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Prescription Drug Use, Misuse and Related Substance Use Disorder Symptoms Vary by Educational Status and Attainment in U.S. Adolescents and Young Adults

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Abstract

Background: Prescription drug misuse (PDM) rates are highest in adolescents and young adults. Little research in these high-risk groups has examined PDM differences by educational status or attainment. This investigation attempted to further our understanding of adolescent and young adult prescription drug use and misuse through examining PDM type (i.e., nonmedical misuse, medical misuse and mixed misuse) and substance use disorder (SUD) symptoms from PDM by educational status/attainment.

Methods: Data were from the 2015 National Survey on Drug Use and Health, with 13,585 adolescent and 14,553 young adult respondents. Participants were categorized by educational status separately in adolescents and young adults. Outcomes were rates of past-year prescription drug use, PDM, PDM type, and SUD symptoms, with analyses performed separately by age group and for opioids, stimulants and sedatives/tranquilizers. Analyses used logistic regression and controlled for age, race/ethnicity and sex.

Results: In adolescents and across medication classes, the highest rates of any use, PDM, medical misuse, nonmedical misuse and presence of two or more SUD symptoms were seen in those with poor school adjustment or not in school. In young adults, opioid-PDM and related outcomes were more prevalent in those not in school, especially HS dropouts. For stimulants, rates were highest in full-time college students and college graduates.

Conclusions: These results further suggest the importance of assessing educational status in adolescent and educational attainment in young adult PDM investigations. Adolescents poorly engaged in school or not in school appear especially in need of interventions to limit PDM and associated SUD symptoms.

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Keywords

adolescent; young adult; prescription misuse; opioid; stimulant

1. INTRODUCTION

Prescription drug misuse (PDM) has been described as an epidemic (e.g., Kanouse and Compton, 2015; McClure, 2015), as rates of PDM-related overdose, emergency department and treatment utilization rise (DAWN, 2013; SAMHSA, 2014). PDM may be especially problematic in adolescents (12–17 years) and young adults (18–25 years), as they consistently have elevated past-year PDM prevalence rates from the most commonly misused medication classes: opioids, stimulants, sedatives and tranquilizers (CBHSQ, 2016b).

Lifetime (Havens et al., 2011; Rigg and Ford, 2014) and past-year (Martins et al., 2015; Schepis and Krishnan-Sarin, 2008) adolescent and young adult PDM is linked to concerning outcomes, including poorer academic performance, psychopathology, and risky behavior. Nonetheless, the PDM literature in these groups is limited by near exclusive use of school- or college-based samples. When investigated by dichotomous school enrollment, past-year PDM prevalence rates differ in adolescents (Edlund et al., 2015) and young adults (Ford and Pomykacz, 2016; Johnston et al., 2016; Martins et al., 2015; SAMHSA, 2005; 2009). Despite these findings, no research has followed to investigate whether more fine-grained educational differences affect PDM (e.g., level of educational attainment in young adults not in college).

Similarly, past-year PDM type and PDM-related substance use disorder (SUD) symptoms are under-investigated (McCabe et al., 2013; McCabe et al., 2012). Type captures how the medication was misused and is one of: *medical misuse* (i.e., use in ways the prescriber did not intend), *nonmedical misuse* (i.e., use without a prescription) or *mixed misuse* (i.e., a combination of medical and nonmedical misuse). PDM type may affect use patterns (McCabe et al., 2013) and SUD symptoms highlight elevated PDM-related consequences (APA, 2013), suggesting both as important for further study.

While it appears that dichotomous school enrollment corresponds with PDM prevalence, the relationships between educational status/attainment and PDM type prevalence or PDM-related SUD symptoms remain unclear. Also, PDM prevalence rates and prevalence of other PDM variables in more granular and under-studied subgroups (e.g., young adult college graduates or those with poor school adjustment [at-risk for HS dropout]) are relatively unknown. Clinically, data on PDM by education status/attainment can be valuable by providing workplace supervisors, clinicians and school professionals with an easily assessed characteristic suggesting more selective prevention and intervention by status/attainment (e.g., different medication classes of concern by group).

This investigation aimed to examine PDM, PDM-related types and SUD symptoms by educational status/attainment in adolescents and young adults, using 2015 National Survey on Drug Use and Health (NSDUH) data. We hypothesized that PDM and SUD symptom

rates would be highest in adolescents not in school and young adults who did not complete high school (HS), given their higher substance use rates (DuPont et al., 2013; Grant et al., 2017); one exception should be stimulant-PDM, which was expected to be higher in college students (Ford and Pomykacz, 2016). Given the limited PDM type data, we did not have *a priori* type hypotheses.

2. METHODS

The NSDUH produced nationally representative data via an independent, multistage area probability sample. Interviews began with audio computer-assisted self-interviewing (ACASI) for sensitive variables (e.g., PDM); ACASI promotes privacy, honest reporting and data completeness. The 2015 weighted interview response rate was 77.7% in adolescents and 74.5% in young adults; age-based weighted screening response rates (79.7% across ages) were not provided. For more on the NSDUH, see CBHSQ (2016a) and Hughes and colleagues (2016).

2.1 Participants

For 2015, 13,585 adolescents (12–17 years) and 14,553 young adults (18–25 years) completed the NSDUH. In adolescents, the weighted sample was 51.0% male, 53.7% white, 13.9% African-American and 23.1% Hispanic/Latino; in young adults, the weighted sample was 50.2% male, 55.0% white, 14.4% African-American and 21.4% Hispanic/Latino. Online-only Supplemental Tables A and B capture demographic characteristics by educational status/attainment.

2.2 Measures

PDM variables were assessed separately by medication class (i.e., opioids, stimulants and sedative/tranquilizers), with sedative/tranquilizers aggregated, per previous studies (Schepis and Hakes, 2013; Tetrault et al., 2008). To aid recall, individual drug names were used, and pictures of common medications were provided. In lifetime users of medication class, *past-year prescription use* was assessed. Then, *past-year PDM* was assessed: “The next question asks about using **[**drug class] in any way a doctor did not direct you to use them. [P]lease think only about your use of the drug in any way a doctor did not direct you to use it, including: Using it without a prescription of your own; Using it in greater amounts, more often, or longer than you were told to take it; Using it in any other way a doctor did not direct you to use it.”

In past-year misusers, PDM type was assessed with: “Which of these statements describe your use of [drug class] at **any** time in the past 12 months?” **Use without a prescription from a prescriber** is ***nonmedical misuse***; these four subtypes are ***medical misuse***: (1) **in greater amounts**, (2) **over a longer period**, (3) **more often**, or (4) **in some other way** the prescriber did not intend. Participants selected as many of the statements as applied, and the combination of nonmedical misuse and medical misuse is ***mixed misuse***. Finally, in past-year misusers, DSM-IV SUD symptoms (APA, 2000) were assessed. The 10 DSM-5 (APA, 2013) symptoms were retained, and participants were categorized as having *zero*, *one* or *two or more SUD symptoms* from each medication class. SUD symptom categories were chosen

to highlight initial impairment or distress from symptomatic PDM (one symptom; Compton et al., 2013) or symptoms consistent with the DSM-5 SUD diagnosis (≥ two symptoms; APA, 2013), given the relative equality of SUD symptoms found elsewhere (Dawson et al., 2010; Hasin et al., 2013).

Participants were categorized by *educational status/attainment*. In adolescents, participants were home-schooled; in school, good school adjustment; in school, poor school adjustment; not in school. *Poor school adjustment* was based on school dropout risk factors (Hammond et al., 2007) and was positive with at least one of: (1) D or worse grades in the last grading period; (2) history of being retained in grade; and/or (3) stating that the respondent "hated going to school". In young adults, participants were still in HS; full-time in college; part-time in college; college graduate; not in college, HS graduate; not in college, less than HS. *College status* comprised those enrolled in "college or university" and included 2- and 4-year schools and post-baccalaureate schooling.

2.3 Analyses

Data were weighted, clustered on primary sampling units, and stratified appropriately. The Taylor series approximation was used, with adjusted degrees of freedom, to create robust variance estimates. Analyses occurred separately by medication class. Initial analyses employed weighted cross-tabulations to estimate prevalence and 95% confidence intervals of past-year medication use and all PDM variables by educational status/attainment. Primary analyses used design-based logistic (PDM prevalence) and multinomial regression (PDM type and SUD symptoms) to examine PDM variable differences by educational status/attainment, controlling for age, race/ethnicity and sex; *post hoc* pairwise comparisons used the same covariates, with Bonferroni-corrected *p*-values. Analyses were performed in Stata 15.0 (StataCorp, 2017).

3. RESULTS

3.1 Use, PDM, PDM-Related Types and SUD Symptoms in Adolescents

For opioids, adolescents not in school had both the highest use and PDM rates, while stimulant and sedative/tranquilizer use and PDM rates were higher in adolescents with poor school adjustment. For PDM-related SUD symptoms, adolescents with poor school adjustment had the highest prevalence of symptomatic PDM (or the lowest prevalence of zero SUD symptoms). The lowest prevalence rates for PDM outcomes were in adolescents with good school adjustment or homeschooled adolescents, who were not included in the statistical tests due to their small sample. PDM type differences were limited, with nonmedical misuse as the most prevalent type. For adolescent outcomes, please see Table 1.

3.2 Use, PDM, PDM-Related Types and SUD Symptoms in Young Adults

In contrast to adolescents, PDM variable patterns differed by medication class between educational subgroups in young adults, with the starkest differences between opioids and stimulants. For opioids, rates of any use, PDM, PDM type and SUD symptoms were significantly higher in those not in college than in college graduates or full-time college students. The pattern reversed for stimulant-PDM, with the highest prevalence rates of PDM

and SUD symptoms in full-time college students and graduates. Outcomes mirrored the opioid-PDM pattern for sedatives/tranquilizers: higher rates in young adults not in school, with fewer significant differences. Young adults in HS had lower sedative/tranquilizer-PDM rates than all subgroups except college graduates. Nonmedical misuse was again the most prevalent type. For young adult outcomes, please see Table 2.

4. DISCUSSION

This work highlights adolescents not in school or with poor school adjustment as having elevated rates of PDM, nonmedical misuse and SUD symptoms. Those with poor school adjustment were similar to those not in school, suggesting that PDM elevations predate HS dropout (DuPont et al., 2013). Identifying adolescents in school engaged in PDM may limit both direct and indirect PDM consequences, which could include HS dropout. Outreach to adolescents not in school requires community-based efforts (National Research Council, 1993), including parental education about medication storage and disposal, as family is a key source for PDM (Schepis and Krishnan-Sarin, 2009). Finally, while not formally tested, homeschooled adolescents had generally low rates of PDM and associated variables, suggesting them as a focus for investigations of protective factors against PDM.

In young adults, those not in school had the highest opioid-PDM and SUD rates, as found previously (Johnston et al., 2016; Martins et al., 2015). Conversely, full-time students and college graduates had higher stimulant-PDM and stimulant SUD symptom rates. While young adults with higher levels of educational attainment have lower substance use rates (e.g., Grant et al., 2017), the elevated stimulant-PDM in full-time college students here and in Ford and Pomykacz (2016) may result from the predominant studying-related motives (Teter et al., 2006) and perceived academic benefits of stimulant-PDM (Arria et al., 2018). In these subgroups, elevated stimulant-PDM mirrored elevated rates of any stimulant use, with this positive relationship between any use and PDM seen broadly across subgroups and medication classes. Clinically, these findings may highlight screening and intervention for opioid-PDM in medical or workplace settings, given the challenges of reaching young adults not in school, versus those in college. These findings also underline the value of intervening to reduce college student stimulant-PDM, as elevated rates persist post-graduation; finally, they raise the question of when, or if, these rates decline post-graduation.

The PDM profiles of adolescents with poor school adjustment and young adults not in school were similar, while adolescents with good school adjustment did not evidence the elevated stimulant-PDM rates of young adults continuing in education. Thus, primary school-based intervention to alter the developmental trajectory of adolescents who are likely to have poor school adjustment and intervention in first-year college students to limit stimulant-PDM would have value.

For PDM type, the non-significant but higher opioid nonmedical misuse rates in adolescents with poor school adjustment or not in school may be reason for concern. Schepis and Krishnan-Sarin (2009) found that adolescent nonmedical misusers had higher rates of other substance use and frequent PDM than medical misusers. Adolescent nonmedical opioid and stimulant misusers also have higher rates of SUD symptoms in adulthood (McCabe et al.,

2017; McCabe et al., 2016). However, medical misuse is associated with poorer outcomes than nonmedical misuse, depending on underlying motives (McCabe et al., 2013), and even medical use can impart risk, as adolescent opioid users have higher follow-up opioid-PDM rates than non-users (McCabe et al., 2016; Miech et al., 2015).

Three limitations should be noted: (1) cross-sectional data, preventing causal inference; (2) self-selection bias, given participation refusal; and, (3) self-report bias. Despite these limitations, this investigation highlighted adolescents with poor school adjustment as more likely to engage in PDM and have PDM-related SUD symptoms, found elevations in stimulant-PDM post-college graduation, and noted young adults not in college as highest risk for opioid-PDM. These data can aid school health professionals and clinicians by emphasizing adolescents not in school or with poor school adjustment for prevention and more careful prescribing and monitoring. College-based interventions in first-year students aimed at stimulant-PDM and workplace prevention for opioid-PDM in young adults are also warranted.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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REFERENCES

American Psychiatric Association, 2000 Diagnostic and statistical manual of mental disorders: DSM-IV-TR. American Psychiatric Association, Washington, DC.

American Psychiatric Association, 2013 Diagnostic and statistical manual of mental disorders. (5th ed). Author, Washington, DC.

Arria AM, Geisner IM, Cimini MD, Kilmer JR, Caldeira KM, Barrall AL, Vincent KB, Fossos-Wong N, Yeh JC, Rhew I, Lee CM, Subramaniam GA, Liu D, Larimer ME, 2018 Perceived academic benefit is associated with nonmedical prescription stimulant use among college students. Addict Behav 76, 27–33. [PubMed: 28735038]

Center for Behavioral Health Statistics and Quality, 2016a 2015 National Survey on Drug Use and Health public use file codebook. Substance Abuse and Mental Health Services Administration, Rockville, MD.

Center for Behavioral Health Statistics and Quality, 2016b Key substance use and mental health indicators in the United States: Results from the 2015 National Survey on Drug Use and Health (HHS Publication No. SMA 16–4984, NSDUH Series H-51).

Compton WM, Dawson DA, Conway KP, Brodsky M, Grant BF, 2013 Transitions in Illicit Drug Use Status over 3 Years: A Prospective Analysis of a General Population Sample. Am J Psychiat 170, 660–670. [PubMed: 23511653]

Dawson DA, Saha TD, Grant BF, 2010 A multidimensional assessment of the validity and utility of alcohol use disorder severity as determined by item response theory models. Drug Alcohol Depend 107, 31–38. [PubMed: 19782481]

Drug Abuse Warning Network, 2013 2011: Selected tables of national estimates of drug-related emergency department visits. Center for Behavioral Health Statistics and Quality, SAMHSA, Rockville, MD.

DuPont RL, Caldeira KM, DuPont HS, Vincent KB, Shea CLAAM, 2013 America's dropout crisis: The unrecognized connection to adolescent substance use. Institute for Behavior and Health, Inc Available at www.ibhinc.org, www.PreventTeenDrugUse.org, and www.cls.umd.edu/docs/AmerDropoutCrisis.pdf, Rockville, MD.

Edlund MJ, Forman-Hoffman VL, Winder CR, Heller DC, Kroutil LA, Lipari RN, Colpe LJ, 2015 Opioid abuse and depression in adolescents: Results from the National Survey on Drug Use and Health. Drug Alcohol Depend 152, 131–138. [PubMed: 25981310]

Ford JA, Pomykacz C, 2016 Non-Medical Use of Prescription Stimulants: A Comparison of College Students and their Same-Age Peers Who Do Not Attend College. Journal of psychoactive drugs 48, 253–260. [PubMed: 27541987]

Grant BF, Chou SP, Saha TD, Pickering RP, Kerridge BT, Ruan WJ, Huang B, Jung J, Zhang H, Fan A, Hasin DS, 2017 Prevalence of 12-Month Alcohol Use, High-Risk Drinking, and DSM-IV Alcohol Use Disorder in the United States, 2001–2002 to 2012–2013: Results From the National Epidemiologic Survey on Alcohol and Related Conditions. JAMA Psychiatry 74, 911–923. [PubMed: 28793133]

Hammond C, Linton D, Smink J, Drew S, 2007 Dropout risk factors and exemplary programs. National Dropout Prevention Center, Communities In Schools, Inc, Clemson, SC.

Hasin DS, O'Brien CP, Auriacombe M, Borges G, Bucholz K, Budney A, Compton WM, Crowley T, Ling W, Petry NM, Schuckit M, Grant BF, 2013 DSM-5 criteria for substance use disorders: recommendations and rationale. Am J Psychiatry 170, 834–851. [PubMed: 23903334]

Havens JR, Young AM, Havens CE, 2011 Nonmedical prescription drug use in a nationally representative sample of adolescents: evidence of greater use among rural adolescents. Arch Pediatr Adolesc Med 165, 250–255. [PubMed: 21041587]

Hughes A, Williams MR, Lipari RN, Bose J, Copello EAP, Kroutil LA, 2016 Prescription drug use and misuse in the United States: Results from the 2015 National Survey on Drug Use and Health. https://www.samhsa.gov/data/sites/default/files/NSDUH-FFR2-2015/NSDUH-FFR2-2015.htm.accessed on.

Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE, Miech RA, 2016 Monitoring the Future national survey results on drug use, 1975– 2015: Volume 2, College students and adults ages 19–55. Institute for Social Research, The University of Michigan, Ann Arbor.

Kanouse AB, Compton P, 2015 The epidemic of prescription opioid abuse, the subsequent rising prevalence of heroin use, and the federal response. J Pain Palliat Care Pharmacother 29, 102–114. [PubMed: 26095479]

Martins SS, Kim JH, Chen LY, Levin D, Keyes KM, Cerda M, Storr CL, 2015 Nonmedical prescription drug use among US young adults by educational attainment. Soc Psychiatry Psychiatr Epidemiol 50, 713–724. [PubMed: 25427665]

McCabe SE, Veliz P, Boyd CJ, Schulenberg JE, 2017 Medical and nonmedical use of prescription sedatives and anxiolytics: Adolescents' use and substance use disorder symptoms in adulthood. Addict Behav 65, 296–301. [PubMed: 27569697]

McCabe SE, Veliz P, Schulenberg JE, 2016 Adolescent context of exposure to prescription opioids and substance use disorder symptoms at age 35: a national longitudinal study. Pain 157, 2173–2178. [PubMed: 27227693]

McCabe SE, West BT, Boyd CJ, 2013 Medical use, medical misuse, and nonmedical use of prescription opioids: results from a longitudinal study. Pain 154, 708–713. [PubMed: 23433943]

McCabe SE, West BT, Teter CJ, Cranford JA, Ross-Durow PL, Boyd CJ, 2012 Adolescent nonmedical users of prescription opioids: brief screening and substance use disorders. Addict Behav 37, 651–656. [PubMed: 22366397]

McClure FL, 2015 The prescription drug misuse epidemic: Are we making progress? Occup Health Saf 84, 88, 90, 92 passim.

Miech R, Johnston L, O'Malley PM, Keyes KM, Heard K, 2015 Prescription Opioids in Adolescence and Future Opioid Misuse. Pediatrics 136, e1169–1177. [PubMed: 26504126]

National Research Council, 1993 Losing Generations: Adolescents in High-Risk Settings. The National Academies Press, Washington, DC.

Rigg KK, Ford JA, 2014 The misuse of benzodiazepines among adolescents: psychosocial risk factors in a national sample. Drug Alcohol Depend 137, 137–142. [PubMed: 24582910]

Schepis TS, Hakes JK, 2013 Dose-related effects for the precipitation of psychopathology by opioid or tranquilizer/sedative nonmedical prescription use: results from the National Epidemiologic Survey on Alcohol and Related Conditions. J Addict Med 7, 39–44. [PubMed: 23222127]

Schepis TS, Krishnan-Sarin S, 2008 Characterizing adolescent prescription misusers: a population-based study. J Am Acad Child Adolesc Psychiatry 47, 745–754. [PubMed: 18520963]

Schepis TS, Krishnan-Sarin S, 2009 Sources of prescriptions for misuse by adolescents: differences in sex, ethnicity, and severity of misuse in a population-based study. J Am Acad Child Adolesc Psychiatry 48, 828–836. [PubMed: 19564803]

StataCorp, 2017 Stata statistical software: Release 15. StataCorp LLC, College Station, TX.

Substance Abuse and Mental Health Services Administration, 2005 The NSDUH Report: College enrollment status and past year illicit drug use among young adults: 2002, 2003, and 2004. Office of Applied Studies, Rockville, MD.

Substance Abuse and Mental Health Services Administration, 2009 The NSDUH Report: Nonmedical use of Adderall® among full-time college students. Office of Applied Studies, Rockville, MD.

Substance Abuse and Mental Health Services Administration, 2014 Treatment Episode Data Set (TEDS): 2002–2012. National admissions to substance abuse treatment services BHSIS Series S-71, HHS Publication No. (SMA) 14–4850. Substance Abuse and Mental Health Services Administration, Rockville, MD.

Teter CJ, McCabe SE, LaGrange K, Cranford JA, Boyd CJ, 2006 Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. Pharmacotherapy 26, 1501–1510. [PubMed: 16999660]

Tetrault JM, Desai RA, Becker WC, Fiellin DA, Concato J, Sullivan LE, 2008 Gender and non-medical use of prescription opioids: results from a national US survey. Addiction 103, 258–268. [PubMed: 18042194]

Table 1.

School and non-school differences in prescription drug use and misuse among adolescents, NSDUH 2015 cohort

	Home-schooled n = 81	In school, good school adjustment (A) n = 10,723	In school, poor school adjustment (B) n = 1,341	Not in school (C) n = 593	Statistics
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Prescription Opioids					
Any past-year use	11.0 (5.02–22.5)	22.0 (21.1–23.0)[C]	27.3 (24.0–30.1)[C]	33.8 (29.7–38.1)[A, B]	$t = 6.19$, $p \leq 0.001$
Any past-year PDM	5.1 (1.7–13.9)	3.5 (3.0–3.9)[B, C]	7.2 (5.6–9.2)[A]	9.0 (6.2–12.8)[A]	$t = 6.26$, $p \leq 0.001$
Nonmedical misuse	1.2 (0.2–8.1)	1.8 (1.4–2.2)	2.6 (1.6–4.2)	3.7 (1.9–6.8)	*(base outcome)* $t = 0.57$, $p = 0.57$ $t = 2.07$, $p = 0.044$
Medical misuse	3.5 (0.8–14.2)	1.1 (0.9–1.4)	2.0 (1.2–3.5)	2.9 (1.7–5.0)	
Mixed misuse	0.1 (<0.1–0.5)	0.2 (0.1–0.4)[B]	2.0 (1.2–3.3)[A]	0.8 (0.3–2.3)	
Prescription Stimulants					
Any past-year use	2.3 (0.6–8.2)	6.6 (6.0–7.3)[B, C]	11.4 (9.6–13.4)[A]	10.5 (7.7–14.2)[A]	$t = 4.85$, $p \leq 0.001$
Any past-year PDM	0.9 (0.1–6.7)	1.8 (1.5–2.1)[B]	3.2 (2.2–4.6)[A]	3.2 (1.8–5.6)	$t = 2.54$, $p = 0.014$
Nonmedical misuse	0.9 (0.1–6.7)	1.1 (0.9–1.4)	1.3 (0.8–2.3)	1.5 (0.5–4.1)	*(base outcome)* $t = 0.97$, $p = 0.34$ $t = 2.86$, $p = 0.006$
Medical misuse	no cases	0.4 (0.3–0.6)	0.9 (0.5–1.9)	0.8 (0.4–1.7)	
Mixed misuse	no cases	0.1 (0.1–0.2)	0.5 (0.2–1.3)	0.7 (0.2–2.0)	
Prescription Sedatives/ Tranquilizers					
Any past-year use	7.3 (2.9–16.8)	5.2 (4.7–5.8)[B, C]	11.1 (8.9–13.7)[A]	10.8 (7.8–15.0)[A]	$t = 6.43$, $p \leq 0.001$
Any past-year PDM	1.3 (0.2–8.5)	1.5 (1.2–1.8)[B]	4.5 (3.4–6.1)[A]	3.0 (1.7–5.5)	$t = 4.51$, $p \leq 0.001$
Nonmedical misuse	1.3 (0.2–8.5)	1.0 (0.8–1.3)	2.8 (2.0–4.0)	1.8 (0.8–3.8)	*(base outcome)* $t = 1.19$, $p = 0.24$ $t = 0.04$, $p = 0.97$
Medical misuse	no cases	0.3 (0.2–0.4)	0.8 (0.4–1.9)	1.2 (0.5–3.0)	
Mixed misuse	no cases	0.1 (<0.1–0.3)	0.5 (0.2–1.2)	<0.1 (<0.1–0.3)	
Substance Use Disorder Symptoms					
Past-year opioid use disorder symptoms					
Zero	98.4 (91.3–99.7)	99.0 (98.8–99.2)[B]	96.2 (94.5–97.4)[A]	98.1 (95.8–99.1)	*(base outcome)* $t = 2.82$, $p = 0.007$ $t = 4.96$, $p \leq 0.001$
One	1.4 (0.2–9.5)	0.6 (0.4–0.8)[B]	1.4 (0.9–2.3)[A]	1.3 (0.5–3.2)	
Two or more	0.3 (0.03–2.2)	0.4 (0.3–0.6)[B]	2.4 (1.4–4.0)[A]	0.7 (0.1–3.1)	
Past-year stimulant use disorder symptoms					

	Home-schooled n = 81	In school, good school adjustment (A) n = 10,723	In school, poor school adjustment (B) n = 1,341	Not in school (C) n = 593	Statistics
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Zero	100.0	99.6 (99.3–99.7)	99.2 (98.5–99.6)	99.8 (99.2–99.9)	*(base outcome)* $t = -0.69$, $p = 0.49$ $t = 0.88$, $p = 0.39$
One	no cases	0.2 (0.1–0.4)	0.4 (0.1–1.0)	0.02 (0.002–0.1)	
Two or more	no cases	0.2 (0.1–0.4)	0.4 (0.2–1.0)	0.2 (0.06–1.0)	
Past-year sedative or tranquilizer use disorder symptoms					
Zero	99.9 (99.5–100.0)	99.6 (99.4–99.7)[B]	98.2 (97.0–98.9)[A]	98.4 (96.1–99.4)	*(base outcome)* $t = 4.15$, $p \leq 0.001$ $t = 2.69$, $p = 0.01$
One	0.06 (0.008–0.5)	0.2 (0.09–0.3)[B, C]	0.8 (0.4–1.8)[A]	1.3 (0.4–3.8)[A]	
Two or more	no cases	0.3 (0.2–0.4)[B]	1.0 (0.5–2.0)[A]	0.3 (0.09–1.0)	

Notes: PDM = Prescription Drug Misuse; analyses excluded home-schooled adolescents, given their small sample size; superscripts indicate significant differences from the subgroup with the letter listed (please see column headers); statistics and pairwise comparisons used logistic or multinomial regression, controlling for age, race/ethnicity and sex, and highlighted differences were at a (Bonferroni-corrected) p-value < 0.0167 (or, 0.05/3).

Table 2.

School and non-school differences in prescription drug use and misuse among young adults, NSDUH 2015 cohort

	In HS (A) n = 745	College graduate (B) n = 1,305	Full-time college (C) n = 4,004	Part-time College (D) n = 1,109	Not in college, HS graduate (E) n = 5,720	Not in college less than HS (F) n = 1,375	Statistics
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Prescription Opioids							
Any past-year use	30.6 (26.6–34.8)	29.8 (27.0–32.7)$^{D, E, F}$	31.4 (29.2–33.5)$^{E, F}$	34.4 (30.9–37.9)	38.4 (37.0–40.0)$^{B, C}$	36.9 (33.7–40.3)$^{B, C}$	$t = 7.26$, $p \leq 0.001$
Any past-year PDM	6.2 (4.4–8.8)	6.1 (4.5–8.2)$^{E, F}$	7.0 (6.0–8.1)$^{E, F}$	8.1 (6.5–10.0)	10.2 (9.1–11.4)$^{B, C}$	11.4 (9.6–13.5)$^{B, C}$	$t = 5.35$, $p \leq 0.001$
Nonmedical misuse	2.7 (1.8–4.2)	3.0 (1.9–4.6)^{E}	3.1 (2.6–3.8)$^{E, F}$	4.1 (3.0–5.5)	5.6 (4.8–6.5)$^{B, C}$	5.4 (4.2–7.0)^{C}	*(base outcome)* $t = -2.02$, $p = 0.049$ $t = -0.59$, $p = 0.55$
Medical misuse	2.5 (1.4–4.5)	2.3 (1.4–3.8)	2.5 (2.0–3.2)	2.2 (1.3–3.6)	2.8 (2.2–3.6)	3.9 (2.9–5.4)	
Mixed misuse	0.6 (0.3–1.2)	0.8 (0.4–1.6)	1.2 (0.8–1.9)	1.7 (1.0–3.1)	1.5 (1.2–1.9)	2.0 (1.3–3.0)	
Prescription Stimulants							
Any past-year use	10.6 (8.2–13.7)^{C}	17.7 (15.3–20.5)$^{E, F}$	17.9 (16.2–19.8)$^{A, E, F}$	14.8 (12.4–17.7)	11.7 (10.9–12.6)$^{B, C}$	10.6 (8.5–13.1)$^{B, C}$	$t = -5.48$, $p \leq 0.001$
Any past-year PDM	3.2 (2.0–5.1)$^{B, C, D}$	11.2 (9.6–13.0)$^{A, E, F}$	10.3 (8.8–12.0)$^{A, E, F}$	7.3 (5.5–9.6)^{A}	5.6 (4.8–6.5)$^{B, C}$	4.4 (3.2–6.0)$^{B, C}$	$t = -6.01$, $p \leq 0.001$
Nonmedical misuse	2.1 (1.2–3.7)$^{B, C, D}$	8.5 (7.1–10.1)$^{A, E, F}$	7.3 (6.4–8.5)$^{A, E, F}$	6.0 (4.4–8.1)^{A}	4.0 (3.3–4.8)$^{B, C}$	2.3 (1.5–3.3)$_{B, C}$	*(base outcome)* $t = 2.04$, $p = 0.047$ $t = 1.38$, $p = 0.17$
Medical misuse	0.7 (0.2–2.1)	1.3 (0.8–2.0)	1.5 (1.0–2.2)	0.7 (0.3–1.5)	1.1 (0.8–1.5)	1.4 (0.7–2.5)	
Mixed misuse	0.3 (0.1–1.0)	1.4 (0.8–2.5)	1.2 (0.7–2.1)	0.5 (0.2–1.4)	0.5 (0.3–0.9)	0.7 (0.3–1.6)	
Prescription Sedatives/Tranquilizers							
Any past-year use	8.5 (6.4–11.2)^{F}	12.1 (9.8–14.8)^{F}	13.4 (12.0–14.9)	15.1 (12.4–18.3)	14.9 (13.6–16.3)	15.0 (12.6–17.8)$^{A, B}$	$t = 4.17$, $p \leq 0.001$
Any past-year PDM	2.7 (1.5–4.7)$^{C, D, E, F}$	3.7 (2.7–5.0)$^{D, F}$	5.6 (4.6–6.8)^{A}	7.5 (5.7–9.9)$^{A, B}$	6.2 (5.5–7.1)^{A}	6.7 (5.2–8.7)$^{A, B}$	$t = 4.47$, $p \leq 0.001$
Nonmedical misuse	1.5 (0.7–3.0)	2.4 (1.6–3.5)	3.7 (3.0–4.5)	5.1 (3.4–7.6)	4.4 (3.7–5.1)	4.0 (2.9–5.5)	*(base outcome)* $t = 0.27$, $p = 0.79$ $t = -1.27$, $p = 0.21$
Medical misuse	0.9 (0.4–2.3)	0.3 (0.1–0.9)	1.2 (0.8–1.7)	1.6 (1.0–2.5)	1.2 (0.9–1.7)	1.5 (0.9–2.6)	
Mixed misuse	0.3 (0.1–1.0)	0.8 (0.4–1.4)	0.6 (0.3–1.1)	0.8 (0.4–1.3)	0.6 (0.4–1.3)	0.8 (0.4–1.7)	
Substance Use Disorder Symptoms							
Past-year opioid use disorder symptoms							
Zero	98.2 (96.6–99.1)	98.8 (97.8–99.4)$^{E, F}$	98.5 (97.9–98.9)$^{E, F}$	97.8 (96.0–98.8)	96.5 (95.8–97.1)$^{B, C}$	96.4 (95.3–97.2)$^{B, C}$	*(base outcome)* $t = 3.06$, $p = 0.004$ $t = 3.95$, $p \leq 0.001$

	In HS (A) n = 745	College graduate (B) n = 1,305	Full-time college (C) n = 4,004	Part-time College (D) n = 1,109	Not in college, HS graduate (E) n = 5,720	Not in college less than HS (F) n = 1,375	Statistics
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
One	0.8 (0.3–1.8)	0.4 (0.1–1.3)	0.6 (0.4–1.1)	0.8 (0.4–1.7)	1.3 (1.0–1.7)	1.1 (0.6–1.9)	
Two or more	1.0 (0.4–2.6)	0.8 (0.4–1.7) [E, F]	0.9 (0.5–1.4)[E, F]	1.4 (0.7–2.8)	2.2 (1.7–2.8)[B]	2.5 (1.8–3.6) [B, C]	
Past-year stimulant use disorder symptoms							
Zero	99.5 (98.6–99.8)	97.6 (96.3–98.5)[F]	97.8 (97.1–98.4)[F]	97.7 (95.8–98.8)	98.8 (98.4–99.1)	98.9 (98.9–99.5)[B, C]	*(base outcome)* $t = -0.58$, $p = 0.56$ $t = -2.44$, $p = 0.018$
One	0.3 (0.08–0.9)	1.4 (0.6–2.8)	0.8 (0.5–1.2)	0.8 (0.3–2.1)	0.7 (0.4–1.0)	0.7 (0.3–1.8)	
Two or more	0.3 (0.06–1.1)	1.0 (0.5–1.9)	1.3 (0.9–1.9)	1.5 (0.8–2.8)	0.5 (0.3–0.8)	0.4 (0.1–0.9)	
Past-year sedative or tranquilizer use disorder symptoms							
Zero	99.3 (98.4–99.7)	99.3 (98.6–99.7)	98.9 (98.3–99.2)	98.6 (97.5–99.2)	98.8 (98.4–99.1)	98.1 (96.7–99.0)	*(base outcome)* $t = 1.52$, $p = 0.13$ $t = 1.63$, $p = 0.10$
One	0.2 (0.02–1.1)	0.3 (0.1–0.8)	0.5 (0.3–0.9)	0.4 (0.1–1.0)	0.5 (0.3–0.8)	0.5 (0.2–1.1)	
Two or more	0.5 (0.2–1.4)	0.4 (0.2–1.1)	0.6 (0.4–1.0)	1.0 (0.5–2.1)	0.7 (0.5–1.1)	1.4 (0.7–2.7)	

Notes: PDM = Prescription Drug Misuse; superscripts indicate significant differences from the subgroup with the letter listed (please see column headers); statistics and pairwise comparisons used logistic and multinomial regression, controlling for age, race/ethnicity and sex, and highlighted differences were at a (Bonferroni-corrected) p-value ≤ 0.0033 (or, 0.05/15).