BRIEF REPORT

Homeless But Connected: The Role of Heterogeneous Social Network Ties and Social Networking Technology in the Mental Health Outcomes of Street-Living Adolescents

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Abstract Although social integration tends to have positive effects on the mental health of housed adolescents, the role of homeless adolescents' social networks is more ambiguous. Social network data were collected from 136 homeless adolescents in Hollywood, California to examine how network ties are associated with symptoms of anxiety and depression. Face-to-face relationships with street-based peers were a risk factor for both anxiety and depression, while contacting home-based friends through social networking technology was found to be protective for depression. Community-based and public agencies serving homeless adolescents should consider facilitating the maintenance of these protective relationships by providing internet access.

Keywords Depression · Anxiety · Homeless youth · Internet · Social network

Mental Health of Homeless Adolescents

Although prevalence rates of psychological disturbance vary widely among samples of homeless adolescents (Sleegers et al. 1998), it is well documented that this population is at higher risk than the general adolescent population for many mental health issues (Craig and Hodson 1998; Unger et al. 1997; Whitbeck et al. 2004). In fact, about two-thirds of homeless adolescents have at least one psychiatric disorder meeting DSM IV-R criteria (Cauce et al. 2000; Craig and Hodson 1998). Specifically,

about one-third of homeless adolescents have had a depressive disorder, and about one-fifth have had an anxiety disorder at some point during their lives Sleegers et al. 1998; Whitbeck et al. 2004; Yoder et al. 2008). Additionally, about 36% of homeless and runaway adolescents meet lifetime criteria for post-traumatic stress disorder (PTSD); though this rate varies widely based on gender, with females presenting with higher rates than males (Cauce et al. 2000; Whitbeck et al. 2007). Female homeless adolescents also have significantly greater rates of depression and other psychological disorders than their male counterparts (Cauce et al. 2000; Rohde et al. 2001; Unger et al. 1997; Whitbeck et al. 2000, 2004). While some studies indicate that African-American and Latino homeless adolescents are at higher risk for depression than their White counterparts (Fitzpatrick et al. 2005; Unger et al. 1998), others have found no significant association between race and depression (Unger et al. 1997). Homeless and runaway adolescents are six times more likely than the general American adolescent population to meet criteria for two or more mood disorders; thus, many homeless adolescents experience a high degree of comorbidity of psychological symptoms (Whitbeck et al. 2004). Furthermore, homeless adolescents may also suffer from low self-esteem, suicidal thoughts, suicide attempts, and self-injurious behavior (Unger et al. 1997).

While there are multiple possible etiologies of depression at play in this population, having an abusive family history has a direct effect on depressive symptoms, even after controlling for gender, race, and other relevant variables (Bao et al. 2000). Depressive symptoms frequently co-occur with substance use, conduct problems, and dangerous sexual encounters (Hallfors et al. 2004; Whitbeck et al. 2000) and have been associated with higher odds of arrest (Chen et al. 2006). The high prevalence of these psychological

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conditions can severely impact homeless adolescents' wellbeing and life outcomes (Chen et al. 2006; Rohde et al. 2001; Unger et al. 1997; Whitbeck et al. 2000, 2007).

The Impact of Social Connection and Isolation on Adolescent Mental Health

In the general population of adolescents, peer relationships exert great force on individuals' mental health and wellbeing (Bearman and Moody 2004; Fitzpatrick et al. 2005; Hall-Lande et al. 2007; La Greca and Harrison 2005). For the average American teen, being socially-integrated improves psychological outcomes, while social isolation worsens them. Teens who are socially isolated demonstrate higher rates of depression (Fitzpatrick et al. 2005; Hall-Lande et al. 2007). Socially-isolated teens also tend to think about suicide more than teens with friends (Bearman and Moody 2004).

Some scholars have challenged the notion that purely having relationships is always beneficial and that social isolation is not necessarily a risk factor for poor mental health; instead they posit that the type and quality of the relationships can produce differential results in individuals. For instance, Lincoln (2000) suggests a need to examine the multidimensional nature of social support, as the negative interactions resulting from some relationships can potentially be more harmful than the benefits derived from the support provided in those relationships. Research on adolescents also indicates the need to conceptualize positive and negative relationships as distinct constructs–affiliation with a peer crowd can protect against psychological disturbances such as social anxiety, while negative peer relationships can have detrimental effects, including an increase in depressive symptoms (La Greca and Harrison 2005). In fact, adolescents who feel socially isolated have higher odds of suicide attempts, lower levels of self-esteem, and higher rates of depressive symptoms (Hall-Lande et al. 2007).

Countervailing Influences of Social Environment on Homeless Adolescents

Among homeless adolescents exists a complex web of influences, one that is difficult to disentangle in hopes of isolating specific factors leading to better or poorer mental health and life outcomes. Some literature indicates that social support can improve mental health outcomes (e.g., depression) and reduce risky drug and sex behaviors (Ennett et al. 1999; Johnson et al. 2005; Unger et al. 1998). Other studies support an alternative hypothesis: homeless adolescents' social networks typically do more harm than good

since they are largely comprised of other homeless adolescents, many of whom come from problematic backgrounds and engage in risky and/or deviant behavior (Whitbeck and Hoyt 1999; Whitbeck et al. 1999). When social networks are comprised largely of deviant adolescents, the risks associated with living on the streets are magnified for individuals operating within those networks. Additional support for this model can be found in subsequent studies (e.g., McMorris et al. 2002; Tyler et al. 2000).

However, others have found that the social networks of homeless adolescents are more heterogeneous than previously thought (Johnson et al. 2005). Networks are comprised not only of other street youth, but also include relationships from adolescents' home communities, including family members, friends, and non-related adults. Furthermore, various dimensions and characteristics of heterogeneous social networks have differential effects on homeless adolescents. Homeless adolescents' social networks can and do include pro-social relationships that contribute to positive outcomes for the individual. Pro-social peer relationships reduce homeless adolescents' risk behaviors and anti-social behaviors (Rice et al. 2007, 2008). The longer adolescents are homeless, the less likely they are to have pro-social peers, and the more likely the proportion of anti-social and risk-taking peers in their networks increases (Rice et al. 2008). Moreover, the social location of the relationship (street versus home community) contributes to adolescents' risk behavior; for homeless adolescents who retain pro-social, home-based peers are less likely to engage in high-risk behavior (Rice 2010).

Modern social networking technologies such as email, cell phones, and social networking websites (e.g., Facebook, MySpace) are facilitating connections to pro-social, home-based ties for homeless adolescents (Rice 2010; Rice et al. 2010). Homeless adolescents report connecting to a wide array of street-based, family, and home-based ties with such technologies (Rice et al. 2010). Despite being homeless and profoundly resource poor, most homeless adolescents get online at least once a week, and rely heavily on free access points such as public libraries and youth service agencies (Rice et al. 2010). Even homeless adults who are less culturally-tied to social networking technologies than adolescents are utilizing mobile phones and the internet to connect to a wide array of social ties from both on and off the streets (Eyrich-Garg 2010).

Thus, existing research provides some evidence supporting the utility of investigating the multidimensionality of the social connection of homeless adolescents (i.e., pro-social versus anti-social, and home-based versus street-based peers) and how communication technology may facilitate home-based social ties. However, existing studies have not sufficiently examined the effect of these various relationship characteristics on homeless adolescents'

mental health outcomes. Since homeless adolescents have above-average rates of mental health issues and these issues often contribute to a higher risk of poor life outcomes, an improved understanding of the positive and negative elements of social network composition will help to inform identification of and service provision to this high-risk population. The aims of this paper are to examine how social isolation influences depression and anxiety and how integration into street and home-based networks differentially affect mental health outcomes among homeless adolescents.

Methods

A convenience sample of 136 adolescents was recruited between June 19 and August 21, 2008 in Hollywood, California at one drop-in agency serving homeless adolescents. All clients, ages 13–24 years, receiving services at the agency during the period of study were eligible to participate. In 2008, the agency saw 1,860 individual adolescents who visited a total of 30,575 times. Adolescents were asked if they would like to participate in the survey at the same time they signed up to receive services at the agency (e.g., a shower, clothing, case management); only 14 adolescents (9.3%) declined to participate. A consistent set of two research staff members were responsible for all recruitment; this was to prevent adolescents from completing the survey multiple times. Signed voluntary informed consent was obtained from each adolescent, with the caveats that physical or sexual abuse, and suicidal or homicidal feelings would be reported. Informed consent was obtained from adolescents 18 years old and older. For minors, loco parentis consent was obtained from an agency staff member, who was not part of the research team, and informed assent was obtained from participants. Interviewers received approximately 40 h 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. In total, the interview lasted approximately 60 min, at about 30 min for each part. All participants received a $20 gift card as compensation for their time. Survey items and procedures were approved by the university's Institutional Review Board.

Part one was a computer-administered self-interview by which adolescents answered survey items pertaining to demographics, sex and drug risk taking behaviors, living situation, service utilization, and mental health. Demographic profiles are displayed in Table 1.

Table 1 Demographic profile of homeless adolescents (n = 136), Hollywood, CA 2008

	n	%
Gender		
Female	53	39.6
Male	81	60.5
Race/ethnicity		
African American	48	38.1
Latino	31	24.6
White	27	21.4
Mixed race/ethnicity	20	15.9
Other	10	7.4
Current living situation		
Family home	10	7.4
Relative's home	4	3.0
Friend's home	18	13.3
Family group home	2	1.5
Shelter	24	17.8
Hotel, motel	10	7.4
Own apartment	11	8.2
Street, squat, abandoned building	42	31.1
Other	14	10.4
Child welfare history	63	46.3
	Mean	SD
Age	20.8	2.1
Beck's anxiety inventory score	9.3	11.3
Beck's depression inventory score	11.5	10.4

Part two was a face-to-face network mapping interview conducted by a trained interviewer who collects "egocentric" network data from each participant (that is data about social network ties as reported by each participant being surveyed). First, interviewers explain that they are interested in collecting information about the adolescent's social network within 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 with/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 adolescent'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, the interviewer recorded nominations on the paper in a large arc around the adolescent's name. The following set of 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; 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 email); people from where you are staying (squatting with); people you see at this agency; other people you know in Hollywood."

After adolescents finished nominating persons, a series of questions about the type of ties and attributes of each nomination were then asked. The interviewers were trained to ask the adolescents 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. This mapping activity, however, provided a visual stimulus which enhanced the adolescent'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. Mental health was assessed via the Beck's Depression Inventory (Beck et al. 1988) and Beck's Anxiety Inventory (Beck et al. 1996); both instruments are widely used and show high consistency. In a meta-analysis looking at outpatients older than 18 years old, Beck's Anxiety Inventory (BAI) was found to have an $\alpha = 0.91$ (de Ayala et al. 2005). Likewise, Beck's Depression Inventory (BDI) has been found to have good internal consistency (Cronbach's $\alpha = 0.87$) with adolescents who are also at risk of substance use (Subramaniam et al. 2007).

Social network variables were coded independently for each respondent based on that respondent's "ego-centric" network data. Total network size was coded based on the total number of nominees in the network. Three important attributes were collected for each of the ties: (1) whether the interaction with the tie was face-to-face or via social networking technology (i.e., "phone, email, or texting") in the prior month; (2) whether the tie was formed at home prior to homelessness, or formed on the streets after the adolescent became homeless; and (3) whether the tie was considered to be a "friend" or not. The total number of friends was coded by summing all ties reported as "friends." A breakdown of eight possible combinations of these three dichotomous variables is presented in Table 2.

Analysis

Because "ego-centric" network data assesses the social network of each individual respondent independently of one another, it can be transformed into variables which can

Table 2 Network properties of homeless adolescents (n = 136), Hollywood, CA 2008

	Mean	SD
All relationships		
Total network size	13.46	8.09
Total "friends"	7.15	6.14
Face-to-face relationships		
Street-based peers	6.34	6.14
Street-based "friends"	4.10	4.44
Home-based peers	2.78	3.37
Home-based "friends"	1.41	2.35
Social networking relationships		
Street-based peers	0.57	1.15
Street-based "friends"	0.38	0.89
Home-based peers	1.54	2.21
Home-based "friends"	0.59	1.22
	n	%
No "friends"	13	9.6

be incorporated into standard linear modeling techniques. For this study, two separate multivariate ordinary least squares (OLS) regression models were run. Outcomes were BDI and BAI summary scores. Because of the modest sample size, not all possible social network variables were included in the final models. After adding social network variables one at a time, only network variables that were significantly associated with at least one outcome were retained in the final model. One-tailed tests were used to assess inclusion in the model, based on the hypothesis that increased ties to street-based ties has a positive association; whereas increased ties to home-based ties has a negative association with increased anxiety and depressive symptoms. The final model included *face-to-face street-based peers* and *social networking home-based friends*.

Results

Details on the sample are provided in Table 1. The mean age of the sample was 20.8 years (SD = 2.1 years). The sample was 60.5% male and 39.5% female; 38.1% African American, 24.6% Latino, and 21.4% White. Twenty-two percent of adolescents reported moderate to high levels of depressive symptoms, and 22% also reported moderate to high levels of anxiety symptoms.

Turning to network composition variables in Table 2, we examined three relationship types: "face-to-face relationships," "social networking based relationships," and a composite named "all relationships." Within these relationship types we looked at the number of street-based

Table 3 OLS regression models of mental health and friendship types of homeless adolescents (n = 136), Hollywood, CA 2008

	Beck's depression		Beck's anxiety	
	b	SE	b	SE
Male	−4.23	1.82*	−5.06	2.00*
White	6.75	2.16**	6.54	2.36**
Age	0.52	0.41	0.68	0.45
Face-to-face street-based peers	0.30	0.14*	0.32	0.15*
Social networking home-based "friends"	−1.16	0.70*	−0.98	0.77
Intercept	0.79	8.47	−4.31	9.28
R^2	0.15		0.14	

* $P < 0.05$, ** $P < 0.01$

peers, street-based "friends," home-based peers, and home-based "friends." "Friends" are people specifically labeled as such, "peers" are people who were nominated but not labeled a "friend." The adolescents sampled reported on average 13.5 (SD = 8) ties, but only 7.2 (SD = 6.14) friends. Adolescents reported more face-to-face ties than social networking ties. Reflecting proximity and affect, adolescents reported the greatest number of street-based peers (mean = 6.34, SD = 6.14), followed by street-based friends (mean = 4.1, SD = 4.44), followed by home-based peers (mean = 2.78, SD = 3.37), followed by home-based friends in their face-to-face networks (mean = 1.41, SD = 2.35). Home-based peers were the most frequent nominated tie type among social networking relationships (mean = 1.54, SD = 2.21) followed by home-based friends (mean = 0.59, SD = 1.22).

In Table 3, the multivariate OLS model for depression, an increasing number of face-to-face, street-based peers were associated with increased levels of *depressive* symptoms (b = 0.30, SE = 0.14, $P < 0.05$), and an increased number of social networking, home-based "friends" was significantly associated with a reduction in *depressive* symptoms (b = −1.16, SE = 0.70, $P < 0.05$), after controlling for gender, race, and age (model R^2 = 0.15). For *anxiety*, an increasing number of face-to-face, street-based peers were associated with increased levels of depressive symptoms (b = 0.33, SE = 0.15, $P < 0.05$), social networking, home-based "friends" were non-significantly associated with anxiety, after controlling for gender, race, age (model R^2 = 0.14).

Discussion

There are several important findings to emerge from these results. First, in terms of demographic correlates of psychological disorder, we found that in keeping with prior literature (Cauce et al. 2000; Rohde et al. 2001; Unger et al. 1997; Whitbeck et al. 2000, 2004), female homeless adolescents were at higher risk of both depression and anxiety than their male counterparts. Our results indicate that

White homeless adolescents are at increased risk of anxiety and depression when compared with their non-White peers, adding to the collection of inconsistent results found with respect to the associations between race and mental health among homeless adolescents (Fitzpatrick et al. 2005; Unger et al. 1998, 1997).

Second, in keeping with recent research (Johnson et al. 2005; Rice et al. 2007, 2008; Rice 2010; Tyler et al. 2000) we found that homeless adolescents were connecting with both street-based and home-based peers and that these different sources of peer support and/or influence were associated with mental health (Whitbeck and Hoyt 1999). Our data indicate that increased numbers of street-based peers were associated with increased depressive and anxiety symptoms. This echoes Whitbeck and Hoyt's (1999) earlier finding that increased contact with deviant peers was positively associated with depressive symptoms. These data also showed increased numbers of home-based "friends" to be associated with reduced depressive symptoms, again similar to Whitbeck and Hoyt's (1999) findings.

What is unique to these data is the importance of social networking technologies (e.g., the internet, mobile phones, texting) in facilitating these positive connections with respect to mental health outcomes. While homeless adolescents have barriers to internet access and rely heavily on free access points such as public libraries and youth service agencies (Rice et al. 2010), these technologies are key to accessing positive support networks. These data show that connecting to "friends" from home was accomplished primarily through these technologies, and that such connections were associated with good mental health. Face-to-face relationships with street-based peers, on the other hand, were associated with both increased anxiety and depression. It has long been acknowledged that street life is unhealthy for adolescents, yet here we see how modern telecommunication technologies provides an opportunity for homeless adolescents to reach outside of their street networks back home to friends who can support healthier outcomes.

There are three important limitations to the current study. First, these data are not causal. One cannot say that having more "friends" from home caused adolescents to be less

depressed. Second, these data are imprecise with respect to the use of social networking technology. Unfortunately, these data do not differentiate among ties maintained through email, social networking websites such as MySpace or Facebook, a cell phone, through texting, or even a standard phone accessed at a social service agency. It is possible that socializing and social support processes may differ according to the interaction media. Third, these data are drawn from a convenience sample and are subject to the biases of such a sampling strategy. Data collected from homeless adolescents, 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 youth is the only viable way to collect data from this population.

Conclusion

There are two directions for future research that stem from these findings. First, a probability sample of homeless adolescents that examines technology use and how social networking technology is used to maintain connections to relations that support health and mental health would be valuable. Second, researchers should seek to understand more completely the process through which connecting to pro-social, home-based peers was associated with improved mental health. A more comprehensive examination of social support in this context would be a logical starting point.

While these data are preliminary, we believe there is a straight forward programming implication for agencies working with homeless adolescents. Homeless adolescents could benefit from increased access to the internet and other forms of mobile telecommunication. Connecting to positive, supportive, home-based ties is made possible through these technologies and these relationships may buttress adolescents' mental health. Community-based and public agencies serving homeless adolescents should consider facilitating the maintenance of such relationships by providing access to computers, the internet, social networking websites, and other social networking technologies.

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