mediated, condom-using peer was associated with a nearly 3.5 times increase in the odds of reporting one partner and condom user. Those who reported larger social networks were less likely to report only one partner and condom use.

DISCUSSION

Several important results emerged from this study. First, with respect to condom use, most homeless young people had at least one pro-social peer, whether that tie was a face-to-face tie with another street youth, a face-to-face tie with a home-based peer, or an electronically mediated tie with a home-based peer. This was in keeping with a growing body of literature demonstrating that homeless young people continue to engage with pro-social network ties.[20–22] Having a pro-social (i.e., condom-using) peer was associated with increased condom usage, which is also in keeping with recent work on the protective nature of pro-social peers.[21,22]

Second, social networking technology helped young people maintain home-based ties. More than half of the respondents in the sample reported having at least one peer with whom they interacted in the previous month via the Internet, telephone, or texting only. Perhaps more important still, nearly one-quarter of the respondents also reported that these home-based peers with whom they communicated via social networking technology were condom users, and, hence, pro-social with respect to sex risk. While the consequences of social networking technology on the health and mental health of adolescents is a topic of heated debate,[24–31] for homeless young people, it appears that social networking technologies helped them maintain connections with pro-social peers, which in turn increased healthy sexual behaviors and reduced sexual risk-taking.

Third, the social location of a condom-using peer and how that tie was maintained were both important

Table 3. Multivariate logistic regression models of sexual risk-taking by homeless young people (*n*=103), Los Angeles, 2008

	Model 1		Model 2		Model 3	
	Unprotected sex at last intercourse		Unprotected sex and multiple partners past 90 days		Condom used and one partner past 90 days	
Demographic characteristics	*Odds ratio*	*95% CI*	*Odds ratio*	*95% CI*	*Odds ratio*	*95% CI*
Male	0.42	(0.16, 1.11)	1.25	(90.38, 4.12)	1.59	(0.53, 4.77)
Gay, lesbian, bisexual	5.08	(0.90, 28.54)	4.81	(1.09, 21.3)[a]	0.56	(0.09, 3.56)
African American	1.19	(0.35, 4.02)	1.66	(0.39, 7.07)	1.14	(0.30, 4.33)
Latino	0.97	(0.26, 3.53)	0.19	(0.03, 1.23)	0.80	(0.18, 3.64)
White	0.72	(0.19, 2.78)	1.16	(0.26, 5.25)	0.55	(0.12, 2.57)
Age	1.16	(0.93, 1.43)	1.07	(0.82, 1.39)	0.96	(0.76, 1.21)
Street/squat	1.52	(0.54, 4.28)	1.86	(0.53, 6.51)	0.69	(0.21, 2.26)
Network size	1.02	(0.96, 1.09)	1.08	(1.00, 1.16)	0.92	(0.85, 0.99)[a]
Condom user in network						
Home-based, electronic tie	0.47	(0.15, 1.44)	0.09	(0.01, 0.68)[a]	3.47	(1.10, 10.93)[a]
Home-based, interpersonal tie	0.83	(0.30, 2.32)	1.57	(0.44, 5.64)	2.31	(0.72, 7.42)
Street-based, interpersonal tie	0.30	(0.12, 0.82)[a]	0.50	(0.15, 1.67)	2.33	(0.71, 7.66)
−2 log likelihood	120.97		92.46		98.18	

[a] $p<0.05$

CI = confidence interval

with respect to the association with condom use for homeless young people. Those who reported having at least one street-based peer (i.e., another homeless young person) who was a condom user were more likely to also report having used a condom themselves at their last intercourse. Those who reported having a home-based, condom-using peer with whom they communicated via social networking technologies were more likely to report safer sex behaviors, as well as less likely to report risky sexual behaviors. These are the first data to report exactly what type of pro-social peer (i.e., condom-using, street- or home-based, face-to-face or electronic) in the network of a homeless young person can support sexual health, by way of reinforcing condom-using behaviors. These data suggest that homeless young people may have multiple "reference groups"[35,36] with whom they are evaluating their own behaviors. School-based research on adolescents has demonstrated that young people's perceptions of the norms and values of their peers are strongly associated with their risk-taking and antisocial behaviors.[37–41] These results suggest that homeless young people may perceive the risk-taking norms and values of street-based peers and home-based peers differently, yet perceptions of the behaviors of both reference groups were associated with the young people's own condom-using behaviors.

Limitations

There were three important limitations to this study. First, these data are not causal. One cannot say that having a condom-using street peer caused young people to use condoms. It was just as likely that young people who themselves were condom users attributed their healthy behaviors to highly regarded peers in their network; thus, in effect, labeling them pro-social. Young people, however, tend to misperceive the risk-taking behaviors of their peers, yet their perceptions of those peers' behaviors (erroneous or not) are strongly associated with their own behaviors.[37–41] Put simply, perceptions matter to adolescents.

Second, these data are imprecise with respect to the use of social networking technology. Unfortunately, these data do not differentiate among ties maintained through e-mail, social networking websites such as MySpace or Facebook, a cellular telephone, texting, or even a standard phone accessed at a social service agency.

Third, these data are drawn from a convenience sample and are subject to the biases of such a sampling strategy. In particular, it is possible that more pro-social young people, who have more pro-social peers, were apt to volunteer for the survey and, thus, these data may be slightly biased toward pro-social young people and their network behaviors. Data collected from homeless young people, however, are almost always drawn from convenience samples. The lack of residential stability or institutional attachments inherent to homelessness make residential or school-based sampling strategies impossible, and often convenience sampling at agencies serving young people is the only viable way to collect data from this population.

CONCLUSIONS

Two important future directions for research stem from this study. First, given the importance of electronically mediated pro-social peers to homeless young people, a great deal more information about just how homeless young people utilize social networking technology is needed. It is easy to assume that resource-poor populations, such as homeless young people, lack access to cellular telephones and the Internet; yet, most of these young people had at least one peer with whom such means were the primary mode of communication. In general, more research is needed on how resource-poor communities are accessing new technologies, and homeless young people would be an ideal starting point.

A qualitative study examining how young people utilize social networking technologies to access their pro-social peers from home and what the quality and character of those relationships are would be informative. In addition, a longitudinal social network assessment of homeless young people and how they maintain these pro-social relationships over time and across space via social networking technology would help elucidate the processes through which such relationships mediate risk and encourage healthy sexual behaviors over time.

Second, these findings suggest a novel approach for HIV prevention among homeless young people; namely, a social networking technology-based intervention. Because communicating via electronic means with peers who are perceived to be condom users is associated with safer sex behaviors and reduced sexual risk-taking, designing an intervention to promote such conversations, taking advantage of social networking technologies as a platform for that communication, could be an engaging and impactful new modality for HIV prevention with these socially dislocated young people.

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REFERENCES

1. Ringwalt CL, Greene JM, Robertson M, McPheeters M. The prevalence of homelessness among adolescents in the United States. Am J Public Health 1998;88:1325-9.
2. Stricof RL, Kennedy JT, Nattell TC, Weisfuse IB, Novick LF. HIV seroprevalence in a facility for runaway and homeless adolescents. Am J Public Health 1991;81(Suppl):50-3.
3. Schalwitz J, Goulart M, Dunnigan K, Flannery D. Prevalence of sexually transmitted diseases (STD) and HIV in a homeless youth medical clinic in San Francisco. Presented at the Sixth International Conference on AIDS; 1990 Jun 20–23; San Francisco.
4. Pfeifer RW, Oliver J. A study of HIV seroprevalence in a group of homeless youth in Hollywood, California. J Adolesc Health 1997;20:339-42.
5. Unger JB, Kipke MD, Simon TR, Montgomery SB, Johnson CJ. Homeless youths and young adults in Los Angeles: prevalence of mental health problems and the relationship between mental health and substance abuse disorders. Am J Community Psychol 1997;25:371-94.
6. Whitbeck LB, Hoyt DR, Yoder KA. A risk-amplification model of victimization and depressive symptoms among runaway and homeless adolescents. Am J Community Psychol 1999;27:273-96.
7. Tyler KA, Hoyt DR, Whitbeck LB, Cauce AM. The effects of a high-risk environment on the sexual victimization of homeless and runaway youth. Violence Vict 2001;16:441-55.
8. Rice E, Milburn NG, Rotheram-Borus MJ, Mallett S, Rosenthal D. The effects of peer-group network properties on drug use among homeless youth. Am Behav Sci 2005;48:1102-23.
9. Booth RE, Zhang Y. Conduct disorder and HIV risk behaviors among runaway and homeless adolescents. Drug Alcohol Depend 1997;48:69-76.
10. Kipke MD, Montgomery SB, Simon TR, Iverson EF. "Substance abuse" disorders among runaway and homeless youth. Subst Use Misuse 1997;32:969-86.
11. Greene JM, Ennett ST, Ringwalt CL. Substance use among runaway and homeless youth in three national samples. Am J Public Health 1997;87:229-35.
12. Clatts MC, Davis WR, Sotheran JL, Atillasoy A. Correlates and distribution of HIV risk behaviors among homeless youths in New York City: implications for prevention and policy. Child Welfare 1998;77:195-207.
13. Ennett ST, Federman EB, Bailey SL, Ringwalt CL, Hubbard ML. HIV-risk behaviors associated with homelessness characteristics in youth. J Adolesc Health 1999;25:344-53.
14. Fors SW, Rojek DG. A comparison of drug involvement between runaways and school youths. J Drug Educ 1991;21:13-25.
15. Johnson TP, Aschkenasy JR, Herbers MR, Gillenwater SA. Self-reported risk factors for AIDS among homeless youth. AIDS Educ Prev 1996;8:308-22.
16. Rotheram-Borus MJ, Meyer-Bahlburg HF, Rosario M, Koopman C, Haignere CS, Exner TM, et al. Lifetime sexual behaviors among predominantly minority male runaways and gay/bisexual adolescents in New York City. AIDS Educ Prev 1992;Suppl:34-42.
17. Yates GL, MacKenzie R, Pennbridge J, Cohen E. A risk profile comparison of runaway and non-runaway youth. Am J Public Health 1988;78:820-1.
18. Whitbeck LB, Hoyt DR. Nowhere to grow: homeless and runaway adolescents and their families. Hawthorne (NY): Aldine de Gruyter; 1999.
19. Tyler KA. Social network characteristics and risky sexual and drug related behaviors among homeless young adults. Soc Sci Res 2008;37:673-85.
20. Johnson KD, Whitbeck LB, Hoyt DR. Predictors of social network composition among homeless and runaway adolescents. J Adolesc 2005;28:231-48.
21. Rice E, Milburn NG, Rotheram-Borus MJ. Pro-social and problematic social network influences on HIV/AIDS risk behaviours among newly homeless youth in Los Angeles. AIDS Care 2007;19:697-704.
22. Rice E, Stein JA, Milburn N. Countervailing social network influences on problem behaviors among homeless youth. J Adolesc 2008;31:625-39.
23. Hagan J, McCarthy B. Streetlife and delinquency. Br J Sociol 1992;43:533-61.
24. Lobelo F, Dowda M, Pfeiffer KA, Pate RR. Electronic media exposure and its association with activity-related outcomes in female adolescents: cross-sectional and longitudinal analyses. J Phys Act Health 2009;6:137-43.
25. LaJoie AS, Ridner SL. Health information and health risk behaviors in a sample of college students. J Ky Med Assoc 2009;107:58-63.
26. Bilardi JE, Sanci LA, Fairley CK, Hocking JS, Mazza D, Henning

DJ, et al. The experience of providing young people attending general practice with an online risk assessment tool to assess their own sexual health risk. BMC Infect Dis 2009;9:29.
27. Boyd D. Why youth "heart" social network sites: the role of networked publics in teenage social life. In: David Buckingham, editor. Youth, identity, and digital media. The John D. and Catherine T. MacArthur Foundation Series on Digital Media and Learning. Cambridge (MA): The MIT Press; 2008. p. 119-42.
28. Gross EF, Juvonen J, Gable SL. Internet use and well-being in adolescence. J Soc Issues 2002;58:75-90.
29. Lange PG. Publicly private and privately public: social networking on YouTube. Journal of Computer-Mediated Communication 2007;13(1):article 18 [cited 2009 Apr 30]. Available from: URL: http://jcmc.indiana.edu/vol13/issue1/lange.html
30. Gray NJ, Klein JD, Noyce PR, Sesselberg TS, Cantrill JA. Health information-seeking behaviour in adolescence: the place of the Internet. Soc Sci Med 2005;60:1467-78.
31. Juvonen J, Gross EF. Extending the school grounds? Bullying experiences in cyberspace. J Sch Health 2008;78:496-505.
32. Bender K, Ferguson K, Pollio D, Thompson S, McClendon J. Technology as an underutilized tool for providing health services and support to street youth. Paper presented at the 2009 Meeting of the American Public Health Association; 2009 Nov 7–11; Philadelphia. Also available from: URL: http://apha.confex.com/apha/137am/webprogram/Paper199105.html [cited 2010 Feb 18].
33. Wasserman S, Faust K. Social network analysis: methods and applications. Cambridge (UK): Cambridge University Press; 1994.
34. Centers for Disease Control and Prevention (US). 2007 Youth Risk Behavior Survey [cited 2008 Apr 15]. Available from: URL: http://www.cdc.gov/yrbss
35. Merton RK. Social theory and social structure. Glencoe (IL): Free Press; 1957.
36. Fisher JD. Possible effects of reference group-based social influence on AIDS-risk behavior and AIDS prevention. Am Psychol 1988;43:914-20.
37. Berndt TJ. Developmental changes in conformity to peers and parents. Developmental Psychology 1979;15:608-16.
38. Sussman S, Dent CW, Mestel-Rauch J, Johnson CA. Adolescent nonsmokers, triers, and regular smokers' estimates of cigarette smoking prevalence: when do overestimations occur and by whom? J Appl Soc Psychol 1988;18:537-51.
39. Collins LM, Sussman S, Rauch JM, Dent CW, Johnson CA, Hansen WB, et al. Psychosocial predictors of young adolescent cigarette smoking: a sixteen-month, three-wave longitudinal study. J Appl Soc Psychol 1987;17:554-73.
40. Graham JW, Marks G, Hansen WB. Social influence processes affecting adolescent substance use. J Appl Psychol 1991;76:291-8.
41. Marks G, Graham JW, Hansen WB. Social projection and social conformity in adolescent alcohol use: a longitudinal analysis. Pers Soc Psychol Bull 1992;18:96-101.