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Prevalence and correlates of nonmedical use of prescription drugs (NMUPD) among Young adults experiencing homelessness in seven cities across the United States

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ABSTRACT

Background: Nonmedical use of prescription drugs (NMUPD) is an urgent public health concern facing the United States. Young adults experiencing homelessness (YEH) are at increased risk of NMUPD; however, community estimates of NMUPD among YEH are sparse. This current study sought to understand patterns and correlates of NMUPD in a geographically heterogeneous sample of YEH recruited from seven cities across the United States.

Methods: From June 2016 to July 2017, 1,426 YEH (aged 18–26) were recruited from seven cities (Houston, Los Angeles, Denver, Phoenix, New York City, St. Louis, San Jose). Participants provided information on substance use, mental health, trauma, and sexual-risk behaviors. Multivariable logistic regression was utilized to assess demographic, psychological, and behavioral correlates of self-reported past-month NMUPD and NMUPD types (i.e., prescription stimulant, sedative, and opioids).

Results: Approximately 20% of participants reported past-month NMUPD. Almost 9% reported misusing prescription opioids, 8.7% misused prescription sedatives, and 6% misused prescription stimulants. Multivariable logistic regressions revealed unmet mental health needs were associated with sedative and stimulant misuse but not opioid misuse. Having suicidal thoughts was associated with opioid misuse but not sedative or stimulant misuse. Although no geographical differences emerged for stimulant and sedative misuse, youth from Denver, Phoenix, and San Jose were more likely to engage in opioid misuse relative to youth in Los Angeles.

Conclusions: These findings indicate that interventions designed to address NMUPD need to be multifaceted, designed to address other risk behaviors correlated with NMUPD, and target unmet mental health needs.

1. Introduction

Nonmedical use of prescription drugs (NMUPD) is an urgent public health concern facing the United States. NMUPD is defined as the use of a medication not prescribed by a health care provider, taken longer than originally prescribed for reasons other than those for which it was prescribed, or in higher doses than directed (Barrett et al., 2008). NMUPD often involves the use of opioids, stimulants, and sedatives (Schepis et al., 2018), with opioids reported to be used most frequently, followed by stimulants, and sedatives (Tapscott and Schepis, 2013). NMUPD is known to have serious health consequences including overdose and death, accounting for more fatalities than heroin and cocaine combined (Seth et al., 2018).

Young adults experiencing homelessness (YEH) engage in

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substantially higher levels of substance use compared to their housed peers (Nyamathi et al., 2012; Santa Maria et al., 2018; Wenzel et al., 2010). Although alcohol and marijuana are the most commonly used substances (Santa Maria et al., 2018; Wenzel et al., 2010), the use of other substances, specifically NMUPD, is on the rise in this group (Al-Tayyib et al., 2014; Barman-Adhikari et al., 2017; Rhoades et al., 2014). Yet with few exceptions, community prevalence estimates of NMUPD among YEH continue to be scarce and often originate from one-city samples. This lack of research is surprising because the few studies that have focused on NMUPD among homeless or street-involved adolescents and young adults in the United States have reported that approximately 25% engage in NMUPD (Al-Tayyib et al., 2014; Barman-Adhikari et al., 2017; Rhoades et al., 2014), a rate much higher than that reported among housed young adults aged 18–25, estimated at around 4.6% (Ahrnsbrak et al., 2017).

Studies have suggested that NMUPD among YEH is often associated with concomitant use of other substances (Al-Tayyib et al., 2014; Barman-Adhikari et al., 2017; Rhoades et al., 2014) and elevated sexual risk behaviors such as condomless sex (Rhoades et al., 2014). Additionally, Rhoades et al. (2014) reported significant associations between NMUPD and increased suicidal ideation and history of foster care, whereas Barman-Adhikari et al. (2017) found a significant association between any type of health care utilization and NMUPD.

Although prior studies provided critical insights about NMUPD among YEH, our understanding is limited in that extant findings largely were drawn from the same sample, were conducted in one geographical region (i.e., Los Angeles), and relied on data collected in 2013. For example, previous studies have found that rates of substance use among YEH are higher in the Southwest (Ferguson et al., 2010; Santa Maria et al., 2018) than other regions of the United States. We are not sure if this is the case with NMUPD. It is important to expand on previous research and document patterns of NMUPD across geographically heterogeneous and understudied samples. The current study used data collected from June 2016 to July 2017 and sampled YEH from seven cities (Los Angeles, San Jose, Phoenix, St. Louis, Denver, Houston, and New York City), which includes representation from the western, midwestern, southern, and northeastern regions of the United States. Thus, this is the first known study to consider NMUPD in such a geographically diverse cohort of YEH.

Further, NMUPD is an umbrella term that refers to subtypes of drugs (i.e., prescription opioids, stimulants, sedatives), and existing research has focused on NMUPD among YEH as a whole and not on these distinct substances. Extant studies have found that patterns and correlates of NMUPD vary by type (McCabe et al., 2016; Rougemont-Bücking et al., 2018). For example, misuse of prescription stimulants is associated with a desire to enhance academic performance (Bavarian et al., 2015) and psychological factors such as increased stress, depression, and anxiety (Verdi et al., 2016; Weyandt et al., 2009). On the other hand, opioids are often used for pain relief rather than getting high (McCabe et al., 2013) and are significantly associated with suicide and suicidal ideation (Schepis et al., 2018). Like opioid misuse, sedative misuse also has been linked to suicidal ideation (Schepis et al., 2018); however, research solely on sedative use has been limited to date, even among housed young adults. Therefore, this study further expanded our understanding of NMUPD by examining distinct NMUPD types so that future prevention and intervention efforts can be tailored to match these specific preferences.

2. Methods

2.1. Study design

This cross-sectional study was the product of a collective research effort undertaken by a team of interdisciplinary researchers around the United States who surveyed approximately 200 YEH in each city chosen for this study (Los Angeles, San Jose, Denver, Phoenix, Houston, New York, and St. Louis; $N = 1426$). The institutional review boards of institutions in all locations approved the study.

2.2. Sample and recruitment

A standardized protocol for recruiting and screening participants was utilized across sites. Purposive sampling was utilized to recruit approximately 200 unique English-speaking YEH (aged 18–26) in each city. Sites intentionally sampled from agencies providing different types of services (e.g., shelter, drop-in center, transitional housing, etc.) to capture the variation in the experiences and demographics of YEH. An eligibility screener was used to determine age and homelessness status, defined as spending the prior night either on the streets, in a shelter, an apartment provided through a temporary housing voucher, in a location not meant for human habitation, or temporarily with friends, acquaintances, or family where they could not stay for more than 30 days. Verbal informed consent was obtained from eligible participants.

2.3. Data collection procedures

Once consent was collected, participants were assigned a unique identification code consisting of the first letter of their mother's first name, the number of older brothers, the number representing the month they were born, and the first letter of their middle name; this helped us identify duplication in participation within and across sites. Using this method, we identified 17 YEH who shared the same unique identification code. After comparing demographic data for these 17 YEH, five duplicates were identified. For these five YEH, only their first survey responses were kept.

The survey lasted about 45 min. Participants received $20 to $25 dollars, depending on the study site, in the form of a gift card to a local vendor in appreciation for their participation.

2.4. Measures

2.4.1. Sociodemographic characteristics

Sociodemographic characteristics included age; gender (male, female, and gender minority [i.e., transgender male, transgender female, gender queer, and other]); ethnicity (White, Black, Latinx, and other and mixed race); sexual orientation (heterosexual or lesbian, gay, bisexual, or queer); foster care experience (1 = *yes*, 0 = *no*); and education (high school degree or less than high school degree).

2.4.2. NMUPD, sedative, stimulant, opioid, and substance use behaviors

Recent NMUPD was assessed by asking whether a participant took a prescription drug without a doctor's prescription or used more of the drug or took the drug more often than prescribed within the last 30 days (1 = *yes*, 0 = *no*; Eaton et al., 2012). Youth were asked to identify the type of prescription drug (i.e., stimulants such as Ritalin, Concerta, Dexedrine, Adderall, prescription diet pills, etc.; sedatives like Valium, Serepax, Ativan, Xanax, Librium, Rohypnol, GHB, etc.; or opioids such as fentanyl, oxycodone [OxyContin, Percocet], hydrocodone [Vicodin], methadone, buprenorphine etc.). Similarly, using items adapted from the Youth Risk Behavior Survey (Eaton et al., 2012), we assessed for past-30-day heavy drinking and use of marijuana, heroin, cocaine, methamphetamine, and injection drugs (1 = *yes*, 0 = *no*). Heavy drinking was defined as having five or more drinks of alcohol in a row; that is, within a couple of hours. Illicit drug use included the use of heroin, cocaine, methamphetamine, ecstasy, and synthetic marijuana in the past 30 days.

2.4.3. Sources of NMUPD

For YEH who had engaged in NMUPD, we assessed how these prescription drugs were obtained (e.g., from doctors, through fake prescriptions, from friends or relatives, or through dealers). The source options were not mutually exclusive (i.e., respondents could check

multiple prescription drug sources). Because these variables were only asked of YEH who had engaged in recent NMUPD, we did not include them in our multivariable models.

2.4.4. Psychological characteristics

Depression was assessed using the 9-item Patient Health Questionnaire (PHQ-9); scores were summed and an overall score greater than 10 indicated depression (Kroenke et al., 2001). Post-traumatic stress symptoms (PTSS) were assessed using the 4-item primary care PTSS screening tool; YEH who answered "yes" to three items were screened as having PTSS (Cameron and Gusman, 2003). Suicidal ideation was assessed by asking participants if they had any suicidal thoughts in the past 12 months (1 = *yes*, 0 = *no*). Scores on the 10-item Adverse Childhood Experience Questionnaire were summed (Felitti et al., 1998) to reflect youth's experiences with childhood trauma and stress. Unmet mental health need was assessed with the question, "Was there ever a time when you needed mental health treatment or counseling for yourself but did not get it?" (1 = *yes*, 0 = *no*).

2.4.5. Street victimization experiences

Measuring street victimization experiences involved assessment of physical victimization (i.e., assaulted with or without a weapon), sexual victimization (i.e., sexual assault or forced sexual encounter), and witnessing victimization (i.e., seeing someone get attacked) after becoming homeless (each coded 1 = *yes*, 0 = *no*).

2.4.6. Sexual risk behaviors

Sexual risks included lifetime survival sex, past-3-month condomless sex, sexual debut before 14 years old, multiple sexual partnerships (i.e., two or more sexual partners), and sexual intercourse under the influence of substances during last sexual intercourse (each coded 1 = *yes*, 0 = *no*).

2.5. Analytic approach

Data analysis was conducted using Stata 13. Correlations between variables were assessed using Pearson's correlation analysis. Bivariable and multivariable logistic regression analyses were conducted to assess associations between independent variables and the four outcomes of interest (i.e., overall NMUPD, stimulant misuse, sedative misuse, and opioid misuse). To preserve statistical power and degrees of freedom (because of the large number of variables being examined), bivariable analyses were first conducted to examine unadjusted associations between study variables and outcome measures (Hosmer et al., 2013). Independent variables significantly associated at $p < .05$ with the outcomes of interest were entered in the final multivariable logistic regression model of the corresponding outcome. Key demographic variables (i.e., age, gender, race and ethnicity, sexual orientation) were entered in the final multivariable models across all four outcomes of interest, regardless of statistical significance. Variance inflation factor analyses were conducted among variables included in final multivariable models to assess for potential multicollinearity. None of the statistics exceeded 2.3, suggesting multicollinearity can be ruled out (Hair et al., 1998).

3. Results

3.1. Descriptive statistics

Descriptive statistics are presented in Table 1. As noted above, YEH were recruited from seven cities across the United States (N = 1426) and were recruited from agencies providing different types of services (e.g., shelter, drop-in center, transitional housing, etc.) to capture the variation in the experiences and demographics of YEH. In some cities, each agency provided one kind of service. However, in many cases and depending on city, an agency provided more than one service. For example, one agency in St. Louis provided both emergency shelter and transitional living programs in the same location. When we recruited participants from programs that offered multiple services, we only documented the agency where we recruited from, not the type of program in which participants were enrolled. This is true for other cities and agencies where we conducted recruitment. Based on these recruitment methods, 841 YEH were recruited from drop-in centers, 196 YEH from shelters, and 389 YEH from agencies that provided multiple

Table 1
Descriptive Characteristics of Participants.

N = 1426)

	n (%) or *M* (*SD*)
Outcomes	
Recent NMUPD	279 (19.9)
Recent prescription stimulant misuse	84 (6.0)
Recent prescription sedative misuse	121 (8.6)
Recent prescription opioid misuse	128 (9.2)
Study sites	
Los Angeles	215 (15.1)
Denver	208 (14.6)
Houston	202 (14.2)
New York City	198 (13.9)
Phoenix	208 (14.6)
St. Jose	197 (13.8)
St. Louis	198 (13.9)
Age (years)	20.9 (2.1)
Gender	
Male	833 (58.8)
Female	482 (34.0)
Gender minority	101 (7.1)
Sexual orientation	
Heterosexual	986 (69.2)
Sexual minority	439 (30.8)
Race and ethnicity	
White	270 (18.9)
Black	531 (37.3)
Latinx	247 (17.4)
Multiracial or other	376 (26.4)
High school education or above	986 (69.2)
Involvement in foster care system	553 (38.9)
Psychosocial characteristics	
Depression	949 (69.2)
Posttraumatic stress symptoms	541 (39.1)
History of suicidal ideation	380 (27.1)
No. of adverse childhood experiences	4.6 (3.0)
Any adverse childhood experience	1218 (88.2)
History of unmet mental health needs	469 (33.5)
Street victimization history	
Witnessed	777 (55.3)
Physical	820 (58.4)
Sexual	415 (29.5)
Substance use behaviors	
Heavy drinking	474 (34.0)
Marijuana	848 (60.7)
Illicit drugs	560 (40.6)
Injection drugs	121 (8.6)
Sexual risk behaviors	
Survival sex	277 (19.6)
Condomless sex	613 (43.3)
Age at sexual debut < 14	407 (28.7)
Sexual intercourse under the influence	495 (35.0)
Multiple sexual partnerships	440 (31.1)
Sources of prescription drugs[a]	
One doctor	64 (22.9)
Multiple doctors	30 (10.8)
Fake prescriptions	22 (7.9)
Doctors, stolen	23 (8.3)
Friends or relatives, free	107 (38.5)
Friends or relatives, purchased	74 (26.6)
Friends or relatives, stolen	37 (13.3)
Dealers, purchased	65 (23.4)
Online, purchased	18 (6.5)

[a] Only applies to youth who misused prescription drugs (*n* = 279); not included in multivariate analysis; and not mutually exclusive.

service programs.

Most participants identified as Black (37.3%), cisgender (92.8%), and heterosexual (69.2%); mean age was 20.9 years. Furthermore, a majority of participants obtaining their high school diploma, GED, or higher (69.2%); and reported no history of foster care (61.1%).

Almost 1 in 5 YEH reported recent NMUPD (19.9%), with opioids being the most used (9.2%), followed by sedatives (8.6%) and stimulants (6.0%). The major methods of obtaining prescription drugs among YEH were being given the drugs free from friends or relatives (38.5%) or purchasing the drugs from friends or relatives (26.6%). Regarding other substance use behaviors, more than 60% of youth reported recent marijuana use and more than 40% reported recent illicit drug use. Engagement in sexual risk behaviors was also high, with 43.3% of participants indicating that they had engaged in condomless sex at last sexual intercourse.

A high proportion of youth met screening criteria for mental health problems including depression (69.2%) and PTSS (39.1%). Many also reported multiple adverse childhood experiences ($M = 4.6$); specifically, 88.2% of YEH reported experiencing at least one category of adverse childhood experiences. More than a third (33.5%) reported unmet mental health needs. Street victimization experiences were also common, with 58.4% reporting physical victimization, 55.3% reporting being a witness to victimization, and 29.5% reporting sexual victimization.

Fig. 1 illustrates the prevalence of NMUPD by study cities. Samples in Denver, Phoenix, and San Jose had the highest frequency of NMUPD among participants (22.3%, 21.9%, and 26.3%, respectively). YEH sampled in Denver had higher rates of misuse across all three types of NMUPD (i.e., 11.3% for stimulants, 11.2% for sedatives, and 12.6% for opioids), whereas YEH sampled in Phoenix and San Jose had higher rates of sedative and opioid misuse.

3.2. Bivariable and multivariable results

Pearson's correlational analysis are presented in Table 2. There were significant large (> .50) positive correlations between NMUPD and heavy drinking, marijuana use, and hard drug use.

Bivariable logistic regression results (not shown) indicated significant associations between variables at $p < .05$ with the outcomes of interest; those variables were entered in the final multivariable logistic regression model of the corresponding outcome. The findings indicated that sexual victimization, sexual debut before age 14, and condomless sex were not significantly associated with prescription stimulant misuse and were excluded from the corresponding multivariable model. Additionally, sexual debut before age 14 was not significantly associated with prescription sedative misuse and was excluded from the corresponding multivariable model. Key demographic variables (i.e., age, site, gender, race and ethnicity, sexual orientation) were entered in the final multivariable models across all four outcomes, regardless of statistical significance.

Multivariable logistic regression models depicting associations with overall NMUPD and each NMUPD type (i.e., opioid, stimulant, and sedative misuse) are presented in Table 3.

Regarding overall NMUPD, the multivariable model (Table 3) indicated that Black (*OR* = 2.9; 95% CI = 1.7, 5.1), Latinx (*OR* = 3.3; 95% CI = 1.8, 6.1), and multiracial (*OR* = 2.5; 95% CI = 1.5, 4.3) YEH had higher odds of engaging in NMUPD compared to White youth. Additionally, having suicidal thoughts (*OR* = 1.5; 95% CI = 1.0, 2.2) and unmet mental health needs (*OR* = 1.8; 95% CI = 1.2, 2.6) were significantly associated with NMUPD. All substance use variables, which included heavy drinking (*OR* = 1.9; 95% CI = 1.4, 2.7), marijuana (*OR* = 2.3; 95% CI = 1.4, 3.7), illicit drug use (*OR* = 2.7; 95% CI = 1.9, 4.0), and injection drug use (*OR* = 6.8; 95% CI = 4.1, 11.3) were significantly associated with NMUPD. Only one sexual risk engagement variable, sexual intercourse under the influence of substances (*OR* = 1.9; 95 CI = 1.3, 2.7), was associated with NMUPD.

Regarding prescription stimulant misuse, the multivariable model (Table 3) indicated that YEH who reported unmet mental health needs (*OR* = 2.3; 95% CI = 1.3, 4.2), illicit drug use (*OR* = 2.5; 95% CI = 1.3, 4.8), and injection drug use (*OR* = 5.7; 95% CI = 3.2, 10.3) had higher odds of engaging in prescription stimulant misuse.

The multivariable model assessing associations with prescription sedative misuse (Table 3) indicated that Black (*OR* = 2.2; 95% CI = 1.1, 4.3) and Latinx (*OR* = 2.2; 95% CI = 1.0, 4.6) YEH had higher odds of engaging in prescription sedative use compared to White YEH. YEH who reported unmet mental health needs (*OR* = 2.7; 95% CI = 1.6, 4.3) and those who reported having witnessed someone being attacked (i.e., witness victimization; *OR* = 2.0; 95% CI = 1.2, 3.5) had higher odds of misusing prescription sedatives. Finally, in terms of risk engagement, heavy drinking (*OR* = 1.6; 95% CI = 1.0, 2.5), illicit drug use (*OR* = 2.8; 95% CI = 1.7, 4.9), injection drug use (*OR* = 3.8; 95% CI = 2.2, 6.6), and sexual intercourse under the influence of substances (*OR* = 1.7; 95% CI = 1.1, 2.7) were associated with prescription sedative misuse.

The multivariable model assessing associations with prescription opioid misuse (Table 3) indicated that compared to YEH sampled in Los Angeles, YEH in Denver (*OR* = 3.0; 95% CI = 1.3, 6.8), Phoenix (*OR* = 3.0; 95% CI = 1.3, 6.6), and San Jose (*OR* = 2.6; 95% CI = 1.1, 6.1) had higher odds of reporting prescription opioid misuse. Past suicidal thoughts (*OR* = 1.8; 95% CI = 1.1, 3.0) and street physical victimization experiences (*OR* = 1.8; 95% CI = 1.0, 3.2) were also associated with prescription opioid misuse. Marijuana use (*OR* = 3.0; 95% CI = 1.4, 6.2), illicit drug use (*OR* = 3.0; 95% CI = 1.7, 5.1), and injection drug use (*OR* = 3.5; 95% CI = 2.1, 6.0) were associated with

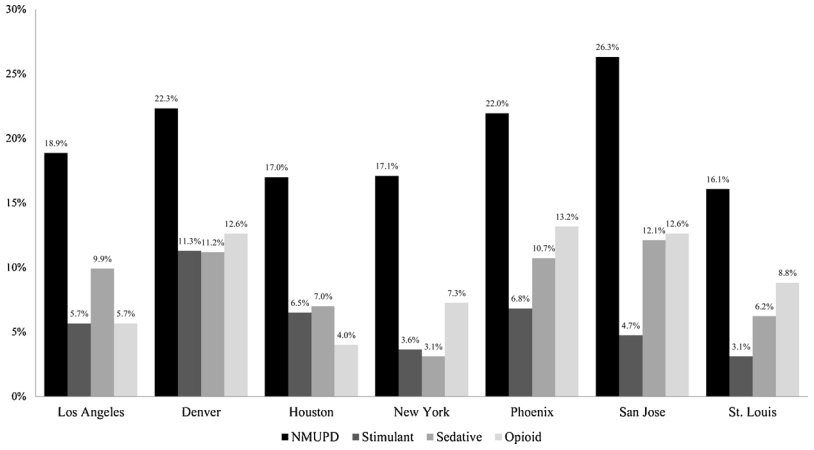

Fig. 1. NMUPD, Sedative, Stimulant and Opioid Misuse by Site of Recruitment.

Table 2
Correlation Matrix of Independent Variables, NMUPD, Stimulant Misuse, Sedative Misuse, and Opioid Misuse.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. NMUPD																						
2. Stimulant misuse	0.5***																					
3. Sedative misuse	0.6***	0.3***																				
4. Opioid misuse	0.6***	0.3***	0.3***																			
5. Age	0.0	0.0	0.0	0.0																		
6. Sexual orientation	−0.0	−0.0	−0.4	−0.0	−0.0																	
7. Education	−0.0	0.0	−0.0	−0.0	0.2***	−0.0																
8. Depression	0.1***	0.1*	0.1***	0.1***	0.0	−0.1***	0.0															
9. Posttraumatic stress symptoms	0.1***	0.1**	0.1***	0.1***	0.0	−0.2***	−0.0	0.4***														
10. Suicidal ideation	0.1***	0.1*	0.1***	0.1***	0.0	−0.2***	−0.0	0.2***	0.3***													
11. Adverse childhood experiences	0.1***	0.1*	0.1***	0.1***	0.0	−0.2***	−0.0	0.3***	0.4***	0.3***												
12. Unmet mental health needs	0.2***	0.1***	0.2***	0.1***	0.0	−0.2***	−0.0	0.3***	0.3***	0.4***	0.3***											
13. Witness victimization	0.1*	0.1***	0.1***	0.1*	0.1**	−0.0	0.0	0.2***	0.2***	0.1***	0.3***	0.2***										
14. Physical victimization	0.1***	0.1***	0.1**	0.1***	0.1***	−0.1*	−0.1*	0.2***	0.2***	0.1***	0.3***	0.2***	0.3***									
15. Sexual victimization	0.1***	0.0	0.1***	0.1**	0.1	−0.2***	0.0	0.2***	0.3***	0.3***	0.4***	0.3***	0.2***	0.2***								
16. Heavy drinking	0.3***	0.1***	0.2***	0.2***	0.1**	−0.1**	−0.0	0.1***	0.1***	0.1**	0.1***	0.1***	0.1***	0.2***	0.1**							
17. Marijuana use	0.3***	0.2***	0.2***	0.2***	0.1**	−0.1*	−0.0	0.2***	0.2***	0.1***	0.2***	0.1***	0.2***	0.2***	0.1*	0.4***						
18. Hard drug use	0.4***	0.2***	0.2***	0.3***	0.1***	−0.0	−0.0	0.2***	0.1***	0.1*	0.1***	0.1**	0.1***	0.2***	0.1***	0.3***	0.4***					
19. Injection drug use	0.4***	0.3***	0.2***	0.3***	0.0	−0.0	−0.0	0.1***	0.1*	0.1**	0.1	0.1***	−0.0	0.1***	0.1***	0.2***	0.2***	0.3***				
20. Age at sexual debut < 14	0.1**	0.1	0.1	0.1**	0.0	−0.1**	−0.1*	0.0	0.1***	0.1*	0.2***	0.1***	0.1***	0.2***	0.2***	0.1***	0.1***	0.1***	0.0			
21. Survival sex	0.1***	0.1*	0.1***	0.1***	0.1***	−0.2***	−0.0	0.1***	0.2***	0.2***	0.3***	0.2***	0.1***	0.2***	0.3***	0.1***	0.1***	0.1***	0.0	0.2***		
22. Condomless sex	0.1*	0.0	0.1**	0.1***	0.0	−0.1**	−0.0	0.1***	0.1***	0.1***	0.2***	0.1***	0.1**	0.1***	0.1**	0.1***	0.1***	0.1***	0.0	0.2***	0.2***	
23. Sex under the influence	0.2***	0.1***	0.2***	0.2***	0.1***	−0.1	0.0	0.1**	0.1***	0.1*	0.2***	0.1*	0.1***	0.2***	0.1***	0.2***	0.3***	0.2***	0.1***	0.2***	0.3***	0.2***

Note. Site, race and ethnicity, and gender identity not included in this table because of their categorical nature; all statistics are rounded at the first decimal, therefore, 0.0 represents statistics lower than 0.05.
*$p <$ .05. **$p <$ .01. ***$p <$ .001.

Table 3
Multivariable Logistic Regressions Assessing Associations with NMUPD, Prescription Stimulant Misuse, Prescription Sedative Misuse and Prescription Opioid Misuse.

	NMUPD		Prescription Stimulant Misuse		Prescription Sedative Misuse		Prescription Opioid Misuse	
	OR	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI
Demographics								
Study sites (ref = Los Angeles)								
Denver	1.7	0.9, 3.0	2.0	0.9, 4.7	1.5	0.7, 3.2	3.0**	1.3, 6.8
Houston	1.0	0.5, 1.9	1.3	0.5, 3.4	0.7	0.3, 1.7	0.8	0.3, 2.3
New York City	0.9	0.5, 1.8	0.4	0.1, 1.4	0.4	0.1, 1.1	1.8	0.7, 4.7
Phoenix	1.6	1.0, 2.9	1.2	0.5, 2.8	1.3	0.6, 2.8	3.0*	1.3, 6.6
San Jose	1.8	1.0, 3.3	0.6	0.2, 1.8	1.3	0.6, 2.8	2.6*	1.1, 6.1
St. Louis	1.1	0.5, 1.9	0.4	0.1, 1.4	0.6	0.2, 1.6	2.3	0.9, 5.9
Age	0.9	0.9, 1.0	0.9	0.8, 1.0	0.9	0.9, 1.1	1.0	0.9, 1.1
Gender (ref = male)								
Female	0.9	0.6, 1.3	0.8	0.4, 1.6	1.1	0.6, 1.9	0.8	0.5, 1.4
Gender minority	0.9	0.4, 1.8	0.8	0.3, 2.5	1.1	0.4, 2.8	0.8	0.3, 2.1
Sexual orientation (ref = LGBQ)								
Heterosexual	1.1	0.8, 1.7	1.3	0.7, 2.4	0.9	0.6, 1.5	1.2	0.7, 2.0
Race and ethnicity (ref = White)								
Black	2.9***	1.7, 5.1	1.1	0.5, 2.5	2.2*	1.1, 4.3	1.9	0.9, 3.7
Latinx	3.3***	1.8, 6.1	1.6	0.7, 3.9	2.2*	1.0, 4.6	2.4*	1.1, 5.0
Multiracial or other	2.5**	1.5, 4.3	1.6	0.8, 3.2	1.6	0.9, 3.2	1.6	0.8, 3.1
High school education or above	1.2	0.8, 1.7	1.6	0.9, 2.9	1.0	0.6, 1.6	1.0	0.6, 1.7
Psychosocial characteristics								
Depression	1.3	0.9, 2.0	1.1	0.5, 2.1	1.0	0.6, 1.9	1.3	0.7, 2.3
Posttraumatic stress symptoms	1.1	0.8, 1.6	1.1	0.6, 2.0	1.4	0.9, 2.3	1.4	0.9, 2.3
History of suicidal ideation	1.5*	1.0, 2.2	0.8	0.5, 1.5	1.3	0.8, 2.2	1.8*	1.1, 3.0
Adverse childhood experiences	0.9	0.9, 1.0	1.0	0.9, 1.1	0.9	0.8, 1.0	1.0	0.9, 1.1
History of unmet mental health needs	1.8**	1.2, 2.6	2.3**	1.3, 4.2	2.7***	1.6, 4.3	1.2	0.7, 1.9
Street victimization history								
Witness	0.9	0.6, 1.3	1.3	0.7, 2.4	2.0**	1.2, 3.5	0.9	0.6, 1.5
Physical	1.2	0.8, 1.8	1.0	0.5, 1.8	0.8	0.5, 1.3	1.8*	1.0, 3.2
Sexual	0.9	0.6, 1.5	–	–	1.0	0.6, 1.7	1.0	0.6, 1.6
Risk engagement								
Substance use behaviors								
Heavy drinking	1.9***	1.4, 2.7	1.7	0.9, 2.9	1.6*	1.0, 2.5	1.5	0.9, 2.3
Marijuana	2.3**	1.4, 3.7	1.7	0.7, 4.1	1.6	0.8, 3.2	3.0**	1.4, 6.2
Hard drugs	2.7***	1.9, 4.0	2.5**	1.3, 4.8	2.8***	1.7, 4.9	3.0***	1.7, 5.1
Injection drugs	6.8***	4.1, 11.3	5.7***	3.2, 10.3	3.8***	2.2, 6.6	3.5***	2.1, 6.0
Sexual risk behaviors								
Age at sexual debut < 14	0.9	0.6, 1.3	–	–	–	–	1.1	0.7, 1.7
Survival sex	1.2	0.8, 1.9	1.2	0.7, 2.3	1.1	0.6, 1.8	1.5	0.9, 2.5
Condomless sex	0.8	0.6, 1.2	–	–	0.9	0.5, 1.5	1.4	0.9, 2.3
Sexual intercourse under the influence	1.9**	1.3, 2.7	1.6	0.9, 2.8	1.7*	1.1, 2.7	1.4	0.9, 2.3
Multiple sexual partnerships	1.2	0.8, 1.7	1.3	0.8, 2.3	1.5	0.9, 2.6	1.1	0.7, 1.8
n	1,318		1,311		1,308		1,319	

LGBQ, lesbian, gay, bisexual, or queer.
*$p < .05$. **$p < .01$. ***$p < .001$.

increased prescription opioid misuse.

4. Discussion

Many valuable findings emerged from this study to extend our knowledge of the patterns and correlates of NMUPD and three types of NMUPD among YEH in a geographically heterogeneous sample of YEH. The prevalence of NMUPD among YEH in this study, at approximately 20%, was nearly equivalent to antecedent studies (Al-Tayyib et al., 2014; Barman-Adhikari et al., 2017; Rhoades et al., 2014), with rates among YEH still much greater, i.e., 2–10 times as high, compared to housed (Seth et al., 2018) and college-going young adults (McCabe et al., 2018), whose prevalence of use has been estimated around 2% and as high as 9%, respectively.

Our study indicates opioids remain the most prevalently used type of NMUPD among our participants, which is consistent with patterns found among national samples of housed young people (Martins et al., 2015; McCabe et al., 2018). However, contrary to college-going young people who use stimulants most frequently (Martins et al., 2015; McCabe et al., 2018; Tapscott and Schepis, 2013), YEH in our study used opioids most often, followed by sedatives and then stimulants. This is similar to the pattern reported by housed young adults not attending college (Martins et al., 2015; McCabe et al., 2018). Motivations for use may provide insight for these differences. College students often cite improved academic performance as motive for increased stimulant use (Arria et al., 2018), which might not be relevant for our participants, who are infrequently enrolled in college. Opioids, on the other hand, are often used to get high or relieve physical pain (Han et al., 2018), which might be more relevant for YEH because they experience high rates of mental health symptoms and physical victimization. Similarly, sedatives are often used to relieve anxiety or aid in sleep (Lehne et al., 2018), a common need among YEH, especially because of their living circumstances, which often involve sleeping outside often in harsh weather conditions.

Regarding how our participants obtained prescription drugs, many participants indicated obtaining them from families and friends or medical professionals. This is consistent with previous research among YEH (Rhoades et al., 2014), housed youth (Lipari et al., 2012) and college-going young adults (McCabe et al., 2018). Increased availability and access to prescription drugs is one of the many reasons that young people start misusing prescription drugs (McCabe et al., 2007a,b), and our findings seem to confirm this pattern with YEH. Easy access to these drugs could be partially ascribed to the prescribing practices of physicians; studies have indicated that from 1991 to 2011, opioid

prescriptions distributed by U.S. pharmacies almost tripled, from 76 million to 219 million (National Institute of Drug Abuse, 2018). Our findings indicate that interventions and prevention programs that address both patient and provider education are essential to reducing over prescription and more importantly, preventing young people from misusing prescription drugs.

In terms of sociodemographic characteristics, the site where YEH were recruited and their race and ethnicity were important in understanding patterns and types of NMUPD engagement. Specifically, there were significant differences in NMUPD among YEH sampled across sites, thus validating the need for studies that have geographically diverse samples. Compared to YEH sampled in Los Angeles, YEH sampled in Denver, Phoenix, and San Jose were significantly more likely to engage in prescription opioid misuse. These geographical differences may reflect the larger regional trends in opiate misuse across the country. For example, both Arizona and Colorado ranked among the 10 states with the highest quintile of estimates of past-year nonmedical use of prescription pain relievers, at 5.18% and 5.03%, respectively (Lipari et al., 2012). Although California is not among these top 10 states, within-state data revealed that northern parts of California (including San Jose) have much higher rates of opioid misuse than the rest of the state (Lipari et al., 2012). It should be noted, however, that we did not randomly sample in these cities, and site-level differences could merely reflect differences between the host agencies' norms and services across sites. Although preliminary, these geographic disparities might indicate the need for targeted interventions that consider these local and regional contexts.

Notable racial and ethnic differences in NMUPD patterns across our sample were observed. Specifically, young people of color in our study were more likely to engage in NMUPD compared to White YEH. This is inconsistent with the national racial and ethnic patterns of NMUPD engagement; extant research has found that White youth and young adults are more likely than other racial and ethnic groups to engage in NMUPD (Collins et al., 2011). Several factors may help shed light on this relationship. Previous studies have found that YEH identifying as racial and ethnic minorities are less likely to engage in illicit drug use compared to their White peers (Bousman et al., 2005; Nyamathi et al., 2012; Rice et al., 2011). Furthermore, one study (Auerswald and Puddefoot, 2012) comparing White and African American YEH found that although heroin, cocaine, and injection drug use was highly stigmatized among African American YEH and partly explained their low levels of engagement in such substance use, White youth did not express any such perceptions. Likewise, research among housed young people has found that prescription drugs are often perceived as safer than "street drugs" (e.g., cocaine, heroin, methamphetamine, etc.) because they are legal and prescribed by doctors (Drug Enforcement Administration, 2018). Taken together, these studies suggest that it is possible that YEH of color ascribe less stigma to prescription drugs relative to illicit or street drugs, which could partly explain their elevated rates of NMUPD compared to White YEH.

Our findings indicate that psychosocial characteristics are critical to the understanding of NMUPD engagement among YEH. Specifically, unmet mental health needs were associated with sedative use among YEH in our sample and could partially explain the increased rates of sedative use. Coping with the effects of higher rates of trauma and victimization endorsed by YEH, alongside increased vulnerability and risk of life on the streets (Chapple et al., 2004; Yoder et al., 2014) and a lack of treatment, might suggest that YEH are self-medicating to alleviate their symptoms. However, we did not ask participants about their reasons for using the myriad types of substances in this study. Future research is needed to explore potential motivations and determinants related to the higher rates and NMUPD type differentials among YEH. The findings of this study suggest NMUPD prevention programs tailored for YEH that incorporate mental health curriculum are needed.

The significant relationship between opioid use and suicidal ideation among YEH in our study is consistent with other studies that have found that opiates remain one of the leading causes of suicide deaths (Fowler et al., 2018) and drug-related suicide attempts resulting in emergency department visits (Substance Abuse and Mental Health Services Administration, 2015). Extant research, although limited, has indicated social vulnerabilities, family dysfunction, and chronic pain contribute to both opioid use and suicide risk (Ashrafioun et al., 2017; Kuramoto et al., 2012). The social complexities and histories of trauma reported by participants in this study suggest the need for more exploration of the relationship between the psychosocial determinants of NMUPD use, especially opioids, and suicide risk.

Related to trauma experienced since becoming homeless, two of the victimization variables were also significantly associated with NMUPD. Specifically, witnessing victimization was associated with prescription sedative misuse, whereas physical victimization was associated with prescription opioid misuse. Research has suggested that young people who are physically victimized often misuse prescription opioids to self-treat their physical pain, and this could be true of our participants, too (Young et al., 2012). On the other hand, a systematic review found that sedatives (such as alcohol) are often used by YEH to block painful memories (Heerde and Hemphill, 2014), which could help explain the link between witnessing victimization and prescription sedative misuse.

Like previous studies among YEH (Al-Tayyib et al., 2014; Barman-Adhikari et al., 2017; Rhoades et al., 2014), illicit drug use and injection drug use were significantly associated with overall NMUPD and all three types of NMUPD, suggesting the clustered nature of such substance use. Considering that these substance use behaviors seem to be clustered in nature, universal substance use prevention programs could provide a viable means of addressing NMUPD in this at-risk group of young people.

4.1. Limitations

A few study limitations need to be acknowledged. First, the study results are based on cross-sectional data, thereby reducing the ability to draw causal conclusions. A future study could remedy this by collecting longitudinal data, which would help elucidate these causal mechanisms. Second, all data were based on self-reports and could be biased because of the sensitive nature of items. However, because we utilized a self-interview format, which is shown to diminish threats of social desirability and impression management (Schroder et al., 2003), this might have reduced such bias. Additionally, participants were recruited from service agencies serving YEH, so they might not be representative of YEH who are not connected to services. Furthermore, our study focused on a wide-ranging yet finite set of variables; research has suggested that other factors (e.g., social context, peer norms, etc.) are associated with NMUPD and also deserve consideration.

4.2. Conclusion

Despite the noted limitations, our findings provide important new information regarding a growing public health concern. These findings indicate that interventions designed to address NMUPD among YEH need to be multifaceted and designed to address other risk behaviors correlated with NMUPD. This could include acknowledging the clustering of substance use behaviors, unmet mental health needs, access to prescription drugs, and racial and ethnic and geographical differences that contribute to disparate rates and types of NMUPD engagement.

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Contributors

Anamika Barman-Adhikari designed the study, collected data, undertook the literature review and writing of the manuscript. Hsun-Ta Hsu also designed the study, collected data and conducted data analyses. Daphne Brydon contributed to the discussion and literature review. Robin Petering, Diane Santa Maria, Jama Shelton, Kimberly Bender, Sarah Narendorf and Kristin Ferguson also designed the study, were responsible for data collection and contributed to the writing of this manuscript by providing feedback and suggestions. All authors have approved of this manuscript.

Conflict of interest

No conflict declared.

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References

Ahrnsbrak, R., Bose, J., Hedden, S., Lipari, R., Park-Lee, E., 2017. Key Substance Use and Mental Health Indicators in the United States: Results From the 2016 National Survey on Drug Use and Health. Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration, Rockville, MD.

Al-Tayyib, A.A., Rice, E., Rhoades, H., Riggs, P., 2014. Association between prescription drug misuse and injection among runaway and homeless youth. Drug Alcohol Depend. 134, 406–409.

Arria, A.M., Geisner, I.M., Cimini, M.D., Kilmer, J.R., Caldeira, K.M., Barrall, A.L., Vincent, K.B., Fossos-Wong, N., Yeh, J., Rhew, I., 2018. Perceived academic benefit is associated with nonmedical prescription stimulant use among college students. Addict. Behav. 76, 27–33.

Ashrafioun, L., Bishop, T.M., Conner, K.R., Pigeon, W.R., 2017. Frequency of prescription opioid misuse and suicidal ideation, planning, and attempts. J. Psychiatr. Res. 92, 1–7.

Auerswald, C., Puddefoot, G., 2012. Comparing White and African American Homeless Youth in San Francisco: Research Findings and Policy Implications. California Homeless Youth Project, Sacramento, CA.

Barman-Adhikari, A., Al Tayyib, A., Begun, S., Bowen, E., Rice, E., 2017. Descriptive and injunctive network norms associated with nonmedical use of prescription drugs among homeless youth. Addict. Behav. 64, 70–77.

Barrett, S.P., Meisner, J.R., Stewart, S.H., 2008. What constitutes prescription drug misuse? Problems and pitfalls of current conceptualizations. Curr. Drug Abuse Rev. 1, 255–262.

Bavarian, N., Flay, B.R., Ketcham, P.L., Smit, E., 2015. The illicit use of prescription stimulants on college campuses: a theory-guided systematic review. Health Educ. Behav. 42, 719–729.

Bousman, C.A., Blumberg, E.J., Shillington, A.M., Hovell, M.F., Ji, M., Lehman, S., Clapp, J., 2005. Predictors of substance use among homeless youth in San Diego. Addict. Behav. 30, 1100–1110.

Cameron, R.P., Gusman, D., 2003. The Primary Care PTSD screen (PC-PTSD): development and operating characteristics. Prim. Care Psychiatry 9, 9–14.

Chapple, C.L., Johnson, K.D., Whitbeck, L.B., 2004. Gender and arrest among homeless and runaway youth: an analysis of background, family, and situational factors. Youth Violence Juv. Justice 2, 129–147.

Collins, D., Abadi, M.H., Johnson, K., Shamblen, S., Thompson, K., 2011. Non-medical use of prescription drugs among youth in an Appalachian population: prevalence, predictors, and implications for prevention. J. Drug Educ. 41, 309–326.

Drug Enforcement Administration, 2018. Prescription Drug Misuse. Retrieved October 9th, 2018 from. https://www.dea.gov/sites/default/files/resource-center/Publications/DEA_Prescription-For-Disaster_508ver.pdf.

Eaton, D.K., Kann, L., Kinchen, S., Shanklin, S., Flint, K.H., Hawkins, J., Harris, W.A., Lowry, R., McManus, T., Chyen, D., 2012. Youth risk behavior surveillance—united States, 2011. Surveill. Summ. 61, 1–162.

Felitti, V.J., Anda, R.F., Nordenberg, D., Williamson, D.F., Spitz, A.M., Edwards, V., Marks, J.S., 1998. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the Adverse Childhood Experiences (ACE) Study. Am. J. Prev. Med. 14, 245–258.

Ferguson, K.M., Jun, J., Bender, K., Thompson, S., Pollio, D., 2010. A comparison of addiction and transience among street youth: los Angeles, California, austin, Texas, and St. Louis. Missouri. Community Ment. Health J. 46, 296–307.

Fowler, K.A., Jack, S.P.D., Lyons, B.H., Betz, C.J., Petrosky, E., 2018. Surveillance for violent deaths - National Violent Death Reporting System, 18 states, 2014. Surveill. Summ. 67, 1–36.

Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C., 1998. Multivariate Data Analysis, fifth ed. Prentice Hall, Upper Saddle River, NJ.

Han, B., Compton, W.M., Blanco, C., Jones, C.M., 2018. Correlates of prescription opioid use, misuse, use disorders, and motivations for misuse among US adults. J. Clin. Psychiatry 79 17m11973.

Heerde, J.A., Hemphill, S.A., 2014. A systematic review of associations between perpetration of physically violent behaviors and property offenses, victimization and use of substances among homeless youth. Child. Youth Serv. Rev. 44, 265–277.

Hosmer Jr., D.W., Lemeshow, S., Sturdivant, R.X., 2013. Applied Logistic Regression. John Wiley and Sons, New York.

Kroenke, K., Spitzer, R.L., Williams, J.B., 2001. The PHQ-9: validity of a brief depression severity measure. J. Gen. Intern. Med. 16, 606–613.

Kuramoto, S.J., Chilcoat, H.D., Ko, J., Martins, S.S., 2012. Suicidal ideation and suicide attempt across stages of nonmedical prescription opioid use and presence of prescription opioid disorders among U.S. Adults. J. Stud. Alcohol Drugs 73, 178–184.

Lehne, G., Zeeb, H., Pischke, C.R., Mikolajczyk, R., Bewick, B.M., McAlaney, J., Dempsey, R.C., Van Hal, G., Stock, C., Akvardar, Y., 2018. Personal and perceived peer use and attitudes towards use of non-prescribed prescription sedatives and sleeping pills among university students in seven European countries. Addict. Behav. 87, 17–23.

Lipari, R.N., Ahrnsbrak, R.D., Pemberton, M.R., Porter, J.D., 2012. Risk and protective factors and estimates of substance use initiation: results from the 2016 national survey on drug use and health. CBHSQ Data Review. pp. 1–32 Rockville (MD).

Martins, S.S., Kim, J.H., Chen, L., Levin, D., Keyes, K.M., Cerdá, M., Storr, C.L., 2015. Nonmedical prescription drug use among US young adults by educational attainment. Soc. Psychiatry Psychiatr. Epidemiol. 50, 713–724.

McCabe, S.E., Cranford, J.A., Boyd, C.J., Teter, C.J., 2007a. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. Addict. Behav. 32, 562–575.

McCabe, S.E., West, B.T., Morales, M., Cranford, J.A., Boyd, C.J., 2007b. Does early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. Addiction 102, 1920–1930.

McCabe, S.E., West, B.T., Boyd, C.J., 2013. Motives for medical misuse of prescription opioids among adolescents. J. Pain 14, 1208–1216.

McCabe, S.E., Kloska, D.D., Veliz, P., Jager, J., Schulenberg, J.E., 2016. Developmental course of non-medical use of prescription drugs from adolescence to adulthood in the United States: national longitudinal data. Addiction 111, 2166–2176.

McCabe, S.E., Teter, C.J., Boyd, C.J., Wilens, T.E., Schepis, T.S., 2018. Sources of prescription medication misuse among young adults in the United States: the role of educational status. J. Clin. Psychiatry 79 17m11958.

National Institute of Drug Abuse, 2018. Prescription Opioids and Heroin. Retrieved from https://www.drugabuse.gov/publications/research-reports/prescription-opioids-heroin on October 9th, 2018. .

Nyamathi, A., Hudson, A., Greengold, B., Leake, B., 2012. Characteristics of homeless youth who use cocaine and methamphetamine. Am. J. Addict. 21, 243–249.

Rhoades, H., Winetrobe, H., Rice, E., 2014. Prescription drug misuse among homeless youth. Drug Alcohol Depend. 138, 229–233.

Rice, E., Milburn, N.G., Monro, W., 2011. Social networking technology, social network composition, and reductions in substance use among homeless adolescents. Prev. Sci. 12, 80–88.

Rougemont-Bücking, A., Grazioli, V.S., Marmet, S., Daeppen, J., Lemoine, M., Gmel, G., Studer, J., 2018. Non-medical use of prescription drugs by young men: impact of potentially traumatic events and of social-environmental stressors. Eur. J. Psychotraumatol. 9, 1468706.

Santa Maria, D.M., Narendorf, S.C., Cross, M.B., 2018. Prevalence and correlates of substance use in homeless youth and young adults. J. Addict. Nurs. 29, 23–31.

Schepis, T.S., Teter, C.J., Simoni-Wastila, L., McCabe, S.E., 2018. Prescription tranquilizer/sedative misuse prevalence and correlates across age cohorts in the US. Addict. Behav. 87, 24–32.

Schroder, K.E., Carey, M.P., Vanable, P.A., 2003. Methodological challenges in research on sexual risk behavior: II. Accuracy of self-reports. Ann. Behav. Med. 26, 104–123.

Seth, P., Scholl, L., Rudd, R.A., Bacon, S., 2018. Overdose deaths involving opioids, cocaine, and psychostimulants—united States, 2015–2016. Am. J. Transplant. 18, 1556–1568.

Substance Abuse and Mental Health Services Administration, 2015. Results From the 2010 National Survey on Drug Use and Health: Summary of National Findings, NSDUH Series H-41. HHS Publication No.(SMA). Substance Abuse and Mental Health Services Administration, Rockville, MD, pp. 11–4658.

Tapscott, B.E., Schepis, T.S., 2013. Nonmedical use of prescription medications in young adults. Adolesc. Med. State Art Rev. 24, 597–610.

Verdi, G., Weyandt, L.L., Zavras, B.M., 2016. Non-medical prescription stimulant use in graduate students: relationship with academic self-efficacy and psychological variables. J. Atten. Disord. 20, 741–753.

Wenzel, S.L., Tucker, J.S., Golinelli, D., Green Jr, H.D., Zhou, A., 2010. Personal network correlates of alcohol, cigarette, and marijuana use among homeless youth. Drug Alcohol Depend. 112, 140–149.

Weyandt, L.L., Janusis, G., Wilson, K.G., Verdi, G., Paquin, G., Lopes, J., Varejao, M., Dussault, C., 2009. Nonmedical prescription stimulant use among a sample of college students: relationship with psychological variables. J. Atten. Disord. 13, 284–296.

Yoder, J.R., Bender, K., Thompson, S.J., Ferguson, K.M., Haffejee, B., 2014. Explaining homeless youths' criminal justice interactions: childhood trauma or surviving life on the streets? Community Ment. Health J. 50, 135–144.

Young, A., McCabe, S.E., Cranford, J.A., Ross-Durow, P., Boyd, C.J., 2012. Nonmedical use of prescription opioids among adolescents: subtypes based on motivation for use. J. Addict. Dis. 31, 332–341.