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### Authors

D'Amico, Elizabeth J  
Davis, Jordan P  
Tucker, Joan S  
[et al.](#)

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## Opioid misuse during late adolescence and its effects on risk behaviors, social functioning, health, and emerging adult roles

Elizabeth J. D'Amico, Ph.D.<sup>1</sup>, Jordan P. Davis, Ph.D.<sup>2</sup>, Joan S. Tucker, Ph.D.<sup>1</sup>, Rachana Seelam, MPH<sup>1</sup>, Bradley D. Stein, MD; PH.D., MPH<sup>3</sup>

<sup>1</sup>RAND Corporation, 1776 Main Street, PO Box 2138, Santa Monica, CA 90407-2138

<sup>2</sup>Suzanne Dworak-Peck School of Social Work, USC Center for Artificial Intelligence in Society, USC Center for Mindfulness Science, USC Institute for Addiction Science, 669 W 34th St, Los Angeles, CA 90089

<sup>3</sup>RAND Corporation, 4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213

### Abstract

Opioid misuse has emerged in recent years as a major public health concern in the United States, particularly for adolescents and emerging young adults. We examined the association of opioid misuse from ages 18 to 20 with four domains at age 21-22: risk behaviors and consequences; health; social functioning; and emerging adult roles. Participants were surveyed annually from 2008 through 2019. The sample includes N=2,880 youth from waves 8-11. The sample was approximately 18 years old at wave 8; 54% female, 46% Hispanic, 20% white, 20% Asian, 2% Black, and 11% multiracial. Opioid misuse was low in this general sample of young adults, with about 4% reporting misuse from age 18-20. We used latent growth curve modeling to examine how misuse from ages 18-20 was associated with functioning at age 21-22. Adolescents who reported opioid misuse at age 18 also reported more negative consequences from alcohol and cannabis use and greater odds of other prescription drug misuse at age 21-22 than those with no misuse. Those reporting opioid misuse at age 18 were also more likely to engage in sexual risk behaviors, report delinquent behavior, and have a higher likelihood of experiencing sexual victimization and engaging in sexual perpetration at age 21-22 than those with no misuse. Neither the intercept nor slope of opioid misuse was associated with depression, anxiety, physical health or ailments, satisfaction with friends, romantic relationship functioning, or emerging adult roles at wave 11. Findings highlight the importance of screening and brief intervention for adolescents reporting opioid misuse.

### Keywords

opioid misuse; adolescents; young adults; consequences; sexual behavior; mental health

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**Corresponding author:** Elizabeth D'Amico, Ph.D., Senior Behavioral Scientist, RAND Corporation, 1776 Main St., Santa Monica, CA 90407-2138, phone: 310-393-0411 x6487, fax: 310-260-8173.

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## 1. Introduction

Opioid misuse has emerged in recent years as a major public health concern in the United States, particularly for adolescents and emerging young adults (Bonar et al., 2020). Opioid misuse can include the non-medical use of prescription opioids (NMUPO), defined here as taking opioid medications in a manner or dose other than prescribed or for its hedonic effects (National Institute on Drug Abuse, 2018), as well as the use of illicit opioids such as heroin. Recent data indicate that NMUPO is associated with 46 deaths every day in the United States (Scholl, Seth, Kariisa, Wilson, & Baldwin, 2019), and the fatal heroin overdose rate for youth aged 15-19 has increased by over 400% from 1999 to 2016 (Gaither, Shabanova, & Leventhal, 2018).

NMUPO use peaks during adolescence and declines through age 25-26 (McCabe, Kloska, Veliz, Jager, & Schulenberg, 2016). Data from the 2017 Youth Risk Behavior Survey of 21 urban high schools found rates of heroin use ranging from 1.3-7.9% (with some districts reporting substantially higher rates than national rates of 1.7%), and rates of NMUPO ranging from 12.7-15.4% across all districts (similar to the national rate of 14.1%) (Jones et al., 2019).

Research to date on opioid misuse during adolescence and emerging young adulthood has mainly been cross-sectional. Bonar and colleagues' (Bonar et al., 2020) 2020 review found 76 articles on NMUPO from January 2013-September 2018, yet only 5 were longitudinal studies. Most studies focus on prevalence of opioid misuse for adolescents and/or young adults or cross-sectionally examine risk/protective factors for misuse. Longitudinal work to date typically focuses on the association between one or two risk factors during adolescence (e.g., medical prescription before age 12; childhood adverse experiences) (Quinn et al., 2019) and subsequent NMUPO. Only one longitudinal study has examined numerous risk/protective factors for opioid misuse across individual, peer, and family domains (Tucker, Davis, Seelam, Stein, & D'Amico, in press).

Similarly, few longitudinal studies address the association of opioid misuse during late adolescence with emerging young adult or adult functioning, and those that do typically focus on a specific domain of functioning, such as substance use problems/disorders or academics. For example, McCabe and colleagues (McCabe, Schulenberg, O'Malley, Patrick, & Kloska, 2014) utilized data from Monitoring The Future (MTF) on high school seniors surveyed across four waves, with the first wave occurring between 1976-2005. Follow-up surveys were administered biennially. Those reporting past year NMUPO at any wave were more likely than those who never reported NMUPO to also report heavy drinking, cannabis use, and non-medical use of other prescription drugs at wave 4, with the likelihood of other substance use increasing with number of waves of reported NMUPO use. In another study using MTF data across 8 waves from age 18 to age 35, McCabe et al. (McCabe, Veliz, Dickinson, Schepis, & Schulenberg, 2019) used latent class analysis to create prescription drug misuse trajectories based on four major prescription drug classes - i.e., opioids, stimulants, sedatives, and tranquilizers. The most frequent profile was "rare", and all other profiles (e.g., peak at age 18, peak at age 23-24) were associated with greater odds of alcohol use disorder, cannabis use disorder, and other drug use disorder, even after

controlling for demographic and drug use covariates. An examination of NMUPO at age 18 and substance use disorder (SUD) symptoms at age 35 using the same sample found that adolescents reporting NMUPO had greater odds of SUD symptoms relative to those reporting medical use of prescription opioids only or those with no use (McCabe, Veliz, Boyd, et al., 2019). Similarly, a small 2017 study of 71 college students surveyed across one year found that compared to students reporting no NMUPO, those reporting NMUPO also reported greater cannabis use, as well as less involvement in academic activities (e.g., studying or completing homework), lower future orientation, and greater anhedonia over the year (Meshesha, Pickover, Teeters, & Murphy, 2017). Finally, a longitudinal study from middle to high school found that students who initiated non-medical prescription drug use during middle school reported lower social functioning and more suspensions and fighting in high school, compared to students who did not initiate use (Tucker et al., 2015).

Given increases in use of both NMUPO and heroin during adolescence, it is important to understand how opioid misuse during this period may be associated with functioning as teens transition into young adulthood. To date, no longitudinal studies have addressed how opioid misuse, including both NMUPO and heroin use, during late adolescence is associated with functioning in emerging young adulthood across multiple domains. Given that substance use during adolescence is often associated with risk behaviors (McCabe, Veliz, Boyd, et al., 2019), health (Patrick, Berglund, Joshi, & Bray, 2020), relationship problems (Scholes-Balog, Hemphill, Evans-Whipp, Toumbourou, & Patton, 2016; Stormshak et al., 2019), academic achievement (D'Amico, Tucker, et al., 2016), and employment difficulties (Bellair, Vuolo, & LaPlant, 2018), we examined the association of opioid misuse from ages 18 to 20 with four domains at age 21-22. The domains included 1) risk behaviors and consequences (use of alcohol and cannabis, alcohol and cannabis consequences, other non-medical prescription drug use, delinquency, sexual risk-taking behavior, sexual victimization and perpetration); 2) health (physical, mental); 3) social functioning (peer and romantic relationship functioning, peer relationship satisfaction); and 4) emerging adult roles (employment status, college status, romantic relationship status, living independently). We expected that youth reporting higher probability of opioid misuse (i.e., NMUPO and/or heroin use) during late adolescence as well as increasing probability of use over time (e.g., 18 – 20 years old) would report worse functioning at age 21-22 across all domains.

## 2. Methods

### 2.1 Procedures

Participants are from two cohorts of students in 6th and 7th grade in 2008 who were initially recruited from 16 middle schools in Southern California as part of a substance use prevention program (D'Amico et al., 2012). Participants consented to the study and procedures were approved by the institution's IRB. Cohorts were followed annually across 11 waves through 2019. Participants completed waves 1 through 5 during physical education classes. Adolescents transitioned to over 200 high schools following wave 5, and were re-contacted and re-consented to complete annual web-based surveys. Participants were paid \$50 for completing each web-based survey. Participants who did not complete a particular wave of data collection remained eligible to complete subsequent waves. They did not “drop

out” of the study once they missed a wave; rather, we fielded the full sample at every wave so all participants could participate in each individual survey. Retention rates from waves 8-11 were high: waves 8-9 (89%), 9-10 (90%), and 10-11 (92%). Substance use at wave 10 did not significantly predict retention at wave 11, similar to previous waves (D'Amico, Rodriguez, Tucker, Pedersen, & Shih, 2018; D'Amico et al., 2020); however, compared to those who did not complete wave 11, retained participants were slightly more likely to be female (94% vs. 91%) and tended to be slightly younger at wave 10 (mean=20.6 years vs. 20.9 years). The current study focuses on data from waves 8-11 (N=2,880).

## 2.2 Measures

**Background covariates.**—Participants reported age, gender (female vs. male), race/ethnicity [non-Hispanic white (reference), non-Hispanic black, Hispanic, Asian, and Other/Multiracial], mother's education (indicator of family socioeconomic status; 1= “did not finish high school” to 4= “graduated from college”). We also controlled for intervention status, which occurred in 2008, and effects were no longer significant after wave 3.

**Opioid misuse (waves 8, 9, 10).**—Participants were asked separate questions about how many times in the past year they had used or tried heroin (horse, smack, H) and prescription narcotic medications to get high (e.g., Vicodin, codeine, OxyContin, and Percocet), rated on a scale from 1= “none” to 6= “more than 20 times.” Most participants reporting heroin use also reported misusing prescription narcotic medications (96% at wave 8 and 80% at wave 10), similar to findings in other studies (Wall et al., 2018). As both items were highly skewed, we derived a dichotomous indicator of any past year opioid misuse (e.g., misuse of narcotic medications and/or use of heroin; 0 = no, 1 = yes) across waves 8, 9, and 10.

## 2.3 Outcomes at wave 11

**Risk behaviors.**—Youth reported how many times in the past year they used alcohol, cannabis, and other prescription drugs (i.e., tranquilizers, sedatives, and stimulants) from 1= “none” to 6= “more than 20 times.” Other prescription drug use was dichotomized (0 = no, 1 = yes) as few participants reported use. We recoded past year alcohol and cannabis use to be pseudo-continuous by using the mid-point of each response option (range: 0 to 20 times). Youth reported negative consequences due to alcohol (e.g., passed out, got into a fight or argument) or cannabis (e.g., had trouble concentrating, missed school, work, or other obligations) use (D'Amico, Parast, et al., 2016) in the past year (1= “never” to 7= “20 or more times”). Delinquency in the past year was assessed by averaging twelve items (e.g., fighting, stealing) (Tucker, Orlando, & Ellickson, 2003) rated on a 6-point scale (1= “not at all” to 6= “20 or more times”) ( $\alpha=.89$ ). Sexual risk-taking behavior included engaging in condomless sex (yes/no) and number of different partners in the past three months. A modified version of the American Association of University Women's Sexual Harassment Survey (Hill & Kearl, 2011) assessed experiences of sexual victimization and perpetration with six items for each scale (e.g., experienced/made unwelcome sexual comments, was touched/touched someone in a sexual way) during the past year (Rinehart, Espelage, & Bub, 2017) (1= “Never” to 5= “7 or more times”). Both victimization and perpetration variables were dichotomized as 0= no victimization/perpetration vs. 1= any victimization/perpetration in past year.

**Health.**—Physical health included 3 items: general health from the Short-Form Health Survey (Ware, Kosinski, & Keller, 1996) (0= “excellent” to 4= “poor”), and two items from the PROMIS Pediatric Physical Function Scales (DeWitt et al., 2011) [e.g., physically able to do activities that one enjoys (0= “with no trouble” to 4= “not able to do”)]. Items were reverse scored and summed with higher scores indicating better health ( $\alpha=0.80$ ). A physical ailments scale (Kroenke, Williams, & Janet, 2002) had 4 items from the Physical Health Questionnaire-15 on how bothered the respondent had been in the previous 4 weeks by stomach pain, headaches, feeling tired or having low energy, and trouble sleeping. Responses were dichotomized such that 0= “not at all bothered” and 1= “bothered a little or a lot.” Responses were summed with higher scores indicating more symptoms ( $\alpha=0.74$ ). The Patient Health Questionnaire (PHQ-8) (Kroenke et al., 2009) measured depression with eight symptoms experienced in the last two weeks, such as “feeling, down, depressed, or hopeless” ( $\alpha = 0.91$ ). The Generalized Anxiety Disorder scale (GAD-7) (Spitzer, Kroenke, Williams, & Lowe, 2006) assessed seven symptoms of general anxiety experienced in the past two weeks, such as “feeling nervous, anxious, or on edge” ( $\alpha = 0.94$ ). The scale for both went from 1= “not at all” to 4= “nearly every day.”

**Social functioning.**—We assessed peer relationship functioning by averaging eight items (e.g., “I was able to count on my friends,” “I felt accepted by other people my age”) from the PROMIS Peer Relationships Short Form item bank (DeWalt et al., 2013) on a 5-point scale (1= “never” to 5= “always”). Higher scores indicate better functioning ( $\alpha=.96$ ). We assessed satisfaction with peer relationships by averaging three items (e.g., “support and understanding your friends give you”) from 1= “poor” to 5= “excellent” ( $\alpha=0.95$ ). Romantic relationship functioning was measured with the Experiences in Close Relationship Scale (ECR)-Short Form (Wei, Russell, Mallinckrodt, & Vogel, 2007), which assesses attachment anxiety (e.g., “I need a lot of reassurance that I am loved by my partner”) and attachment avoidance (e.g., “I want to get close to my partner, but I keep pulling back”) with 12 items ranging from 1= “disagree strongly” to 7= “agree strongly.”

**Emerging adult roles.**—We assessed whether participants were currently enrolled in college (yes/no), employed part- or full-time (yes/no), in a committed romantic relationship (yes/no; defined as being married, engaged, living with a partner but not married or engaged, or dating one person exclusively for six months or longer), and living independently (yes/no; defined as not currently living with any family members).

### 3. Analytic Plan

We fit a latent growth model (LGM) for opioid misuse from waves 8-10 in a structural equation modeling framework using Mplus v8 (Muthén & Muthén, 2012-2017). We used the weighted least squares with mean and variance adjusted estimator (WLSMV), which can accommodate categorical and ordinal data, missing data, and provide unbiased and consistent estimates (Asparouhov & Muthén, 2010). When using LGM with categorical data, the categorical indicators are transformed into a normally distributed continuous (underlying) latent variable. Briefly, this transformation starts with the probability of the observed binary indicators (range 0 – 1), which are converted into log-odds values (range  $-\infty - \infty$ ; see (Lee, Wickrama, & O’Neal, 2018) for more details). In LGM, the model

intercept represents the predicted value of the outcome when the predictor is equal to zero, and thus represents a baseline level or probability, whereas the slope represents the change in level or in the probability overtime. We used standard fit statistics to determine model fit such as Comparative Fit Index (CFI;  $> 0.90$  where larger is better fit), Root-mean-square error of approximation (RMSEA;  $< 0.08$  where lower is better fit), and Weighted root-mean-square residual (WRMR;  $\sim 1$  where lower is better fit; (Wu, West, & Taylor, 2009)). Each outcome was estimated separately, and, in addition to controlling for demographic covariates, we also controlled for wave 10 values for each of our wave 11 outcomes to estimate the unique association of opioid misuse over and above the prior value of the outcome.

#### 4. Results

Table 1 provides participant characteristics. The sample was racially/ethnically diverse. Approximately 4.4% of youth reported opioid misuse at waves 8 and 9, and 3.9% at wave 10. Our unconditional LGM for opioid misuse indicated excellent model fit (CFI = 1.00, TLI = 1.00, RMSEA = 0.01, WRMR = .254). The best fitting model indicated the slope variance should remain random versus fixed. Results indicated a significant intercept value ( $\alpha = 0.18$ ,  $SE = .043$ ,  $p < .001$ ) and a non-significant, positive slope ( $\beta = 0.97$ ,  $SE = .028$ ,  $p = .34$ ), suggesting individuals with a heightened probability of opioid misuse at wave 8 remained relatively stable in their use overtime.

##### Risk behaviors.

A general pattern emerged for the risk behavior domain in which intercept values of opioid misuse at wave 8 (i.e., higher probability of opioid misuse at age 18) were associated with greater alcohol consequences (CFI = 0.94, RMSEA = 0.07; WRMR = 2.87;  $\chi^2 = 233.6(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.92,  $p < 0.001$ ,  $\beta$  variance = 0.18,  $p = 0.002$ ), greater cannabis consequences (CFI = 0.93, RMSEA = 0.06; WRMR = 2.68;  $\chi^2 = 201.1(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.91,  $p < 0.001$ ,  $\beta$  variance = 0.14,  $p = 0.006$ ), and higher odds of other prescription drug misuse (CFI = 0.86, RMSEA = 0.10; WRMR = 2.98;  $\chi^2 = 430.1(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.95,  $p < 0.001$ ,  $\beta$  variance = 0.22,  $p = 0.006$ ) at wave 11 (see Table 2). A higher probability of opioid misuse at age 18 was also associated with greater delinquency (CFI = 0.91, RMSEA = 0.09; WRMR = 2.65;  $\chi^2 = 379.8(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.88,  $p < 0.001$ ,  $\beta$  variance = 0.19,  $p = 0.004$ ), greater number of sexual partners (CFI = 0.99, RMSEA = 0.02; WRMR = 1.25;  $\chi^2 = 44.8(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.91,  $p < 0.001$ ,  $\beta$  variance = 0.14,  $p = 0.006$ ), higher odds of engaging in condomless sex (CFI = 0.95, RMSEA = 0.04; WRMR = 1.71;  $\chi^2 = 80.8(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.88,  $p < 0.001$ ,  $\beta$  variance = 0.13,  $p = 0.01$ ), as well as higher odds of experiencing sexual victimization (CFI = 0.95, RMSEA = 0.03;  $\chi^2 = 66.25(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.91,  $p < 0.001$ ,  $\beta$  variance = 0.15,  $p = 0.007$ ) and engaging in sexual perpetration (CFI = 0.93, RMSEA = 0.04;  $\chi^2 = 69.7(17)$ ,  $p < .001$ ;  $\alpha$  variance = 0.90,  $p < 0.001$ ,  $\beta$  variance = 0.14,  $p = 0.01$ ) at wave 11. We found only one effect for changes in opioid misuse (i.e., slope) on risk behavior, showing that an increase in the probability of opioid misuse over time was associated with greater delinquency at wave 11. Opioid misuse was not associated with alcohol or cannabis use at wave 11.

**Health.**

We did not find significant effects of initial levels or changes over time of probability of opioid misuse for reports of depression, anxiety, or physical health or ailments.

**Social functioning.**

An initially higher level of opioid misuse was associated with a lower level of peer relationship functioning at wave 11 (CFI = 0.98, RMSEA = 0.03; WRMR = 1.32  $\chi^2 = 50.3$  (17),  $p < .001$ ;  $\alpha$  variance = 0.91,  $p < 0.001$ ,  $\beta$  variance = 0.14,  $p = 0.006$ ). Neither the intercept nor slope of opioid misuse was associated with satisfaction with friends or romantic relationship functioning at wave 11.

**Emerging adult roles.**

We did not find significant effects of initial levels or changes over time of probability of opioid misuse for college status, employment status, romantic relationship status, or independent living status.

**5. Discussion**

The current study provides a comprehensive look at how opioid misuse from age 18-20 is associated with risk behaviors, health, peer social functioning, and transitions to emerging adult roles at age 21-22. Overall, opioid misuse was fairly low in this general sample of young adults, with only about 4% of the sample reporting misuse from age 18-20. Despite low rates, similar to previous work (McCabe, Veliz, Boyd, et al., 2019) we found that adolescents who reported opioid misuse (use of either nonmedical prescription opioids and/or heroin) at age 18 also reported greater use and problems compared to those who did not report opioid misuse at age 18. This included more negative consequences from alcohol and cannabis use and greater odds of other prescription drug misuse at age 21-22. Furthermore, those reporting opioid misuse at age 18 were also more likely to engage in sexual risk behaviors, report delinquent behavior, and have a higher likelihood of experiencing sexual victimization and engaging in sexual perpetration at age 21-22 than those with no opioid misuse at age 18. We only found one slope effect whereby an increase in the probability of opioid misuse from age 18-20 was associated with an increase in delinquent behavior at age 21-22. The general lack of slope effects is likely due to stable rates of opioid misuse across this time frame; however, findings highlight that any misuse at age 18 was strongly related to a wide range of risk behaviors.

For social functioning, we found that a higher probability of opioid misuse at age 18 was associated with poorer peer social functioning at age 21-22, but not satisfaction with friends or romantic relationship functioning. Given the importance of peer relationships during young adulthood (Lansford, Yu, Pettit, Bates, & Dodge, 2014), it is notable that teens who engaged in any opioid misuse reported having more problems connecting with their peers several years later. These problems could affect these young adults' support networks and the protective influence that network ties can have in discouraging substance use (Kennedy et al., 2018).



Interestingly, we did not find an association of opioid misuse at age 18 with transitions into emerging adult roles (e.g., college, employment, relationship, independent living statuses) at age 21-22. While opioid misuse may be unrelated to these types of transitions, it is also possible that lack of associations in this study are due to transitions taking longer today than in earlier generations (Myles, 2015). For example, 15% of 25- to 35-year-olds still live in their parents' home, and are doing so for longer periods of time than previous generations (Berngruber, 2015; Fry, 2017; Sacker & Cable, 2010). In the current study, two-thirds of the sample reported still living with a relative at age 21-22. Young adults are also taking longer to become financially independent (Institute of Medicine National Research Council, 2015), and the under-25 unemployment rate is twice that of the general population (Duffin, 2020). Transitions to committed relationships and parenthood are also delayed (Settersten Jr & Ray, 2010), with only 16% of 18- to 24-year-olds in 2018 reporting living with a spouse or an unmarried partner (Gurrentz, 2018). In the current sample, only about one-third of 21- to 22-year-olds reported being in a committed romantic relationship.

One particularly unexpected finding was the lack of association of opioid misuse during late adolescence with mental health and physical health or ailments in emerging young adulthood. We may not have seen this association given that we measured past year opioid misuse, and because we had to dichotomize misuse given low levels of overall use. It may also be that opioid misuse is associated with poorer mental and physical health in at-risk populations, such as youth experiencing homelessness, who tend to report greater rates of opioid misuse (Barman-Adhikari et al., 2019). However, the association appears weaker in general population samples such as the one used in this study.

Overall, findings emphasize the importance of educating both teens and families about opioids and opioid misuse. Many youth do not view prescription opioids as dangerous when they are provided by a doctor (Romberg et al., 2019), and people often do not understand the potential for addiction from prescription opioids (Morone & Weiner, 2013). One 2020 study found that the strongest predictor of lifetime **opioid** dependence was a person having a prescription **opioid in their** family medicine cabinet at age 14 (Elliott, Liu, Egan, Striley, & Cottler, 2020). In addition, our results highlight the importance of screening and brief intervention for adolescents reporting opioid misuse. Several studies have shown that addressing teens' substance use in the primary care setting can decrease the likelihood of subsequent problems during both adolescence and young adulthood (D'Amico, Parast, et al., 2018; D'Amico et al., 2019; Levy, Mountain-Ray, Reynolds, Mendes, & Bromberg, 2018).

Results should be interpreted in light of the predominantly California sample (e.g., California young adults are more likely to live at home with their parents due to housing costs) (Levin, 2019). We also relied exclusively on self-report data, although note that rates of use in our sample have consistently matched national rates of use (Schulenberg et al., 2019). Nonetheless, our findings suggest that any opioid misuse in the past year at age 18 is a risk factor for numerous problems in emerging young adulthood, including misuse of other prescription drugs, substance use consequences, sexual risk behavior, delinquency, and poor peer social functioning. Of note, significant associations occurred even after controlling for the value of each outcome at the previous wave. In sum, opioid misuse needs to be addressed

in prevention programming for adolescents, as misuse during this important developmental period can have long-term consequences.

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### Highlights

- Opioid misuse during late adolescence was associated with increased risk of negative consequences from alcohol and cannabis use, other prescription drug misuse, sexual risk behaviors, delinquent behavior, experiencing sexual victimization, and engaging in sexual perpetration in young adulthood
- Opioid misuse during late adolescence was not associated with mental or physical health, satisfaction with friends, or emerging adult roles
- Findings highlight the importance of screening and brief intervention for adolescents reporting opioid misuse

**Table 1.**

Participant characteristics N=2880

<b>Demographics</b>	<b>M(SD) or N(%)</b>
Age at wave 8	18.3 (0.78)
Female	1,546 (53.7%)
<i>Race/ethnicity</i>	
White	589 (20.5%)
Black	66 (2.3%)
Hispanic	1,314 (45.6%)
Asian	578 (20.1%)
Other/Multiracial	332 (11.5%)
<i>Mothers education</i>	
High school or less	838 (29.1%)
Some college	376 (13.1%)
Graduated college	1,464 (50.8%)
<b>Opioid misuse</b>	
Opioid use (wave 8)	109 (4.4%)
Opioid use (wave 9)	107 (4.4%)
Opioid use (wave 10)	94 (3.9%)
<b>Outcomes Wave 11</b>	
<i>Risk behavior</i>	
Frequency of alcohol use, days	11.4 (8.47)
Frequency of cannabis use, days	5.86 (8.08)
Alcohol Consequences	1.45 (0.74)
Cannabis Consequences	1.30 (0.73)
Delinquency	1.30 (0.52)
Number of partners	1.59 (5.77)
Unprotected sex	1,032 (42.5%)
Victimization	1,173 (52.6%)
Perpetration	300 (12.7%)
<i>Health</i>	
>Physical Health	9.20 (2.34)
Physical Ailments	2.00 (1.41)
Depression	5.62 (5.53)
Anxiety	5.03 (5.38)
<i>Social Functioning</i>	
Peer social functioning	3.89 (0.97)
Satisfaction with peer relationships	3.74 (1.16)
Relationship quality – anxiety	23.1 (6.86)
Relationship quality – avoidance	18.0 (6.77)

Demographics	M(SD) or N(%)
<i>Emerging adult roles</i>	
College status	1,596 (64.0%)
Employment status	1,759 (70.8%)
Committed relationship	968 (39.0%)
Living independently	931 (37.3%)

Note: 7% of participants selected "do not know" for mothers' education. Frequency of alcohol/cannabis use in past year (days): 0-20; Alcohol/cannabis consequences: range 1-7; Delinquency: range 1-6; Number of partners: range 0-100; Physical health: range 0-12; Physical ailments: range 0-4; Depression: range 0-24; Anxiety: range 0-21; Peer social functioning: range 1-5; Satisfaction with peer relationships: range 1-5; Relationship quality – anxiety: range 5-42; Relationship quality – avoidance: range 2-42.



**Table 2.**

Effect of intercept and slope of opioid use on domains of functioning

	<b>Intercept</b>	<b>Slope</b>
	<i><math>\beta</math>(SE)</i>	<i><math>\beta</math>(SE)</i>
<i>Risk Behaviors</i>		
Alcohol use	-0.20 [-0.87, 0.47]	-3.66 [-7.92, 0.61]
Cannabis use	0.40 [-0.16, 0.96]	-2.30 [-5.17, 0.58]
Alcohol Consequences	<b>0.06 [0.02, 0.10]</b>	-0.11 [-0.27, 0.05]
Cannabis Consequences	<b>0.11 [0.06, 0.15]</b>	0.02 [-0.15, 0.20]
Delinquency	<b>0.08 [0.06, 0.11]</b>	<b>0.10 [0.01, 0.20]</b>
Number of partners	0.26 [-0.06, 0.57]	-0.84 [-3.10, 1.42]
Unprotected sex	<b>0.15 [0.01, 0.28]</b>	0.38 [-0.27, 1.03]
<i>Health</i>		
Physical Health	-0.05 [-0.21, 0.12]	-0.14 [-0.95, 0.68]
Physical Ailments	0.08 [-0.04, 0.19]	0.22 [-0.27, 0.70]
Depression	0.18 [-0.19, 0.54]	0.37 [-1.25, 1.98]
Anxiety	0.20 [-0.14, 0.55]	0.33 [-1.31, 1.97]
Victimization	<b>0.21 [0.07, 0.36]</b>	0.42 [-0.18, 1.01]
Perpetration	<b>0.20 [0.05, 0.36]</b>	0.39 [-0.28, 1.05]
<i>Peer and Social Functioning</i>		
Peer social functioning	<b>-0.08 [-0.15, -0.01]</b>	-0.22 [-0.58, 0.13]
Satisfaction with peer relationships	-0.03 [-0.12, 0.06]	0.05 [-0.38, 0.48]
Relationship quality – anxiety	0.13 [-0.54, 0.79]	0.17 [-3.41, 3.74]
Relationship quality – avoidance	0.82 [-0.28, 1.92]	0.84 [-0.51, 1.52]
Committed relationship	0.004 [-0.12, 0.12]	0.36 [-0.26, 0.98]
Living independently	0.05 [-0.09, 0.18]	0.44 [-0.23, 1.12]
<i>Emerging adult roles</i>		
College status	0.13 [-0.002, 0.26]	0.26 [-0.35, 0.86]
Employment status	0.08 [-0.05, 0.21]	-0.12 [-0.75, 0.51]
Number of hours worked	-2.20 [-1.51, 6.75]	1.73 [-0.42, 3.86]

Note: **Bold** indicates confidence interval does not contain 0.