Original Article

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Prevalence and Correlates of Substance Use in Homeless Youth and Young Adults

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Abstract

Substance use is higher among homeless youth than among the general population. Although substance use has been well studied, little is known about the risk factors associated with specific substances used by homeless youth, particularly in the Houston, Texas, area. Therefore, we conducted this study to examine the rates of lifetime and past-month substance use in a sample of homeless youth in Harris County, Texas, and examine the relations between substance type and race/ethnicity, age, gender identity, sexual orientation, shelter status, stress, and trauma history. Participants were recruited during October and November 2014 as part of the study YouthCount 2.0! and completed a survey to assess demographics, stress, abuse, substance use, and risk behaviors. The sample (N = 416) was predominantly young adult (13–17 years old: 55 and 18–24 years old: 361), African American (54.5%), and male (55.9%). Nearly one quarter identified as lesbian, gay, bisexual, or questioning (n = 102). Over a third of youth had used alcohol (38%) or marijuana (36%) in the past month, and 36% had ever used synthetic marijuana. Bivariate analyses showed that substance use was significantly associated with race/ethnicity, age, gender identity, sexual orientation, shelter status, stress, and trauma scores. Youth in this study had lower rates of alcohol and some substance use than other samples of homeless youth, although use still exceeded national rates for housed youth. Substance use prevention interventions for homeless youth should be trauma informed and include housing navigation and stress management strategies. The most at-risk subgroups included street-dwelling and lesbian, gay, bisexual, or questioning youth.

Keywords: homeless youth, substance use, substance abuse, stress

INTRODUCTION

Substance use disproportionately affects homeless youth. Levels of substance use and abuse are far higher among homeless youth than among the general youth population (Early, 2005; Kemp, Neale, & Robertson, 2006). Substance use disorders are common among homeless adolescents and young adults, with estimates of 69% meeting the diagnostic criteria for at least one substance use disorder (Baer, Ginzler, & Peterson, 2003); rates of alcohol abuse and dependence as high as 20% and 61%, respectively; and rates of drug abuse and dependence as high as 30% and 55%, respectively (Gomez, Thompson, & Barcyzk, 2010). One study of homeless youth 12–20 years old in Los Angeles, California, found that 57%–68% reported recent use of marijuana (Rosenthal, Mallett, Milburn, & Rotheram-Borus, 2008). In contrast, a national sample of youth (19–28 years old) not attending college from the 2014 Monitoring the Future study found that the rate of marijuana use in the past 30 days was 19%, and among 12th graders, 22.5% had used marijuana in the past month (Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016; Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2017). Similar rates were found in the 2016 National Survey on Drug Use and Health with 20% of 18- to 25-year-olds reporting marijuana use (Center for Behavioral Health Statistics and Quality, 2016).

Homeless youth disproportionately experience adverse health outcomes stemming from the high prevalence of substance use. Mortality rates among homeless youth are 10 times those of the general adolescent population, and drug overdose is one of the leading causes of death (Roy et al., 2004). Furthermore, youth in general are more likely to engage in high-risk sexual behaviors when they use substances (Tapert, Aarons, Sedlar, & Brown, 2001); substance and alcohol use before sex is associated with inconsistent condom use (Tucker et al., 2012), trade sex, having sex against one's will

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(Heerde, Scholes-Balog, & Hemphill, 2015), known HIV and pregnancy risk factors. Youth who meet the criteria for substance use disorders (i.e., alcohol abuse, alcohol dependence, drug abuse, drug dependence) are also more likely to engage in violence (Crawford, Whitbeck, & Hoyt, 2011), and substance use is associated with sexual victimization (Heerde & Hemphill, 2016). Alcohol and marijuana use is associated with both committing a crime and being a victim of a crime (Heerde & Hemphill, 2016), indicating the complex bidirectional relation between substance use and victimization.

Several factors have been found to be associated with substance use. Homeless youth who have experienced trauma by witnessing victimization are more likely than those who report low levels of exposure to victimization to meet criteria for substance abuse as well as substance dependence (Bender, Thompson, Ferguson, & Langenderfer, 2014). Other factors that have been found to influence substance use are age at the onset of homelessness, duration of homelessness, and perceptions of one's health and coping strategies (Bender et al., 2014; Childress et al., 2015). Youth who experience homelessness before the age of 25 years have been found to have a greater likelihood of having sedative problems than those who first experience homelessness at 25 years or older (Childress et al., 2015). A study in homeless youth 15–25 years old in Santa Monica, California, found that higher drug use severity scores were independently related to low levels of perceived health and maladaptive coping strategies (Nyamathi et al., 2010).

Differences in substance use patterns also exist by race/ethnicity. Nationally representative studies have consistently shown racial differences in alcohol use in adolescence and young adulthood, with more Whites reporting drinking alcohol than Blacks (Klima, Skinner, Hagerty, Crutchfield, & Catalano, 2014). For example, in 2012, the proportion of White high school seniors who reported heavy drinking was twice as high as the proportion of Black students (25.7% vs. 11.3%; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2014). Among youth 12 years or older, the rate of current illicit drug use was similar between White and Black youth (9.5% vs. 10.5%), although White youth were more likely than other racial/ethnic groups to report current use of alcohol (57.7%; Johnston et al., 2014). In a study of 10th graders, White youth reported drinking more frequently than Black youth, and Black heavy drinkers reported fewer alcohol-related problems than White heavy drinkers (Klima et al., 2014).

Youth who identify as lesbian, gay, bisexual, or questioning (LGBQ) also have a greater risk of self-reported lifetime substance use problems than youth who identify as heterosexual (Mereish & Bradford, 2014). Previous research suggests that, compared with their heterosexual peers, lesbians and bisexual women are at a greater risk for alcohol and drug use disorders and related problems and gay and bisexual men are at a greater risk for illicit drug use and related problems (Green & Feinstein, 2012). Results from a systematic review of 12 studies of lesbian, gay, and bisexual youth indicated that the strongest risk factors for substance use were victimization, lack of supportive environments, psychological stress, internalizing/externalizing problem behavior, negative sexual orientation disclosure reactions, and housing instability or homelessness (Goldbach, Tanner-Smith, Bagwell, & Dunlap, 2014). Substance use is also associated with psychological distress (Elkington, Bauermeister, & Zimmerman, 2010).

Nationally representative studies have also identified differences in substance use according to gender with rates of current illicit drug use being higher for men than for women aged 12–17 years (9.6% vs. 8.0%) and men being more likely than women to be current users of marijuana (9.7% vs. 5.6%; Johnston et al., 2016, 2017). In addition, among those 19–30 years old, men report higher past-year use of any illicit drug (41% vs. 35%), marijuana (35% vs. 30%), and alcohol (32.6% vs. 17.4%; Center for Behavioral Health Statistics and Quality, 2016; Johnston et al., 2016, 2017). Men also have higher past-month rates of illicit drug use than women (12.8% vs. 7.3%; Center for Behavioral Health Statistics and Quality, 2016; Johnston et al., 2016).

Although substance use among youth and young adults has been well studied, little is known about the risk factors associated with specific substances used by homeless youth, particularly in the Houston, Texas, area. A study among homeless young adults suggested that social networks, economic factors, and future expectancies are significant predictors of the level of substance use (Gomez et al., 2010). In addition, people experiencing homelessness, in general, are more likely to be substance users, and substance users are more likely to be homeless, indicating a bidirectional relation (McVicar, Moschion, & van Ours, 2015).

Most data on substance use in homeless youth originate from the coastal regions and may not generalize to youth experiencing homelessness in the Southwest region, particularly because substance use among youth overall in the Southwest exceeds national substance use rates (Kann et al., 2016). Therefore, we conducted a thorough analysis of substance use among homeless and unstably housed youth to describe the rates of different types of substance use and identify variables associated with each substance type. The aims of this study were to (a) examine the rates of lifetime and past-month substance use in a sample of homeless youth in Harris County, Texas, and (b) examine the relations between each substance type and race/ethnicity, age, gender identity, sexual orientation, shelter status, stress, and trauma history.

METHODS

Participants were recruited from Harris County, Texas, during October and November 2014, as part of the study YouthCount 2.0! (Narendorf, Santa Maria, & Cooper, 2015; Narendorf, Santa Maria, Ha, Cooper, & Schieszler, 2016). Youth were eligible if they were 13–24 years old and either homeless or unstably housed at the time of recruitment. Recruitment was conducted on 95 occasions across 47 locations, including shelters, street outreach, Magnet events, and drop-in service centers in an attempt to include all young people experiencing homelessness in the county

during the study period. Youth were approached by study staff and screened for eligibility at the time of the encounter. Eligible youth provided verbal consent, completed a survey using paper and pencil or audio-assisted computers, and received a $10 gift card for a local grocery store as compensation. The survey took approximately 20 minutes to complete. Study staff assignments were consistent across recruitment locations to facilitate facial recognition. Youth were also asked whether they had taken the survey before to reduce duplicate enrollment. The human subjects review boards at the two represented institutions approved the study protocol.

Demographics

Participants' demographic characteristics, including race/ethnicity, age, gender identity, sexual orientation, and housing status, were assessed using a survey. Race/ethnicity was defined as African American, White, Hispanic, multiracial (participants who chose two or more options), and other (participants who identified as American Indian, Asian, Native Hawaiian/Pacific Islander, not sure, or something else). Age was dichotomized into minors (13–17 years old) and young adults (18–24 years old) for bivariate analysis. Youth self-identified as male, female, transgender male to female, or transgender female to male. Transgender individuals were categorized as the gender they currently identified with and not their biological sex. Youth self-identified as LGBQ or heterosexual. For multivariable analyses, this was dichotomized to LGBQ or heterosexual. To assess housing status, youth were asked where they had spent the previous night. This information was coded as street dwelling, sheltered (including transitional housing), or unstably housed, defined as a temporary living arrangement in which the participant could not stay for 30 or more days (i.e., doubled up or couch surfing).

Substance Use

Data for lifetime and current (in the past 30 days) substance use were collected using substance use items adapted from the Monitoring the Future survey to facilitate comparability of the findings (Johnston et al., 2017). Participants reported whether they had used any of 14 substances ever during their lifetime and within the past 30 days. High-prevalence substances (alcohol, marijuana, and synthetic marijuana) were analyzed individually. Opioids including Vicodin, Xanax, and heroin were collapsed into a category called "opioids" and cocaine, crack cocaine, ecstasy, and methamphetamine were collapsed into a category called "stimulants."

Stress

The four-item Perceived Stress Scale was used to assess current stress. Four items asked participants how often they found life situations stressful, unpredictable, and uncontrollable over the previous month using a 5-point Likert scale rated from 0 = *never* to 4 = *very often* (Cohen & Williamson, 1988). Positively worded items were reverse coded, and responses were summed into a total score, with higher scores indicating a greater level of stress.

Adverse Childhood Experiences

A history of exposure to childhood traumatic events was measured using the Adverse Childhood Experiences (ACE) scale, which asks about the occurrence of 10 traumatic events before the age of 18 years, including parental death, parental incarceration, household substance use, domestic violence, household mental health problems, neglect, and physical, sexual, and emotional abuse (Felitti et al., 1998). The items are summed for a total ACE score ranging from 0 to 10.

STATISTICAL ANALYSES

Bivariate statistical analyses were conducted using SPSS Version 23 (IBM, Inc., Armonk, NY), and multivariable analyses were conducted using STATA Version 12 (StataCorp LP, College Station, TX). For bivariate analyses, we examined each variable, testing for significance using chi-square and independent samples *t* tests. Small amounts of data were missing for individual variables (less than 10%); however, we decided to use imputation to avoid listwise deletion when conducting multivariable analyses. Missing responses on the independent variables were estimated using multiple imputation procedures to create 20 imputations using a model that included all independent variables. Imputed variables were then used with mi estimate procedures for multivariable logistic regression models to examine predictors of past-month substance use, controlling for all other variables. All variables examined were entered as covariates in the multivariable model to examine the contribution of each, controlling for all of the others. We used an interaction term for Gender identity × Stress to test whether associations between stress and substance use varied by gender identity. The interaction term was retained in the final model only if it was significant.

RESULTS

The sample included 416 participants and was predominantly young adult ($M = 20$ years old, $SD = 2.7$), African American ($n = 226$, 54.5%), and male ($n = 228$, 55.9%; see Table 1). Nearly one quarter identified as LGBQ ($n = 102$, 24.8%). Although the sample does not approximate the larger population of Houston, TX, or Harris County, it is similar to the racial/ethnic breakdown of the adult homeless population in Harris County. Over a third of the sample had used alcohol (38%) or marijuana (36%) in the past month. Bivariate analyses showed that use of various substances was significantly associated with race/ethnicity, age, gender identity, sexual orientation, shelter status, stress, and trauma scores. In the entire sample, the average stress score was 8.3, and the average ACE score was 4.3.

BIVARIATE AND MULTIVARIABLE ANALYSES

Alcohol

Overall, 66% reported lifetime use of alcohol, and 38% had used it in the past month (see Table 1), with significant differences by race/ethnicity in lifetime use. Male youth reported significantly lower rates of ever using alcohol than

TABLE 1 Total Sample Group Differences in Substance Use

	Total Sample	Alcohol		Marijuana		Synthetic Marijuana		Stimulants		Opioids	
Overall	*N* = 416	Lifetime (*N* = 409)	Past Month (*N* = 408)	Lifetime (*N* = 416)	Past Month (*N* = 391)	Lifetime (*N* = 407)	Past Month (*N* = 385)	Lifetime (*N* = 401)	Past Month (*N* = 392)	Lifetime (*N* = 397)	Past Month (*N* = 392)
	%	66.3	38.2	65.6	35.8	36.1	17.4	29.2	12.3	22.9	7.9
Race/ethnicity											
African American	54.5	63.0	34.3	61.8	33.3	25.8	12.2	23.1	8.4	18.8	6.6
White	13.5	82.1	39.3	75.4	36.4	59.6	30.4	48.2	23.2	35.7	8.9
Hispanic	11.3	76.1	45.7	70.8	39.1	44.7	16.3	41.7	23.9	30.4	15.2
Multiracial	15.2	67.2	48.5	70.1	38.3	36.4	15.3	20.3	10.3	15.8	5.3
Other	5.5	34.8	26.1	52.2	40.9	52.2	38.1	33.3	4.6	29.2	4.5
Significance	–	**	*ns*	*ns*	*	***	*	**	**	*	*ns*
Age											
Minor	13.2	69.1	27.3	67.3	30.9	8.9	11.3	32.1	18.9	34.6	15.4
Young adult	86.8	65.8	39.9	65.4	36.6	35.7	18.4	28.8	11.3	21.2	6.7
Significance	–	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*	*
Gender identity											
Male	55.9	61.1	38.9	66.4	40.3	38.5	20.0	30.1	13.0	24.6	9.7
Female	44.1	72.1	37.1	65.2	30.7	32.2	13.1	26.8	10.1	20.9	5.1
Significance	–	*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*	*ns*
Sexual orientation											
Heterosexual	76.0	64.0	35.5	63.6	34.6	31.4	15.2	24.8	9.1	20.1	7.1
Lesbian or gay	7.15	69.0	41.4	67.7	39.3	45.2	9.0	38.7	19.3	29.0	12.9
Bisexual	10.9	74.4	48.8	80.0	45.5	54.8	31.7	46.5	30.2	40.0	12.2
Questioning	5.6	82.6	56.5	65.2	35.0	54.1	21.0	41.7	13.6	21.7	4.5
Significance	–	*ns*	*ns*	*ns*	*ns*	**	*ns*	**	**	*	*ns*
Shelter status											
Street	32.7	64.8	47.7	63.7	46.7	49.2	29.1	37.2	17.1	27.0	11.5
Shelter	50.0	69.4	30.8	65.2	28.4	31.1	11.0	26.3	10.8	21.9	5.9

(continues)

TABLE 1 Total Sample Group Differences in Substance Use, Continued

	Total Sample	Alcohol		Marijuana		Synthetic Marijuana		Stimulants		Opioids	
Unstably housed	17.3	59.7	43.1	70.4	38.2	26.1	16.2	22.9	8.7	18.6	7.2
Significance	–	*ns*	**	*ns*	**	**	***	*	*ns*	*ns*	*ns*
Current stress score, *M* (*SD*)	8.3 (3.1)	8.5 (3.2)*	8.8 (3.2)*	8.5 (3.2)*	8.8 (3.1)*	8.8 (3.2)**	9.5 (2.9)***	8.6 (3.0)	9.1 (2.6)*	8.7 (3.0)	8.8 (2.5)
ACE score, *M* (*SD*)	4.3 (3.1)	4.7 (3.0)***	4.9 (3.0)***	4.3 (3.1)	4.2 (3.1)	4.6 (2.9)*	4.9 (2.7)*	4.9 (2.7)**	4.5 (2.5)	5.0 (2.7)**	5.3 (2.5)*

Note. Club drugs are combined opiates, ecstasy, inhalants, promethazine (cough syrup), hallucinogens, and bath salts; hard drugs are combined cocaine, crack cocaine, methamphetamines, heroin, and PCP. Young adults are those aged 18–24 years; minor are those aged 13–17 years.
Other = combined American Indian, Asian, Native Hawaiian/Pacific Islander, not sure, and something else; LGBQ = lesbian, gay, bisexual, or questioning; ACE = Adverse Childhood Experiences scale.
*$p < .05$. **$p < .01$. ***$p < .001$.

female youth (61% vs. 72%; $p < .05$). LGBQ youth had significantly higher rates of past-month use than heterosexual youth (48% vs. 36%; $p < .05$). However, when compared across heterosexual, lesbian or gay, bisexual, and questioning, no significant relations were found. Those living on the streets were significantly more likely to have used alcohol in the past month (48%) than sheltered youth (31%; $p < .01$). Stress and ACE scores were significantly associated with lifetime and past-month alcohol use. Those who had used alcohol in the past month had significantly higher stress and ACE scores than those who had not used alcohol ($p < .05$ and $p < .001$, respectively). No significant bivariate relations between alcohol use and age or sexual orientation were found. In the multivariable logistic regression model for past-month use, those who were on the streets ($p < .05$) and those with higher ACE scores ($p < .01$) had higher odds of past-month alcohol use when controlling for other variables (see Table 2). The interaction term between gender identity and stress was significant, indicating that the relation between stress and substance use was stronger among women than men (see Figure 1).

Marijuana

In the total sample, 66% reported lifetime use of marijuana, and 36% had used it in the past month. No significant differences were found in lifetime marijuana use by age, gender identity, sexual orientation, or ACE score. However, past-month marijuana use differed significantly by race/ethnicity; Hispanic youth and those identifying as "other" had the highest rates (39% and 41%, respectively), and African American youth had the lowest rate (33%; $p < .05$). Past-month use also differed significantly by shelter status, with street-dwelling youth reporting the highest rates (47%) and sheltered youth reporting the lowest rates (28%; $p < .01$). Those who had used marijuana in their lifetime and in the past month had higher mean stress scores than those who did not use marijuana ($p < .05$). In the multivariable logistic regression models for past-month marijuana use, those who were Hispanic or multiracial, those who were unsheltered, those who identified as male, and those who had higher stress scores had higher odds of past-month marijuana use (see Table 2).

Synthetic Marijuana

Overall, 36% reported lifetime use of synthetic marijuana, and 17% had used it in the past month. White youth reported the highest rate of lifetime use of synthetic marijuana (60%), whereas African American youth reported the lowest rate (26%). Rates of lifetime use differed significantly according to sexual orientation and shelter status ($p < .001$); bisexual and street-dwelling youth also reported high rates (55% and 50%, respectively). Past-month use differed significantly by race/ethnicity ($p < .05$) and shelter status ($p < .01$) in the same patterns seen in lifetime use. Finally, those who used synthetic marijuana in their lifetime and in the past month had higher mean stress ($p < .01$) and higher mean ACE

TABLE 2 Multivariable Logistic Regression Models for Past-Month Substance Use

	Alcohol, OR (CI; *n* = 408)	Marijuana, OR (CI; *n* = 391)	Synthetic Marijuana, OR (CI; *n* = 385)	Stimulants, OR (CI; *n* = 382)	Opioids, OR (CI; *n* = 384)
White	0.95 (0.50, 1.80)	1.33 (0.70, 2.53)	2.34 (1.11, 4.93)*	2.62 (1.12, 6.12)*	1.01 (0.32, 3.13)
Hispanic	1.37 (0.67, 2.80)	2.08 (1.06, 4.07)*	2.05 (0.86, 4.87)	3.57 (1.47, 8.66)**	2.78 (0.99, 7.80)
Multiracial	1.19 (0.65, 2.19)	2.23 (1.20, 4.14)*	1.23 (0.52, 2.95)	1.04 (0.38, 2.86)	0.68 (0.18, 2.58)
Other	0.47 (0.17, 1.30)	1.53 (0.57, 4.08)	1.46 (0.43, 4.98)	0.35 (0.04, 2.95)	0.45 (0.05, 3.73)
Stress	0.98 (0.90, 1.08)	1.08 (1.01, 1.18)*	1.16 (1.04, 1.29)**	1.08 (0.96, 1.21)	1.00 (0.88, 1.15)
LGBQ	1.56 (0.94, 2.57)	1.35 (0.81, 2.25)	2.03 (1.09, 3.77)*	3.82 (1.92, 7.61)**	2.67 (1.33, 6.29)*
Sheltered	0.53 (0.34, 0.82)**	0.53 (0.34, 0.83)**	0.46 (0.25, 0.84)*	0.69 (0.35, 1.36)	0.55 (0.24, 1.24)
ACE score	1.15 (1.07, 1.24)**	1.01 (0.94, 1.09)	1.07 (0.97, 1.18)	1.04 (0.93, 1.17)	1.20 (1.04, 1.38)*
Young adult	1.02 (0.94, 1.11)	0.93 (0.85, 1.01)	0.99 (0.88, 1.11)	0.83 (0.73, 0.94)**	0.80 (0.68, 0.94)**
Female	0.10 (0.01, 0.70)*	0.62 (0.39, 0.20)*	0.47 (0.25, 0.89)*	0.48 (0.23, 0.98)*	0.29 (0.12, 0.75)*
Stress × Female	1.18 (1.01, 1.37)*	–	–	–	–

Note. Race reference group: African American.
OR = odds ratio; CI = confidence interval; LGBQ = lesbian, gay, bisexual, or questioning; ACE = Adverse Childhood Experiences scale.
*$p < .05$. **$p < .01$.

($p < .05$) scores than those who did not. In the multivariable logistic regression models for past-month use, those who were White, those who identified as LGBQ, those who were unsheltered, those who identified as male, and those with higher stress scores had higher odds of synthetic marijuana use (see Table 2).

Stimulants

In the total sample, 29% had ever used stimulants, and 12% had used them in the past month. Rates of lifetime and past-month stimulant use differed significantly according to race/ethnicity, sexual orientation, shelter status, stress, and ACE score. White youth reported the highest rate of lifetime use of stimulants (48%), and multiracial and African American youth reported the lowest rates (20% and 23%, respectively; $p < .01$). Bisexual and street youth had the highest rates of both lifetime and past-month stimulant use ($p < .01$), whereas heterosexual and unstably housed youth had the lowest of both rates. No significant differences in stimulant use were found according to age or gender identity. Multivariable logistic regression models for past-month use showed that those who were White or Hispanic had greater odds of stimulant use compared with African American youth, those who were LGBQ had higher odds than those who identified as heterosexual, men had higher odds than women, and minors had higher odds than young adults (see Table 2).

Opioids

In the total sample, 23% reported lifetime use of opioids, and 8% had used in the past month. White youth reported the highest rate of lifetime use, and Hispanic youth reported the highest rate of past-month opioid use. Minors had higher rates of both lifetime and past-month opioid use than young adults. Bisexual youth had significantly higher rates of lifetime opioid use (40%), but no significant differences were found in past-month use ($p < .05$). The mean ACE score was higher in those who reported both lifetime and past-month use of opioids. No significant differences in use rates by gender identity, shelter status, or stress levels were found. In the multivariable logistic regression models for past-month use, those who identified as LGBQ and minor and those with higher ACE scores had higher odds of opioid use (see Table 2). In summary, race/ethnicity, stress, sexual orientation, shelter status, ACE score,

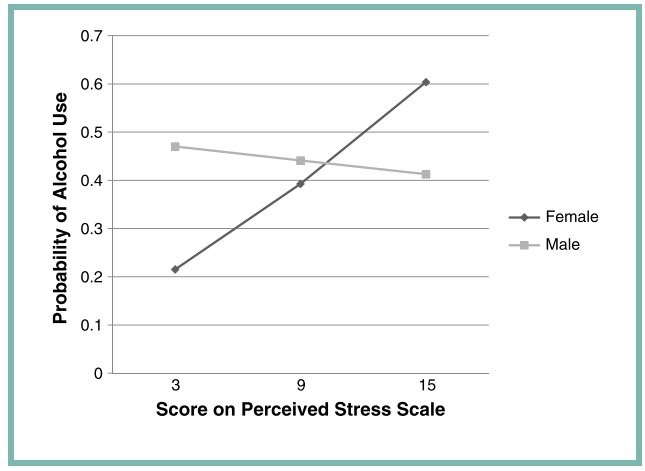

Figure 1. Relation between stress, gender identity, and alcohol use.

age, and gender identity were associated with substance use, although the associations differed by substance.

DISCUSSION

In this study, we assessed variations in substance use patterns among homeless youth and differences by race/ethnicity, age, gender identity, sexual orientation, housing status, stress levels, and experiences of trauma. As expected, our findings confirm that substance use is high in homeless youth and that stress, trauma, and housing are clearly risk factors for use. Surprisingly, our findings show that synthetic marijuana is very high in homeless youth in Houston, Texas, and represents an emerging health concern. Although White and LGBQ youth appear to be at the highest risk of substance use, our data suggest that sheltering is a protective factor for substance use. Homeless youth in this study had lower rates of using alcohol and some substances than those reported in other samples of homeless youth (Rosenthal et al., 2008), although these rates still exceed national rates for housed adolescents and young adults (Kann et al., 2016). Lifetime use rates were higher in homeless youth when compared with national youth data for alcohol (66% vs. 63%), marijuana (66% vs. 39%), and synthetic marijuana (36% vs. 9%; Kann et al., 2016).

White and Hispanic youth had higher odds of past-month use of marijuana, synthetic marijuana, and stimulant use compared with African American youth. These findings suggest that White and Hispanic youth may be high-risk subgroups of homeless youth in need of targeted substance use treatment and prevention initiatives. Male youth were also a high-risk group reporting more past-month substance use than female youth. Moreover, women had higher odds of alcohol use as stress levels increased, whereas stress had a little impact on the likelihood of alcohol use in men. It is particularly important to address alcohol use in homeless women as a means of preventing fetal alcohol syndrome. Homeless women are four times more likely to become pregnant and more likely to experience multiple pregnancies than housed female adolescents (Berry, Shillington, Peak, & Hohman, 2000; Whitbeck & Hoyt, 1999). Finally, LGBQ youth were more likely than heterosexual youth to have used any substance in the past month and significantly more likely to have used synthetic marijuana, stimulants, and opioids.

Although findings from this study suggest slightly higher rates of alcohol and marijuana use compared with a nationally representative sample of youth (Johnston et al., 2016, 2017), of great concern were the high rates of synthetic marijuana among the sample: Over one third (36%) reported lifetime use of synthetic marijuana compared with only 1.3% in the general population (Johnston et al., 2016, 2017). Synthetic marijuana is an emerging public health threat among homeless youth in Harris County, Texas, due to the significant and detrimental health consequences associated with its use, including seizures, severe agitation and anxiety, hallucinations, psychosis, suicidal thoughts, hypertension, tachycardia, myocardial infarction, and stroke, frequently in otherwise healthy young individuals (Castaneto et al., 2014; Seely, Lapoint, Moran, & Fattore, 2012; Winstock & Barratt, 2013a, 2013b). In addition, multiple synthetic marijuana overdoses have been reported in the news in cities across the country (e.g., Houston, Texas, and New York City, available at http://www.houstonpress.com/news/16-hospitalized-after-synthetic-marijuana-overdose-at-hermann-park-8511687 and http://www.nytimes.com/2016/07/13/nyregion/k2-synthetic-marijuana-overdose-in-brooklyn.html?_r=0). We found that White, LGBQ, and street-dwelling youth reported higher rates of lifetime and past-month use of synthetic marijuana. Of particular interest is the strong relation between stress and synthetic marijuana use. Although we cannot ascertain whether higher past-month stress drives this use or if synthetic marijuana use increases stress, our findings support the idea that users experience more stress than nonusing homeless youth and may benefit from stress management strategies. The literature does suggest a connection between higher stress and alcohol and drug use (Fetzner, McMillan, Sareen, & Asmundson, 2011; Reynolds et al., 2005).

Findings from this study suggest that interventions aiming to prevent substance use may benefit from incorporating housing support, providing trauma-informed care, and integrating stress management strategies. Healthcare providers caring for homeless patients should consider the high rates of substance use coupled with health, psychiatric, and psychosocial comorbid conditions such as stress and trauma and discuss the benefits of and accessibility to substance abuse treatment (Krupski, Graves, Bumgardner, & Roy-Byrne, 2015). Interventions to reduce substance use in homeless youth should also consider the environmental factors such as sheltering options and drop-in centers that may be associated with risk for substance abuse and dependence (Gomez et al., 2010). Substance use prevention interventions should be trauma informed and address the high levels of stress experienced by this population. Substance use prevention strategies are needed in the most at-risk subgroups, including street-dwelling and LGBQ youth.

Several study limitations should be considered when interpreting these findings. Substance use measures were dichotomous variables and allowed participants to indicate lifetime or past-month use but not their personal perception of problematic use or abuse, which is more common in substance use research. Data from this study were collected on a cross-sectional convenience sample, so no definitive conclusions about causality or temporality can be conferred.

This study also has several strengths. It provides more detailed information on associations of several types of substance use with known risk factors across a sample that was recruited not only from shelters but also from the streets and other Magnet events. Therefore, although a convenience sample, it likely captures a more representative cross-section of youth who are experiencing homelessness

than prior work. Our findings also highlight the widespread use of synthetic marijuana. Future research on substance use in homeless youth should use a longitudinal prospective design and consider using methods such as ecological momentary assessments to gather data very close to the time of substance use to identify proximal triggers that can predict near-real-time substance use and might serve as ready points of intervention. In addition, questions regarding participants' perception of problem use or abuse would help in identifying youth who are ready to seek treatment or counseling for substance use.

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