

Social network correlates of education and employment service use among youth experiencing homelessness: A longitudinal study

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ABSTRACT

Background: Youth experiencing homelessness (YEH) face significant obstacles to educational achievement and gainful employment. Drop-in centers offer support services to facilitate these opportunities, but there remains a need to understand which youth are most likely to use them. The present study used a diffusion of innovations framework to examine social network correlates of service use over a three-month period. Positive staff relationships, personal network exposure, and structural network measures were examined.

Methods: Participants were 253 YEH ($M_{age} = 21.9$, $SD = 2.2$) participating in an HIV-prevention trial at three drop-in centers in Los Angeles. Surveys were completed at baseline (wave 1), 1-month (wave 2) and 3-months (wave 3) post-baseline. Individual characteristics and sociometric network ties to other youth were assessed. Cross-sectional and lagged logistic regression models were used to identify significant network correlates of service use.

Results: A significant minority of YEH used education (23.6%) or employment (33.7%) services at wave 1, with modest increases at waves 2 and 3. Indegree centrality was associated with education service use at wave 1 ($OR = 1.30$, 95% CI[1.04, 1.64]). Positive staff relationships were associated with employment service use at wave 1 ($OR = 2.05$, 95% CI[1.06, 2.99]), and outdegree was associated with employment service use at wave 3 ($OR = 1.69$, 95% CI[1.13, 2.55]). In addition, education level, housing situation, LGBTQ+ identity, drop-in center location, and duration of drop-in center use were related to service usage.

Conclusions: Youth who occupy more central network positions and/or report positive relationships with staff are more likely to use higher-level drop-in services. Network approaches to engaging youth in services should be considered along with other individual and contextual factors.

1. Introduction

Results from a recent nationwide survey estimate that youth from roughly 1 in 30 adolescent households and 1 in 10 young adult households experienced some form of homelessness in the previous year (Morton et al., 2018). Compared to stably housed adolescents and young adults, youth experiencing homelessness (YEH) face multiple obstacles in their transition to adulthood. Among these are lower educational achievement and lack of steady employment for YEH of working age (Abdul Rahman et al., 2015; Morton et al., 2018; Whitbeck, 2009a). Accordingly, many organizations that serve YEH (i.e., drop-in centers and shelters) provide educational and employment support services to these youth (Administration for Children and Families [ACF], 2017).

The relatively small body of research on YEH service utilization makes it difficult to determine how broadly these programs are used, or which factors are associated with educational and employment service use. A growing body of research suggests that in addition to individual characteristics (e.g., demographics, housing), social network factors—such as social support received and structural position within a broader youth network—play an important role in a variety of YEH behaviors, including service use (Barman-Adhikari, Petering, et al., 2016; Barman-Adhikari & Rice, 2014). However, there has yet to be a longitudinal investigation of how these factors are related over time. Such a study may help service providers understand the individual and social network correlates associated with first-time (i.e., adoption) as well as the continued use of these services.

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1.1. Educational and employment support needs for YEH

Generally, studies suggest that YEH exhibit lower education attainment and gainful employment outcomes than stably housed adolescents and young adults. However, as noted by Tierney et al. (2008), the educational experiences of YEH are seldom the focus of research with YEH, which has tended to focus more on issues of housing, and physical and mental health. Available research has reported that YEH tend to have lower educational success, including low reading and math proficiency than stably housed low-income youth (National Center for Homeless Education [NCHE], 2020), and relatively high rates of learning disabilities and disruptive behavioral problems (Toro et al., 2007; Whitbeck, 2009b). In the first wave of the Midwest Longitudinal Study of Homeless and Runaway Adolescents, 51.1% of males and 56.3% of females reported dropping out of school at least once (Whitbeck, 2009a). Large scale studies in the U.S. and Australia also suggest that not completing high school, school suspensions, and academic failures are significant risk factors for experiencing homelessness during young adulthood (Heerde et al., 2020; Morton et al., 2018). These concerning statistics must be understood in light of the unique challenges YEH often face, including school disruptions caused by residential instability, insufficient educational guidance from parents or guardians, and lack of supplies and space to complete school work (Tierney et al., 2008). Despite these adversities, YEH have also show great resilience in their ability to meet proficiency standards, graduate high school, and attend college (NCHE, 2020). In interviews conducted with YEH, many express aspirations for higher education and careers that require it, but such hopes are also paired with youths' low expectations for the future, and a lack awareness of the specific steps needed to achieve their educational goals (Tierney et al., 2008; Whitbeck, 2009a), highlighting the need for further educational support.

In addition to educational achievement, stable and meaningful employment offers a variety of benefits to YEH. Being engaged in meaningful work provides adolescents and young adults intangible benefits that are helpful in the transition to adulthood, such as developing time management and social skills (Mortimer, 2010). Stable employment has also been associated with more housing stability and lower substance use risks (Slesnick et al., 2018), and may prevent homelessness trajectories into adulthood (Barile et al., 2018; Caton et al., 2005). However, unemployment rates among YEH are concerning; existing research with YEH reports 57–71% of the YEH study participants as unemployed (Ferguson & Xie, 2008; Ferguson et al., 2011; Whitbeck, 2009a), despite a majority of participants being older adolescents or young adults. In a longitudinal study conducted in two large Canadian cities, only 17 percent of YEH were employed during all three waves of the study, although most unemployed youth were looking for work (59%) or actively applying to jobs (47%) (Hagan & McCarthy, 2005). As is typical with this age group, the types of jobs available offer low-wages and low-skilled work. Previous research has found that some unemployed or underemployed YEH turn to the underground economy to generate income, by engaging in survival sex, selling blood or plasma, drug dealing, theft, or panhandling (Ferguson et al., 2011; Hagan & McCarthy, 2005; Whitbeck, 2009). Unemployment among homeless young adults may also depend upon the geographic context, as well as individual factors like greater length of time spent homeless, survival-based income generation strategies, and substance dependence (Ferguson et al., 2011). Such factors are important to consider when designing and delivering employment support services. The little research available suggests that there is room to expand such services (Barman-Adhikari & Rice, 2014).

1.2. Social network correlates of service utilization

Understanding the correlates of service use is essential for designing and delivering services to vulnerable youth populations, as this may help service providers understand which youth are more or less likely to use

these services and can therefore inform more targeted outreach efforts. A growing body of research has recognized that in addition to individual characteristics (i.e., educational attainment, residing in a shelter, etc. Barman-Adhikari & Rice, 2014; Pedersen et al., 2016), YEH's social network characteristics are vitally important for understanding individual behavior (Barman-Adhikari, Rice, Winetrobe, & Petering, 2015; Rice et al., 2012). Two recent studies have investigated social network factors associated with service utilization among YEH (Barman-Adhikari, Bowen, et al., 2016; Barman-Adhikari & Rice, 2014). These studies used social capital theory, social influence, and structural network theories as building blocks for their conceptual framework. Social capital has been defined as the resources available to individual actors through their social networks (Lin, 1999). In their investigation of YEH's use of employment services at one drop-in center, Barman-Adhikari and Rice (2014) further differentiated between *bonding* and *bridging* social capital (Putnam, 2000). Bonding social capital was defined as resources (in the form of emotional and instrumental social support) received from street-based peers, and bridging social capital was defined as social support received from non-street contacts (parents, family members, home-based friends, and caseworkers). Social influence was indicated by the presence of one or more ties to other YEH who had used employment services, and network structure was measured as one's position within the center or periphery of the drop-in center YEH network.

Barman-Adhikari's (2014b) results suggest that bridging social capital is predictive of using employment services; social influence and network structure, however, were not. Interestingly, the relationship between bonding social capital and employment service use depended on the type of support received. Namely, YEH who received *emotional* support from street-based peers were more likely to use employment services, but YEH who received *instrumental* support from street-based peers (lending money, food, or a place to stay) were less likely to use employment services. The authors speculated that youth who are more involved in the street-based economy may have been less likely to use employment services at the drop-in center. A follow-up study found that bridging social capital (emotional support from drop-in center staff) was related to the use of health, shelter, therapeutic, as well as employment support services (Barman-Adhikari, Petering, et al., 2016).

While these previous studies have helped establish which social network characteristics are related to YEH's utilization of employment and other types of services, existing research has relied on cross-sectional data. Little is known regarding how social network factors related to education and employment service utilization over time. Diffusion of Innovations Theory describes how innovations, such as novel technologies, behaviors, or ideas, spread and are adopted by members of a social system (Rogers, 2003), and thus may be helpful for understanding service utilization among YEH. Valente (1999) has outlined a number of potential mechanisms through which innovations diffuse throughout a social network. For instance, *relational diffusion* occurs through direct contact with others, such as when an individual learns of the existence of services through interpersonal contacts (i.e., vicarious learning), or is encouraged by someone else to use them (persuasion). As has been demonstrated previously (Barman-Adhikari, Petering, et al., 2016; Barman-Adhikari & Rice, 2014), social support from case workers such as drop-in center staff may be the most important social network correlate of using employment and other higher-level services. *Personal network exposure* is another relational mechanism through which greater exposure to others who have adopted a particular innovation increases the likelihood of adoption (Valente, 1999). A direct tie to a service-using peer was not associated with use of employment services in previous cross-sectional research (Barman-Adhikari & Rice, 2014), but it's possible that it may take more time for this peer influence to occur.

In addition to relational models of diffusion, *structural models of diffusion* "postulate that the rate and character of diffusion are determined by structural characteristics of the social system" (Valente, 1999, p. 49). For instance, individuals who occupy a more central position in a

network may have greater access to novel information like the availability of services. More central individuals (often measured by having greater *indegree*, or nominations from others in the network) also tend to be earlier adopters of an innovation, and hence may use education and employment services earlier than others who are on the periphery of the drop-in center network. Likewise, *outdegree* is the number of outgoing ties, and reflects a more expansive network. It is worth mentioning, however, that degree centrality had no significant relationship with employment service use in previous research (Barman-Adhikari & Rice, 2014), although this was at only one drop-in center and at a single point in time. Other research at the same drop-in center found that occupying a central position within the youth network was associated with risky behaviors like unprotected sex and substance use (Barman-Adhikari, Rice, Winetrobe, & Petering, 2015; Rice et al., 2012), but these behaviors are not necessarily incompatible with employment service use. Another potentially important structural measure is *betweenness centrality*, as it reflects how often an individual lies on the shortest path connecting two other individuals in a network (Freeman, 1977). Individuals who have high betweenness centrality may therefore act as brokers or intermediaries between many other youths, and hence may have greater access to novel information within the drop-in center youth network. However, it is unknown whether betweenness centrality is associated with education or employment service use in particular.

1.3. Aims and hypotheses

The purpose of the current study was to examine whether social network factors account for homeless youths' use of educational and employment services, over and above individual factors. We used a diffusion of innovations framework, where service use over time was conceptualized as the "innovation" to be adopted. Our first aim was to test a *personal network exposure model*, in which it was hypothesized that youth who had a direct, outgoing tie to an early adopter would be more likely to use the service themselves. Secondly, we sought to determine whether *social capital* played a role, evidenced by bridging social capital (ties to a supportive adult at the drop-in center). It was hypothesized that youth with greater bridging capital would be more likely to use education and employment support services, potentially through greater support or encouragement from the adult to participate in such services or greater knowledge of services available to them. Our third aim was to test a *structural model*, in which more central/popular members of the network were hypothesized to be early adopters. By identifying whether use of these key services is related to individual and social network characteristics, the present study will be useful for YEH-serving organizations who wish to tailor their programs to reach more youth who may benefit from them. This research will also add to the paucity of longitudinal research on service utilization among YEH.

2. Methods

2.1. Participants and study setting

Participants included 252 youth aged 14–26 ($M_{age} = 21.9, SD = 2.16$) receiving services at three drop-in centers in Los Angeles, California. Drop-in centers are common service locations used by YEH, and differ from shelters in their low barrier approach to service delivery, typically during day-time hours only (Pedersen et al., 2016). Two of the drop-in centers were located in Hollywood, a densely populated urban area with a relatively high concentration of homelessness services, and one drop-in center was located in Venice, an urban beach community. Previous research at these three drop-in centers has documented significant differences in client demographics and service utilization (Barman-Adhikari, Petering, et al., 2016); participant characteristics at each drop-in center are presented in Table 1. Overall, the majority of participants were male (69.8%), and diverse in terms of race and ethnicity. Nearly half (44.8%) identified as LGBTQ+, and 14.7 percent identified as

Table 1
Youth Characteristics and Service Use at Three Los Angeles Drop-in Centers (Wave 1).

Variable	Drop-in 1 Hollywood #1 (n = 89)	Drop-in 2 Hollywood #2 (n = 84)	Drop-in 3 Venice, CA. (n = 79)	Total (N = 252) M (SD) or N (%)
Age	21.5 (2.1)	22.1 (2.13)	22.0 (2.28)	21.9 (2.16)
Age (min - max)	17–25	14–26	17–25	14–26
Male birth sex	64 (71.9%)	63 (75.0%)	49 (62.0%)	176 (69.8%)
Transgender identity ^{***}	5 (5.6%)	28 (33.3%)	4 (5.1%)	31 (14.7%)
Race				
White	17 (19.1%)	19 (22.6%)	22 (40.5%)	58 (23.0%)
Black ^{**}	34 (38.6%)	21 (25.0%)	14 (17.7%)	69 (27.5%)
Hispanic	16 (18.2%)	18 (21.4%)	12 (15.2%)	46 (18.3%)
Mixed/Other race ^{*,**}	21 (23.9%)	26 (31.0%)	31 (39.2%)	78 (31.1%)
LGBQ+ ^{**}	27 (30.3%)	61 (73.5%)	24 (30.8%)	112 (44.8%)
Education				
Less than high school	26 (29.2%)	19 (22.6%)	22 (27.9%)	67 (26.6%)
High school diploma / GED	43 (48.3%)	42 (50.0%)	44 (55.7%)	129 (51.2%)
College or some college	20 (22.5%)	23 (27.4%)	13 (16.5%)	56 (22.2%)
Current Housing				
Shelter / TLP ^{**}	17 (19.1%)	25 (29.8%)	5 (6.3%)	47 (18.7%)
Unstably housed [*]	35 (39.3%)	22 (26.2%)	37 (46.8%)	94 (37.3%)
Unsheltered	37 (41.6%)	37 (44.0%)	37 (46.9%)	111 (44.0%)
Drop-in Center Use[*]				
Less than 1 month	22 (24.7%)	17 (20.7%)	28 (35.9%)	67 (26.9%)
1–6 months	29 (32.6%)	22 (26.8%)	26 (33.3%)	77 (30.9%)
6 months to 1 year	17 (19.1%)	10 (12.2%)	12 (15.4%)	39 (15.7%)
1 year or more	21 (23.6%)	33 (40.2%)	12 (15.4%)	66 (26.5%)
Social network variables				
Relationship with staff [*]	53 (60.2%)	63 (76.8%)	48 (61.5%)	164 (66.1%)
Indegree [*]	0.65 (1.11)	0.91 (1.42)	1.66 (2.29)	1.05 (1.7)
Outdegree ^{**}	0.63 (1.11)	0.96 (1.30)	1.70 (1.90)	1.08 (1.5)
Isolate ^{**}	41 (46.1%)	31 (36.9%)	17 (21.5%)	89 (35.3%)
Betweenness centrality ^{***}	2.24 (6.99)	3.26 (8.10)	24.92 (54.95)	9.8 (32.9)
Tie to education svc. user [*]	14 (15.7%)	30 (35.7%)	20 (25.3%)	65 (25.7%)
Tie to employment service user ^{**}	11 (12.4%)	32 (38.1%)	21 (26.6%)	65 (25.7%)
Used Education Services				
Wave 1 ^{**}	21 (23.6%)	36 (42.9%)	17 (21.5%)	74 (29.8%)
Wave 2 [*]	19 (27.1%)	26 (44.8%)	10 (20.4%)	55 (31.1%)
Wave 3	18 (31.0%)	23 (46.0%)	17 (38.6%)	58 (38.2%)

(continued on next page)

Table 1 (continued)

Variable	Drop-in 1 Hollywood #1 (n = 89)	Drop-in 2 Hollywood #2 (n = 84)	Drop-in 3 Venice, CA. (n = 79)	Total (N = 252)
	M (SD) or n (%)	M (SD) or n (%)	M (SD) or n (%)	M (SD) or N (%)
<i>Used</i>				
<i>Employment Services</i>				
Wave 1 ***	30 (33.7%)	52 (61.9%)	17 (21.5%)	99 (39.1%)
Wave 2 **	25 (35.7%)	32 (55.2%)	10 (20.4%)	67 (37.9%)
Wave 3	25 (43.1%)	28 (56.0%)	16 (36.4%)	69 (45.4%)

LGBTQ+ = lesbian, gay, bisexual, transgender and/or queer identity; TLP = transitional living placement; OR = odds ratio; CI = confidence interval; LL = lower limit; UL = upper limit ^a Other races include American Indian / Alaska Native, Asian, and Native Hawaiian / Pacific Islanders; these were grouped together due to small sample sizes.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

transgender or gender non-conforming. Most (73.4%) had a high school diploma/GED, and almost half (44.0%) were unsheltered.

2.2. Procedures

This study uses data from a social network intervention, in which peer leaders were selected and trained to communicate HIV risk-reduction messages throughout youth networks at three drop-in centers. The larger study used a quasi-experimental design to compare the effect of three peer leader selection strategies on diffusion outcomes: 1) an Artificial Intelligence selection algorithm, 2) selection based on indegree centrality (popularity), and 3) observation only (see Rice et al., 2018 for more details). Data for the present study come from the observation only group. Informed consent was obtained from all participants; the University IRB waived the need for parental consent for participants under the age of 18, who were considered emancipated minors. Participants completed three surveys: baseline (wave 1), one-month post-baseline (wave 2), and three months post-baseline (wave 3). Study attrition was moderate; 72% of participants completed the wave 2 survey, and 51% completed the wave 3 survey. Participants who had missing education service use data at follow-up were more likely to be non-Hispanic (missing education service use: $\chi^2[1, 251] = 4.67, p = 0.03$), and less likely to be central members of the network. Specifically, participants with lower indegree (missing education service use: $t[251] = 1.93, p = 0.05$; missing employment service use: $t[251] = 2.97, p = 0.003$), and lower outdegree (missing employment service use: $t[251] = 2.74, p = 0.01$) were more likely to be missing at follow-up. Participants with fewer ties to peers who used employment services at time 1 were also more likely to be missing employment service use data at follow-up ($\chi^2[1, 251] = 10.22, p = 0.001$).

2.3. Measures

2.3.1. Demographics and control variables

Surveys assessed participant age, birth sex (male, female), transgender identity (dichotomized: male/female = 0; trans male/man, trans female/woman, gender queer/non-conforming or other = 1), race/ethnicity (White, Black, Hispanic/Latino, Mixed, Other) and sexual orientation (dichotomized: heterosexual/straight = 0; lesbian, gay, bisexual, questioning, asexual or other [LGBQ+] = 1). Participants reported their highest level of education, which was trichotomized into 1 = less than high school, 2 = high school diploma/GED, or 3 = college or

some college. Participants were asked how long they had been coming to the drop-in center, with response options re-coded as 1 = less than a month, 2 = one to six months, 3 = six months to one year, or 4 = one year or more. Current housing was assessed by asking participants to select from a list of locations where they spent most of their nights in the past two weeks, recoded as 1 = residing in a shelter or transitional living program ("sheltered"), 2 = spending most nights in an apartment, hotel, foster/group home, institution or dormitory ("unsheltered"), or 3 = spending most nights outside or in a structure not fit for human habitation, e.g., an abandoned building, public transit, car or RV, etc., ("unsheltered").

2.3.2. Social network variables

A sociometric, event-based approach (Freeman & Webster, 1994) was used to determine relationships between YEH accessing services at each drop-in center. A sociometric network is a whole network made up of connections between individuals within a specified boundary (e.g., a specific school or workplace, etc.) (Valente, 2010). This differs from egocentric networks (sometimes called personal networks), are networks composed of an individual study participant (ego) and the persons they are directly tied to (alters). Ego-centric networks need not be bound, for example by a school or workplace, and can include people attached to an individual who come from a multiplicity of social spheres concurrently, for example work colleagues, neighbors, family, and friends from school. Youth were asked to identify up to 10 people they interact with (alters) at the drop-in center. Research staff collected enough information from the participant to determine if the alters were also study participants; therefore, the sociometric networks include only ties between YEH who were study participants at each drop-in center (see Figs. 1–3 for a visual depiction of the networks).

2.3.2.1. Bridging social capital. Bridging social capital was measured using participant responses to the following statement, "During my time in youth services, I have developed at least one relationship with a supportive and positive staff at an agency that I attend" (No/not sure = 0; Yes = 1).

2.3.2.2. Network structure. Adjacency matrices were created in UCINET (Borgatti et al., 2002) representing directed ties between participants (1 = tie; 0 = no tie) at wave 1 and wave 2. Matrices were then used to create network variables for each individual, including: *indegree* (number of incoming nominations), *outdegree* (number of outgoing nominations), *isolate* (indegree and outdegree equal to zero), and *betweenness centrality* (the frequency in which a participant lied on the shortest path connecting two other participants in the network).

2.3.2.3. Personal network exposure. Using adjacency matrices, two variables were created to represent personal network exposure to other service users: 1) outgoing ties to a study participant who had used education services and 2) outgoing ties to another participant who had used employment support services. Because very few participants reported more than one outgoing tie to education and employment service users, these variables were dichotomized as presence of a tie or not (yes = 1; no = 0).

2.3.3. Service use

Service use was assessed via self-report by asking the participant to check which services they had used following the prompt, "During my time in youth services, I participated in one or more meaningful activities." Those who checked "Education programs (GED, college)" were considered employment service use, and those who checked "Job readiness training/employment services" or "Paid internship/work experience" were considered employment service users. A dichotomous variable was used to represent service use (yes = 1, no = 0) at each survey wave. Further, because participants could access multiple drop-

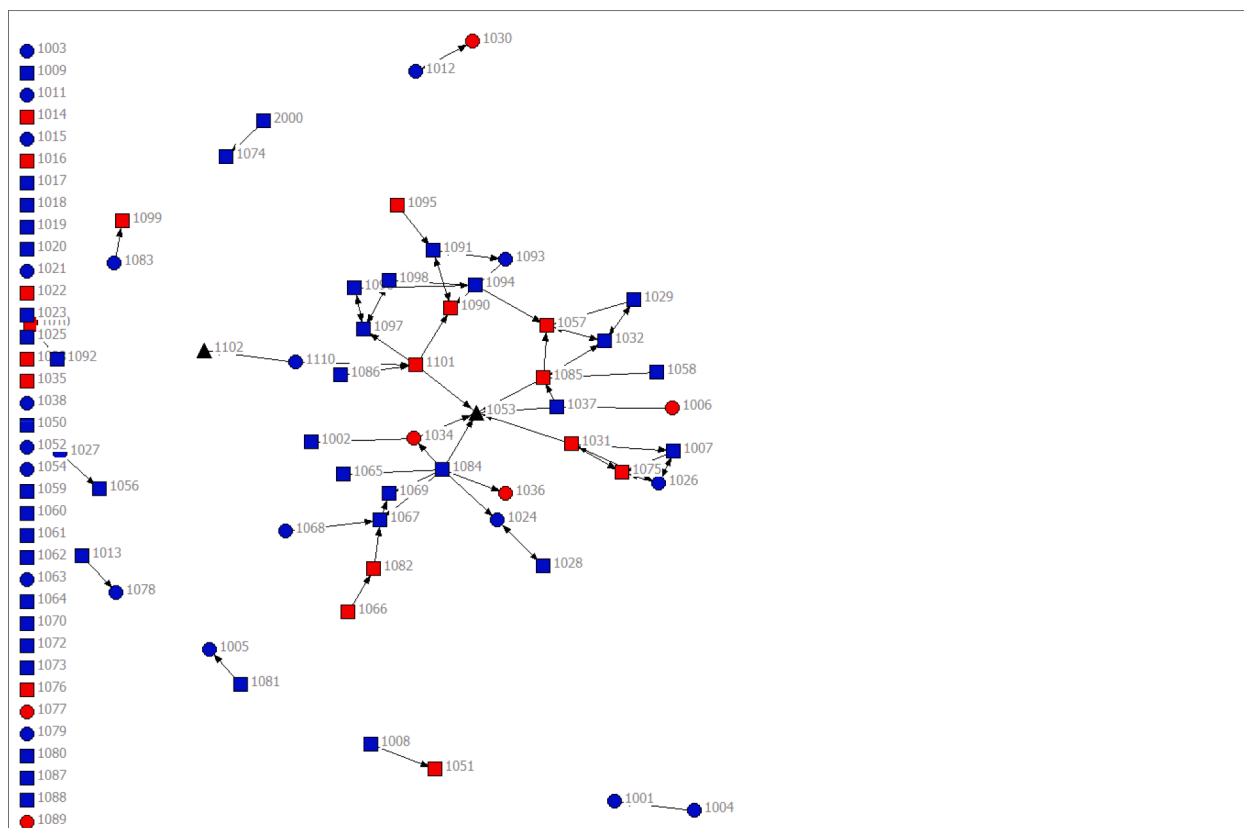


Fig. 1. Sociometric Network of Hollywood Drop-in Center 1 at Wave 1. *Note.* circles = female; squares = male; triangles = transgender identity; red = education service users; blue = did not use education services. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

in centers, primary drop-in center use was assessed with the following item, “I am currently receiving the majority of my drop-in services from: [select drop-in center]”.

2.4. Data Analysis

Univariate statistics were calculated to describe the characteristics of participants overall and at each drop-in center (see Table 1). Chi-square tests and one-way Analysis of Variance (ANOVAs) were then performed to determine if participant characteristics significantly differed between drop-in centers at wave 1. Such differences have been found in previous research (Barman-Adhikari, Petering, et al., 2016), supporting the need to control for drop-in center location in multivariate analyses. Network diagrams were created using NetDraw (Borgatti et al., 2002) to visualize the sociometric network of YEH at each drop-in center. Stata IC version 15.1 was used for all other statistical analyses (StataCorp, 1985–2017).

Lagged logistic regression models were used to determine whether social network variables were associated with service use at each survey wave, adjusting for individual characteristics. In total, six models were run—three predicting education service use and three predicting employment service use. In the first set of models, individual and network variables at wave 1 were used to predict service use at wave 1 (cross-sectional models). In the second set of models, individual and network variables at wave 1 were used to predict service use at wave 2 (controlling for wave 1 service use). In the third set of models, individual and network variables at wave 2 were used to predict service use at wave 3 (controlling for wave 1 and wave 2 service use). All models included terms for age, race, male birth sex, lesbian, gay, bisexual, transgender, and/or queer (LGBTQ+) identity (sexual and gender minority identity combined), education, primary drop-in center use, and duration of drop-in center use. All of these control variables in the model were assessed at

wave 1, with the exception of drop-in center location, which was allowed to vary from wave 1 to wave 2 (94% of participants reported using the same drop-in center from wave 1 to wave 2).

3. Results

3.1. Participant characteristics and service use at wave 1

Table 1 displays participant characteristics and service use stratified by drop-in center. For the social network variables, roughly two-thirds reported a supportive relationship with a drop-in center staff; this was significantly higher at Hollywood drop-in center two ($\chi^2[4, 248] = 6.29, p = 0.04$). Indegree and outdegree centrality were quite low. Participants received a nomination from, and sent a nomination to, about one other youth on average. Degree centrality at the Venice drop-in center ($M = 1.66, SD = 2.29$) was significantly higher than the two Hollywood drop-in centers ($M_{\text{Hollywood 1}} = 0.65, SD = 1.11; M_{\text{Hollywood 2}} = 0.65, SD = 1.11; F[2, 249] = 8.22, p < 0.001$). Just over a third (35.3%) of participants were isolates; isolates were less prevalent in the Venice network ($n = 17$) than the two Hollywood networks ($N_{\text{Hollywood 1}} = 41, N_{\text{Hollywood 2}} = 31; \chi^2[2, 252] = 11.18, p = 0.004$). About one-fourth of participants (25.7%) reported a tie to another education and employment service user at Wave 1. Personal network exposure was significantly higher at the Hollywood drop-in 2 than the other two drop-in centers (tie to education service user: $\chi^2[2, 252] = 9.11, p = 0.01$; tie to employment service user: $\chi^2[2, 252] = 15.19, p = 0.001$). For service use, almost a third of participants reported using education (29.8%) and employment (33.7%) services at wave 1. Rates of service use were significantly higher at Hollywood drop-in center 2, relative to the other drop-ins, at waves 1 and 2 ($ps < 0.05$). Service use increased modestly over time to a high of 38.2% (education) and 45.4% (employment) at

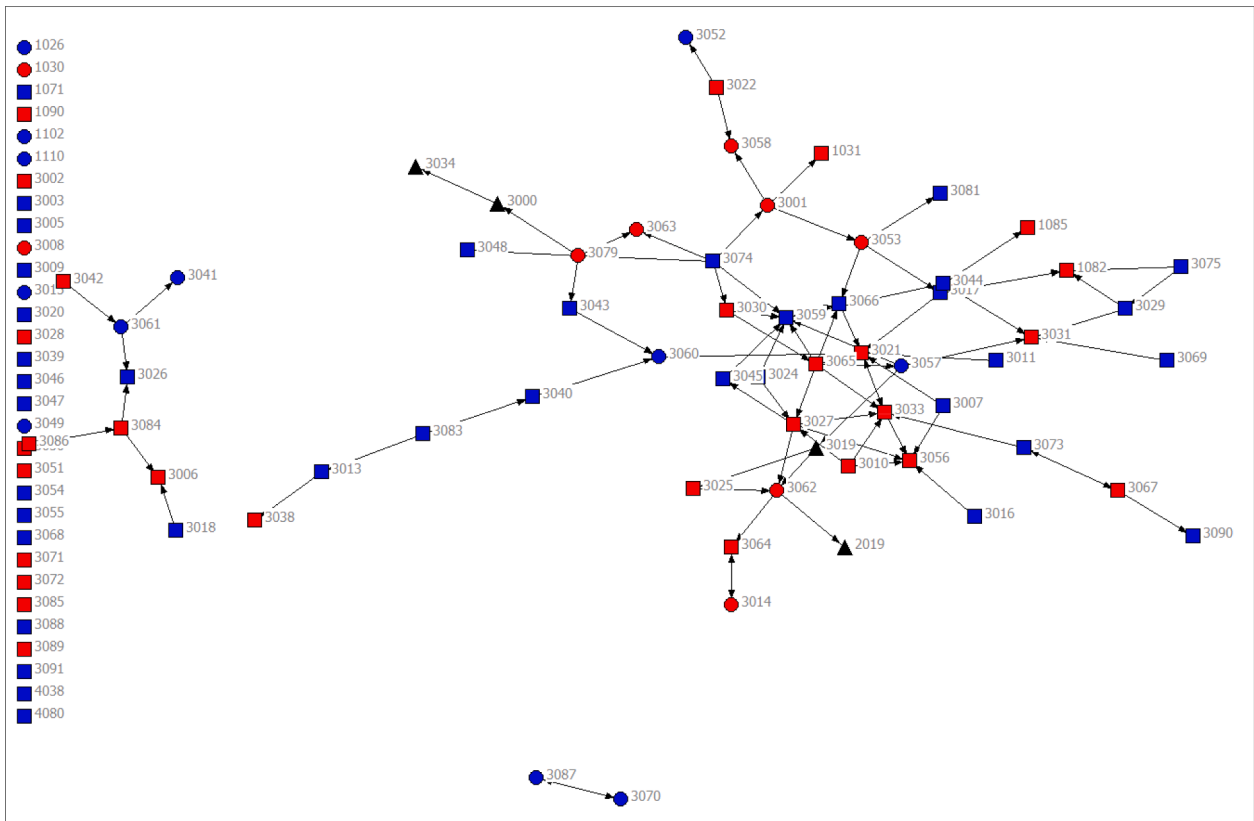


Fig. 2. Sociometric Network of Hollywood Drop-in Center 2 at Wave 1. *Note.* circles = female; squares = male; triangles = transgender; red = education service users; blue = did not use education services. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

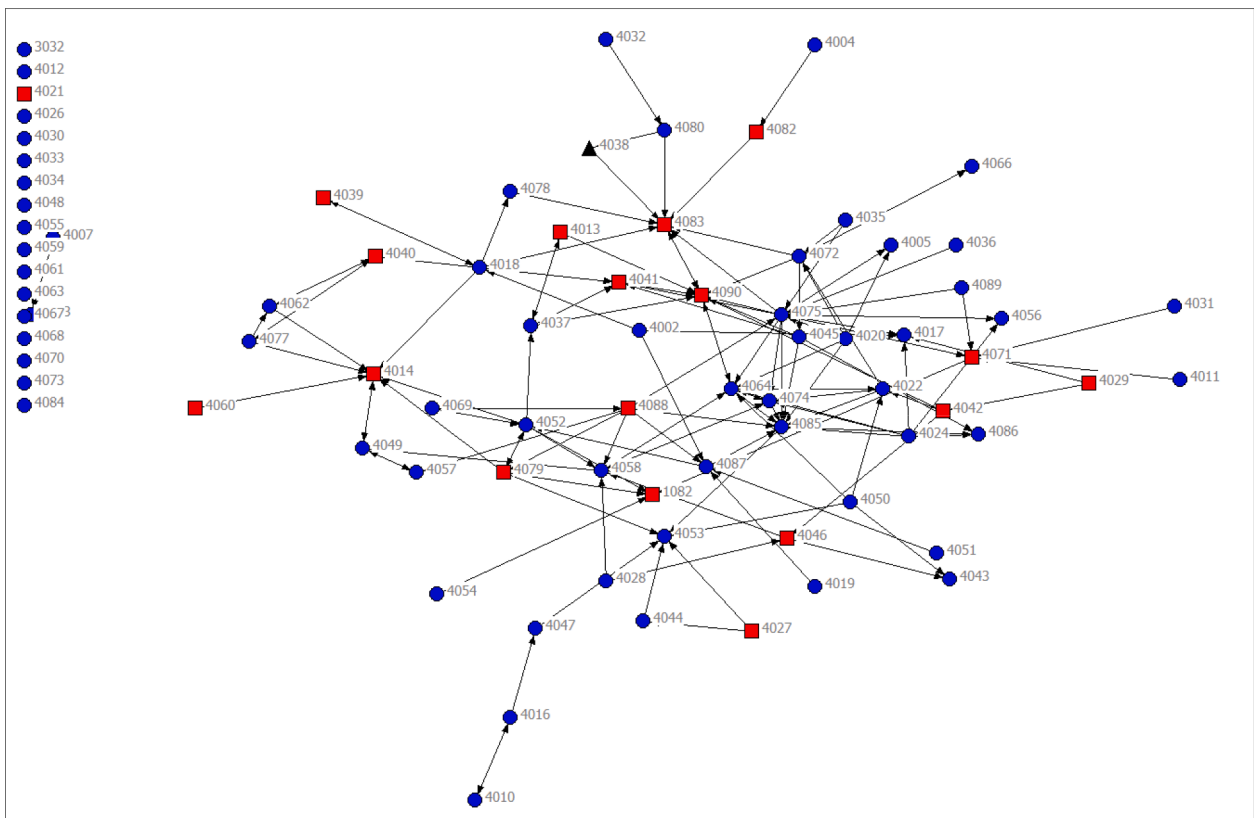


Fig. 3. Sociometric Network of Venice Drop-in Center at Wave 1. *Note.* circles = female; squares = male; triangles = transgender; red = education service users; blue = did not use education services. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

wave 3. A number of other individual and drop-in center variables significantly differed by drop-in center, as shown in Table 1.

3.2. Sociometric network diagrams

Hollywood drop-in center 1 was the most fragmented network, with one main component, eight dyads and 41 isolates (see Fig. 1). Hollywood drop-in center 2 had two main components, one dyad, and 31 isolates (see Fig. 2). Drop-in center 3 (Venice) had the most densely connected network, with one large main component and 17 isolates (see Fig. 3). This also illustrates why drop-in center 3 had higher indegree, outdegree, betweenness centrality, and a lower number of isolates than the two Hollywood drop-in center networks (see Table 1).

3.3. Use of education support services

Results of lagged logistic regression models predicting education service use are displayed in Table 2. Indegree was the only social network factor significantly associated with education service use at wave 1 (OR = 1.30, 95% CI [1.04, 1.64]). Other correlates of education service use at wave 1 were college/some college education (relative to less than high school; OR = 0.32, 95% CI[0.12, 0.82]), unstable housing (relative to being unsheltered; OR = 2.13, 95% CI[1.04, 4.36]), and drop-in location (lower odds of service use at the Hollywood #1 and Venice drop-ins, relative to Hollywood #2 drop-in). No social network variables were significantly associated with education service use at wave 2 or wave 3 (controlling for prior service use). However, longer duration of drop-in center use at wave 1 (OR = 1.67, 95% CI[1.15,

2.44]) was associated with greater education service use at wave 2, and LGBTQ+ identity was associated with greater education service use at wave 3 (OR = 5.46, 95% CI[1.34, 22.22]).

3.4. Use of employment support services

Results of lagged logistic regression models predicting employment support service use are displayed in Table 3. Positive relationship(s) with staff (bridging capital) was positively associated with employment service use at wave 1 (OR = 2.05, 95% CI[1.06, 3.99]), and betweenness centrality was negatively associated with employment service use at wave 1 (OR = 0.97, 95% CI[0.94, 1.00]). Further, outdegree (OR = 1.59, 95% CI[1.06, 2.39]) was positively associated with employment service use at wave 3 (controlling for prior service use). Other variables associated with employment service use were education (having a high school/GED vs. not; OR = 2.25, 95% CI[1.05, 4.79]), drop-in center (at Wave 1, receiving services at Hollywood #1 and Venice was associated with lower odds of service use, compared to the Hollywood #2 drop-in). Compared to unsheltered YEH, those residing in a shelter/TLP and unstably housed YEH had a higher odds of employment service use at wave 3.

4. Discussion

The current study had three aims and corresponding hypotheses. The first aim was to test whether personal network exposure, in which a direct tie to another service-using peer was associated with a greater likelihood of service use cross-sectionally and at successive survey

Table 2
Lagged Logistic Regression Models Predicting Education Service Use Over Time.

Variable	Education Service Use								
	Wave 1 (n = 245)			Wave 2 (n = 176)			Wave 3 (n = 124)		
	OR	95% CI		OR	95% CI		OR	95% CI	
	LL	UL		LL	UL		LL	UL	
Age	0.99	0.85	1.15	0.92	0.74	1.14	0.85	0.64	1.12
Male sex	1.22	0.58	2.59	1.49	0.56	3.92	1.74	0.46	6.58
<i>Race (ref: Non-Hispanic White)</i>									
Black	0.93	0.38	2.29	1.31	0.41	4.18	2.54	0.40	15.90
Hispanic/Latinx	1.66	0.65	4.26	1.96	0.59	6.49	2.21	0.33	14.79
Mixed/Other	1.12	0.47	2.65	2.41	0.77	7.51	4.66	0.76	28.60
LGBTQ+	0.68	0.33	1.39	0.70	0.27	1.76	5.46*	1.34	22.22
<i>Education (ref: < high school)</i>									
High school/GED	0.54	0.26	1.12	0.50	0.20	1.30	0.55	0.15	1.96
College/some college	0.32*	0.12	0.82	0.57	0.17	1.92	1.95	0.44	8.65
<i>Housing (ref: unsheltered)</i>									
Shelter/TLP	2.06	0.88	4.79	1.64	0.58	4.62	3.75	0.86	16.31
Unstably housed	2.13*	1.04	4.36	0.62	0.25	1.56	0.81	0.23	2.83
<i>Drop-in Center (ref: Hollywood #2)</i>									
Hollywood #1	0.31*	0.14	0.70	0.58	0.21	1.60	1.70	0.39	7.48
Venice	0.24*	0.09	0.61	0.47	0.13	1.75	1.79	0.30	10.58
Drop-in center use (duration)	1.11	0.84	1.48	1.67*	1.15	2.44	1.13	0.68	1.89
<i>Prior Service Use</i>									
Education service use (Wave 1)				4.54*	1.92	10.76	4.39*	1.31	14.71
Education service use (Wave 2)							2.32	0.75	7.20
<i>Social Network Variables</i>									
Relationship with staff (Wave 1)	1.24	0.63	2.46	0.44	0.19	1.03			
Indegree (Wave 1)	1.30*	1.04	1.64	0.98	0.73	1.30			
Outdegree (Wave 1)	1.16	0.88	1.53	0.74	0.48	1.14			
Betweenness centrality (Wave 1)	0.99	0.98	1.00	1.00	0.99	1.02			
Tie to service user (Wave 1)	1.07	0.45	2.54	1.23	0.39	3.86			
Relationship with staff (Wave 2)							2.07	0.67	6.41
Indegree (Wave 2)							0.99	0.67	1.47
Outdegree (Wave 2)							1.37	0.85	2.21
Betweenness centrality (Wave 2)							1.01	0.99	1.03
Tie to service user (Wave 2)							0.43	0.09	2.17
Constant	0.55	0.02	17.13	1.28	0.01	120.23	0.23	0.00	97.30

Note. LGBTQ+=lesbian, gay, bisexual and/or queer identity; TLP = transitional living placement; OR = odds ratio; CI = confidence interval; LL = lower limit; UL = upper limit

* p < 0.05

Table 3
Lagged Logistic Regression Models Predicting Employment Service Use Over Time.

Variable	Employment Service Use								
	Wave 1 (n = 245)			Wave 2 (n = 176)			Wave 3 (n = 124)		
	OR	95% CI		OR	95% CI		OR	95% CI	
	LL	UL		LL	UL		LL	UL	
Age	1.09	0.94	1.27	0.95	0.77	1.16	1.00	0.78	1.29
Male sex	1.07	0.52	2.21	1.33	0.53	3.33	1.85	0.56	6.06
<i>Race (ref: Non-Hispanic White)</i>									
Black	1.31	0.55	3.15	0.93	0.32	2.66	0.39	0.10	1.55
Hispanic/Latinx	1.27	0.50	3.24	0.32	0.09	1.10	0.52	0.12	2.27
Mixed/Other	1.08	0.47	2.49	1.01	0.36	2.80	0.58	0.15	2.22
LGBTQ+	1.03	0.51	2.09	1.98	0.83	4.69	2.33	0.73	7.45
<i>Education (ref: < high school)</i>									
High school/GED	2.25*	1.05	4.79	1.00	0.39	2.56	0.43	0.13	1.39
College/some college	1.19	0.47	3.03	1.22	0.38	3.99	0.75	0.19	2.91
<i>Housing (ref: unsheltered)</i>									
Shelter/TLP	1.99	0.85	4.70	1.66	0.60	4.57	5.00*	1.38	18.18
Unstably housed	1.12	0.56	2.22	1.09	0.47	2.55	4.11*	1.36	12.42
<i>Drop-in Center (ref: Hollywood #2)</i>									
Hollywood #1	0.34*	0.16	0.74	1.13	0.43	3.02	1.42	0.38	5.31
Venice	0.18*	0.07	0.46	0.56	0.15	2.03	1.13	0.25	5.05
Drop-in center use (duration)	1.03	0.78	1.37	1.07	0.75	1.53	1.11	0.72	1.70
<i>Prior Service Use</i>									
Employment service use (Wave 1)				5.22*	2.30	11.83	2.17	0.77	6.11
Employment service use (Wave 2)						1.03	0.37	2.85	
<i>Social Network Variables</i>									
Relationship with staff (Wave 1)	2.05*	1.06	3.99	1.50	0.65	3.47			
Indegree (Wave 1)	1.20	0.93	1.54	1.19	0.90	1.58			
Outdegree (Wave 1)	1.31	0.97	1.77	1.22	0.87	1.73			
Betweenness centrality (Wave 1)	0.97*	0.94	1.00	0.99	0.98	1.01			
Tie to service user (Wave 1)	1.39	0.57	3.41	0.91	0.31	2.69			
Relationship with staff (Wave 2)							1.71	0.62	4.75
Indegree (Wave 2)							0.92	0.67	1.27
Outdegree (Wave 2)							1.59*	1.06	2.39
Betweenness centrality (Wave 2)							1.00	0.99	1.02
Tie to service user (Wave 2)							0.62	0.17	2.35
Constant	0.04	0.00	1.23	0.28	0.00	23.15	0.08	0.00	19.51

Note. LGBTQ+ = lesbian, gay, bisexual, transgender and/or queer identity; TLP = transitional living placement; OR = odds ratio; CI = confidence interval; LL = lower limit; UL = upper limit

* p < 0.05.

waves (facilitating diffusion). Our results did not support this hypothesis, and are therefore consistent with prior work by Barman-Adhikari and Rice (2014). Our results suggest that education and employment service use behaviors may not easily diffuse through drop-in center youth networks via personal network exposure. Youth may simply not be aware that their peers are using these services, or service-using youth may not be persuading their peers to use them. Valente (1999) also discusses how individuals have different thresholds at which personal network exposure influences adoption. Since youth in the study had only one direct tie to other youth, on average, there may not have been enough variability in personal network exposure to detect social influence effects. Together, our results show that personal network exposure may not play as important a role in influencing youths' decisions to use these services as diffusion of innovations theory would suggest.

Our second aim was to test whether bridging social capital, as measured by youths' reports of having at least one supportive relationship with a drop-in center staff member, would be associated with service use cross-sectionally and prospectively. Our results showed that a positive tie to an adult drop-in staff member was associated with over twice the odds of using employment services at wave 1, compared to youth without such a relationship. Bridging capital was not associated with education service use, however, demonstrating mixed support for our bridging capital hypothesis. Our findings are consistent with previous research showing that supportive relationships with adult staff were associated with a greater likelihood of using employment service at one drop-in center (Barman-Adhikari & Rice, 2014), as well as other types of service use in samples from three drop-in centers (Barman-Adhikari, Petering, et al., 2016). It is unclear why bridging capital was

not associated with using education support services, and there is little previous research investigating education service use among YEH in particular. Our models show that other individual and contextual factors such as educational attainment, housing, and drop-in center location likely play a more important role as correlates of using education support services.

Our third aim investigated whether structural network measures—namely, three measures of network centrality: indegree, outdegree, and betweenness centrality—were significant correlates of service use. Results support that network centrality likely plays an important role in youths' service utilization and subsequent adoption. Consistent with Valente (1999) observation that opinion leaders tend to be early adopters, youth who received a greater number of nominations from their peers were more likely to use education services earlier in the study at Wave 1. However, indegree was not associated with the use of employment services. The relationship between outdegree and service use showed a lagged effect. Outdegree was associated with later adoption of employment services at wave 3 (but not education services). This suggests that youth may have decided to use employment services byway of having a more expansive network at the drop-in center, perhaps because they were able to observe some benefits of using employment services among their peers. It is also possible that youth perceive these two different services differently, given that there were different network factors responsible for their use. Education services might be perceived more favorably by YEH at the drop-ins, given that more popular youth (as measured by indegree) were earlier adopters of this service. Employment services, on the other hand, may not be as well-known or highly favored by YEH, given that its use was not related

to popularity. Finally, betweenness centrality was not associated with education service use, but was negatively associated with employment service use at wave 1. This was contrary to our hypothesis, and may be because youth with high betweenness are burdened by their role as “gatekeepers” (Freeman, 1979) between a large number of their peers. The social obligations and potentially high volume of communication between their peers be a barrier for their participation in higher-level services, although more research is needed to confirm this. If we were to choose between centrality measures, we would argue for the utility of using degree centrality as a correlate of service use, as it is a much simpler and common measure of opinion leadership (Valente et al., 2008).

In addition to social network measures, a number of individual and drop-in center related characteristics were shown to be important correlates of service use. First, our results suggest that YEH with a college degree or some college education may be less likely to use educational support services than YEH who have not completed their high school diploma/GED. This suggests that if educational support services are intended to assist youth with enrolling in programs to complete their high school diploma/GED or apply for college, then these programs may be reaching their intended audience. YEH who are currently enrolled in college, however, may be more likely to seek educational support through their home institution rather than at the drop-in. Secondly, and consistent with prior research (Barman-Adhikari & Rice, 2014), housing was also an important correlate of both types of service use. Compared to unsheltered youth, those who were characterized as “unstably housed” (living in an apartment, hotel, foster/group home, etc.) or residing in a shelter or transitional living accommodations were more likely to be early adopters of education support services. This supports the idea that YEH who have their more basic needs met are able to pursue their higher-level needs to advance their education and employment (Kort-Butler & Tyler, 2012). Third, LGBTQ+ youth were more likely to be later adopters of both services. The reason for this is unclear, but it is telling that the drop-in center with the highest rate of service use (Hollywood drop-in two) also had the greatest proportion of LGBTQ+ youth clients. This may suggest that LGBTQ+ youth gravitated towards accessing services at this particularly drop-in, even if they had indicated another drop-in as their primary location. (It is common for YEH in the area to access more than one drop-in center.) Finally, the fact that receiving services at Hollywood drop-in center two was related to a greater likelihood of being an early adopter of both types of services highlights the important role of the organizational context in service utilization. Longer duration of drop-in center use was also associated with adopting educational services at wave 2, suggesting that youth may eventually utilize higher level services if they continue coming back to the drop-in.

4.1. Study limitations

Several limitations to this study should be pointed out. For one, the study was carried out over three months, a relatively short period of time. Increases in the adoption of service use were encouraging to see, but it may take longer to observe social diffusion as it naturally occurs. Another limitation is the significant number of participants who were lost to follow-up, resulting in some missing data at later survey waves. As mentioned earlier, non-Hispanic youth and youth who were on the periphery of the network were more likely to be lost to follow-up, potentially introducing some bias into our results. More peripheral network members may have also been less likely to consistently use drop-in center services, but this is not known for certain. Furthermore, the relatively small number of ties between study participants could indicate that the youth drop-in networks were relatively sparse (i.e., less dense), which has been seen in other sociometric YEH data (e.g. Barman-Adhikari & Rice, 2014). The difficulty of surveying whole networks, and consequences of missing network data have been documented elsewhere (de la Haye et al., 2017), but it should be noted that the research staff

went to great lengths to accurately survey youths' sociometric ties at each drop-in center.

4.2. Implications for service provision and future research

Findings from this study have several implications for service provision at drop-in centers and future research with YEH. Results support that positive relationships with adult staff are important for use of employment services, but not education support services. This is consistent with a wealth of previous research showing the benefits of assisting YEH develop social capital resources in the form of positive and supportive relationships with service providers and other adults, family members and peers (Dang et al., 2014; Milburn et al., 2012; Rice et al., 2007; Stewart et al., 2009). Results do point to the potential benefit of using social network interventions, such as enlisting (and compensating) popular peer opinion leaders to encourage youth to access higher level services. Some early efforts have been successful in this area. Particularly, efforts to train peer advocates to disseminate HIV prevention messages have shown early promise in reducing HIV risk behaviors (Rice et al., 2021). And, as noted by Kidd and colleagues (Kidd et al., 2019), peer support has been widely used in youth service settings, but there is a lack of scholarship documenting this in the social science literature. The need for peer support and opinion leader models is heightened by the fact that YEH are often not aware of the range of services available to them (Pergamit and Ernst, 2010), and YEH often learn about services through their peers (Pennbridge, Yates, David, & Mackenzie, 1990; Pergamit and Ernst, 2010). More youth participatory research methods are needed to understand youths' knowledge and perceptions of available services, in order to tailor services to better meet youths' diverse needs (Gomez & Ryan, 2016). Youth characteristics, such as educational level, current housing situation, and LGBTQ+ identity are also important to consider when designing and delivering services.

Finally, more research is needed to understand the organizational factors related to utilization of higher-level services. Drop-in centers that have more established resources to provide education and employment supports are likely in a better position to provide these services to a greater number of youth (Slesnick et al., 2008). Many drop-in centers may lack the resources to provide such services, highlighting the need to advocate for more funding, coordinate services, and utilize innovative peer-advocate models to help connect youth to services. Finally, it is important to note that service use is only a first step to connect youth with educational and employment opportunities. Further research is needed to determine if these services are efficacious in helping youth achieve their educational and employment goals.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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