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Age-Specific Risk of Substance Use Disorders Associated With Controlled Medication Use and Misuse Subtypes in the United States

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Abstract

Objective: To examine the age-specific risk of past-year substance use disorders (SUDs) associated with use and misuse of prescription opioids, stimulants, sedatives and tranquilizers.

Methods: The authors analyzed nationally representative data from 114,043 U.S. individuals aged 12 and older in the 2015–2016 National Survey on Drug Use and Health. For each controlled medication class, logistic regression was used to model any past-year SUD as a function of use pattern: no use or misuse, use without misuse, prescription drug misuse (PDM). Among individuals reporting PDM, logistic regression was used to model any past-year SUD as a function of PDM subtype (misuse of someone else's medication only, misuse of one's own medication only, and misuse of one's own and someone else's medication). Analyses were stratified by age group.

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Additional information: The original data sets for the 2015 and 2016 National Survey on Drug Use and Health (NSDUH) are available from the Substance Abuse & Mental Health Data Archive (<https://www.datafiles.samhsa.gov/study-series/national-survey-drug-use-and-health-nsduh-nid13517>).

Results: Controlled medication use was associated with higher odds of any past-year SUD compared to no use in many age groups and medication classes. Compared to non-use, PDM was associated with higher odds of any past-year SUD across virtually all age groups and medication classes. Compared to misuse of one's own medication only, misuse of both someone else's and one's own medication was associated with higher odds of any past-year SUD for many age groups and medication classes among individuals reporting PDM.

Conclusions: Clinicians should screen all controlled medication users for PDM and SUDs. Age-specific screening may be required due to heterogeneity in the prevalence and risks of use and misuse of different medications. Determination of PDM subtype can guide interventions to prevent SUDs.

Keywords

epidemiology; opioid; stimulant; benzodiazepine; substance use disorder

INTRODUCTION

Substance misuse represents a major source of disability, morbidity and mortality.¹⁻⁵ More than one in six U.S. high school seniors has misused prescription opioids, sedatives, stimulants or tranquilizers.^{6,7} Prescription drug misuse (PDM) represents a constellation of behaviors that includes use of someone else's controlled medication as well as use of one's own controlled medication in a way other than prescribed (e.g., higher doses, frequencies, and durations). Prescription opioid misuse accounts for the majority of PDM in the U.S., but among young adults, rates of prescription stimulant misuse are comparable to rates of prescription opioid misuse.⁷⁻⁹

While overall PDM rates in the U.S. have recently stabilized, rates of PDM consequences (e.g., overdose deaths) have continued to rise at alarming rates.^{4,5,10-12} Although most of the attention has focused on opioid misuse,¹³ the prevalence and related consequences of sedative/tranquilizer and stimulant misuse are also increasing over time.^{7,14,15} Cross-sectional and longitudinal studies have demonstrated robust relationships between PDM (involving prescription opioids, sedatives/tranquilizers and stimulants) and related consequences.¹⁴⁻¹⁹ Taken together, the data suggest that the U.S. suffers from a PDM public health problem across several controlled medication classes, not just prescription opioids.

A key gap in the literature is the lack of nationally representative studies assessing whether the risk of substance use disorders (SUDs) is associated with use of controlled medications such as prescription opioids, stimulants, sedatives, and tranquilizers. There is evidence suggesting that appropriate medical use of controlled medications does not lead to increased risk of SUD, as well as evidence that any history of PDM (with or without medical use) is associated with risk of SUD.¹⁹⁻²² However, these studies have focused largely on psychostimulants in regional non-representative samples recruited from clinical settings and schools, or have used non-representative commercial health insurance claims databases that may inadequately capture substance misuse.

A second key gap is the lack of studies assessing whether use and misuse of controlled medications is associated with different magnitudes of risk when considering substance-specific SUD (i.e., SUD within the same class of agent used or misused) versus any SUD (i.e., SUD of any substance, including prescription medications and illicit substances). Addressing this gap could inform whether screening efforts for SUD should be general or substance-specific.

A third key gap is the lack of understanding regarding the risk of SUD associated with different PDM subtypes (i.e., misuse of someone else's medication vs. one's own medication vs both). Differences in this risk have been demonstrated using regional studies,^{16,17} but national data sources have historically not disaggregated PDM by subtype.²³ In 2015, however, the National Survey on Drug Use and Health (NSDUH) became the first national survey to disaggregate PDM, providing a valuable opportunity to assess the relationship between PDM subtype and SUD at a national level.

A final key gap is the lack of literature assessing whether the risk of SUD associated with prescription medication use and misuse varies by age group, especially for adolescents and young adults, the two age groups with the highest prevalence rates of PDM and new onset for SUD in general. In this study, we addressed these gaps using the 2015 and 2016 NSDUH. Our objective was to assess the age-specific risk of past-year SUDs associated with prescription opioid, stimulant, sedative and tranquilizer use and PDM subtypes.

METHOD

Study Population

We analyzed data from the 2015 and 2016 NSDUH, which uses an independent, multistage area probability sampling strategy to produce nationally representative data of individuals aged 12 and older. Interviews began with audio computer-assisted self-interviewing questions on sensitive variables; audio computer-assisted self-interviewing promotes privacy and, thus, honest reporting and data completeness. The 2015 and 2016 NSDUH weighted screening response rates were 81.9% and 77.9%, and weighted full interview response rates were 71.2% and 68.4%, respectively. The NSDUH project design and sampling methods are described in greater detail elsewhere.^{3,9} Question wording and data collection methods were identical in the 2015 and 2016 NSDUH.

For the 2015 and 2016 NSDUH cohorts, 114,043 individuals provided data, with roughly equal proportions in the adolescent and young adult subgroups, and smaller subgroups of adults aged 26–49 and 50 years and older. The proportion of female and Caucasian race/ethnicity participants increased with age. Demographic information of respondents is provided in Table 1.

Measures

Past-year prescription medication use and misuse were assessed in the NSDUH separately by medication class: prescription opioids, stimulants, sedatives, and tranquilizers. Participants were asked about past-year use of each medication class, and respondents were prompted why these medications were prescribed. To aid recall, individual drug names were

used, and pill cards with pictures of common medications were provided. Respondents were instructed not to include any over-the-counter medications that can be bought in drug stores or grocery stores without a doctor's prescription. Next, all participants were asked about past-year PDM for each medication class, including use of someone else's prescription medication and use of one's own prescription medication in a way other than prescribed (e.g., greater amounts, more often or longer, other way).^{3,9} Participants reporting any past-year PDM were then specifically asked whether they ever used someone else's medication in the past year, and whether they used their own medications in a way other than prescribed. Based on responses to these questions, we classified participants as having one of five mutually exclusive use patterns: 1) No use or misuse; 2) Use without misuse; 3) Misuse of someone else's medication only, 4) Misuse of one's own medication only, and 5) Misuse of both someone else's and one's own medication. The latter three categories represented PDM subtypes.

Past-year substance use disorders (SUDs) were assessed using past-year DSM-IV symptoms for substance abuse and dependence. We defined "past-year substance-specific SUD" for the four controlled prescription drug classes separately and "any past-year SUD" as SUD symptoms for any of 11 substances: the four prescription drug classes above, alcohol, cannabis, cocaine, heroin, methamphetamine, hallucinogens, and inhalants.²⁴ Prior studies have shown these measures have good reliability and validity.^{25,26}

Statistical Analysis

Data were weighted, clustered on primary sampling units, and stratified appropriately. Within-year adjustments were used and the NSDUH sample weight was divided by 2 to produce unbiased estimates. The Taylor series approximation was used, with adjusted degrees of freedom, to create robust variance estimates. Analyses were performed separately for each medication class. Missing data were imputed using multiple imputation. Analyses were performed using Stata 15.0.²⁷

First, for each medication class, we used unadjusted weighted descriptive statistics to estimate the proportion of individuals with 1) No use or misuse; 2) Medication use without misuse; and 3) Misuse (i.e., PDM regardless of subtype). We also calculated the proportion of individuals with no use or misuse of any of the four medication classes, use without misuse of any class, and misuse of any class. Analyses were stratified by age group (adults 18 years, adolescents aged 12–17 years, young adults aged 18–25 years, adults aged 26–49, adults 50 years and older).

Second, for each age group and medication class, we used weighted descriptive statistics to calculate the percentage of individuals with each of the three substance use patterns who met criteria for past-year substance-specific SUD and any past-year SUD.

Third, for each age group and medication class, we used design-based multivariable logistic regression to model the occurrence of substance-specific and any past-year SUD as a function of no use or misuse, use without misuse, and PDM. We repeated this analysis for nonuse or misuse of any of the four medication classes, use without misuse of any class, and PDM of any class. We found significant interactions between age group and substance use

pattern type and therefore stratified analyses by age group. Models controlled for single year of age, sex, race/ethnicity, educational attainment, marital status, income, population density of respondent geographic area (a marker of urban/rural status), health insurance, self-rated health, emergency department visits, major depressive episode. Additional control variables included the use of alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, and methamphetamines; and the use and misuse of medications in classes other than the one in question.

Fourth, for each age group and medication class, we used a similar approach to model the occurrence of substance-specific and any past-year SUD as a function of the three PDM subtypes among individuals who reported PDM. We repeated this analysis for non-use or misuse of any of the four medication classes, use without misuse of any class, and PDM of any class.

RESULTS

Prevalence of substance use pattern by age group and medication class

For adults aged 18 years and older, the prevalence of past-year PDM ranged from 0.6% (sedatives) to 4.6% (opioids) across medication classes, and 7.0% had past-year PDM of any of the four medication classes (Table 2). PDM was most prevalent among young adults aged 18–25, with approximately one in every seven (14.7%) engaged in past-year PDM of any of the four medication classes. Notably, the past-year prevalence of young adults reporting prescription stimulant misuse was higher than the past-year prevalence of young adults reporting use of prescription stimulants (without misuse).

Prevalence of substance-specific and any past-year SUD by controlled medication use

For all age groups and prescription medication classes, the prevalence of past-year substance-specific SUD was considerably lower than the prevalence of any past-year SUD among those who reported PDM (e.g., adults 18 years or older ranged from 9.0% to 16.5% across medication classes for the former outcome and 41.5% to 48.6% for the latter outcome) (Table 3). For all age groups and prescription medication classes, the prevalence of any past-year SUD was higher among individuals with past-year use without misuse compared to individuals with no use or misuse, and was even higher among individuals with past-year PDMs. For instance, among adolescents, the prevalence of any past-year SUD was 2.7% among individuals with no use or misuse, 5.8% among individuals with use but no misuse, and 37.1% among individuals with PDM.

Prevalence of PDM subtypes among individuals with PDM

Among individuals who reported past-year PDM, misuse of someone else's medication was more prevalent than misuse of one's own medication or misuse of both someone else's and one's own medication for most age groups and medication classes (Supplemental Table A). One notable exception was adults aged 50 years and older, for whom misuse with one's own opioid medication was the most prevalent subtype of prescription opioid misuse.

Prevalence of substance-specific and any past-year SUDs by PDM subtype.

Individuals engaged in misuse of someone else's medication only tended to have lower rates of past-year substance-specific SUD and any past-year SUD than the other PDM subtypes for all age groups (Supplemental Table B).

Risk of any past-year SUD associated with controlled medication use and misuse

In logistic regression models, use without misuse was associated with higher odds of any past-year SUD compared to no use or misuse for at least one medication class in most age groups (Table 4). For example, among adolescents, use without misuse of opioids was associated with over 34% higher odds of any past-year SUD compared to no use or misuse (AOR=1.34, 95% CI=1.08–1.69); a similar positive association was found for stimulant use. In contrast, for young adults, use without misuse was not significantly associated with higher odds of any past-year SUD for any individual medication class. Finally, for adults aged 26–49 and those aged 50 and older, use without misuse was associated with higher odds of any past-year SUD for tranquilizers only. For all age groups, past-year PDM of any of the four medication classes was associated with higher odds of any past-year SUD compared to no use or misuse of any class (Table 4).

Risk of any past-year SUD associated with PDM subtypes

Among adults aged ≥18 years reporting past-year PDM, PDM with both someone else's and one's own medication was associated with higher odds of any past-year SUD compared to PDM with one's own medication only for all medication classes except for sedatives (Table 5). The analogous associations were not significant for adolescents aged 12–17 years, potentially due to low sample sizes.

Risk of substance-specific SUD associated with PDM subtypes

Compared to misuse of someone else's medication, misuse of one's own medication and misuse of both someone else's and one's own medication was associated with higher odds of past-year substance-specific SUD for most age groups and medication classes.

DISCUSSION

To our knowledge, this is the first nationally representative U.S. study to examine the age-specific risk of SUD associated with the following five prescription medication use and misuse patterns: no use or misuse, use without misuse, misuse of someone else's medication only, misuse of one's own prescription only, and misuse of both someone else's and one's own medication. There are four main findings of our study. First, past-year prescription opioid, sedative, stimulant and tranquilizer use (even in the absence of PDM) was associated with increased risk of past-year SUDs compared to non-use in several instances; however, these associations varied across age groups and medication classes. Second, PDM was associated with a higher risk of any past-year SUD across virtually all age groups and medication classes. Third, the risk of substance-specific SUD associated with medication use and misuse was much lower than the risk of any SUD. Finally, the risk of substance-specific SUDs and any SUDs varied by PDM subtype (i.e., PDM with someone else's medication only, PDM with one's own medication only, and PDM with both someone else's

and one's own medication). Compared to PDM with someone else's medication (the most common PDM subtype), PDM with both someone else's and one's own medication were associated with higher risks of SUDs for many age groups and medication classes.

The finding that past-year use of controlled medications (without PDM) was associated with an increased risk of past-year SUD in several cases is consistent with prior studies demonstrating that individuals who are prescribed controlled medication are at increased risk for subsequent PDM and SUDs in adulthood.^{19,21,28,29} Several prior clinical and epidemiological studies have not demonstrated an association between controlled medication use and SUD,^{19–22} but many of these studies used different measures of medication use (e.g., specifying they had taken controlled medications as prescribed by a doctor), controlled for different covariates, and focused on regional samples. Nevertheless, the increased risk associated with medication use (even in the absence of PDM) suggests that all individuals who are prescribed controlled substances should be screened for SUDs and behaviors associated with PDM such as “doctor shopping”, utilizing validated clinical tools and prescription drug monitoring programs.

Notably, the number of young adults reporting prescription stimulant misuse exceeded the number of young adults reporting use of prescription stimulants (without misuse). This finding was not observed among adolescents, older adults or the overall U.S. adult population, and is a serious cause for concern based on the short-term and long-term consequences associated with prescription stimulant misuse.^{8,19,30,31} This finding has been demonstrated in earlier studies of U.S. high school and college students and suggests that all young adults should be screened for stimulant misuse, not just those prescribed stimulants. Furthermore, this finding suggests the need for the development of age-specific screening tools based on differences in the prevalence of use and misuse of individual medication classes.^{19,32}

The present study also found that prescription opioid, sedative, and tranquilizer use was more prevalent among U.S. middle-aged adults and older adults than adolescents or young adults. Other national studies have also found the highest rates of benzodiazepine and opioid use among older patients despite cautions concerning risks associated with long-term use of these controlled medications.^{9,33} Moreover, the high rates of opioid, sedative and tranquilizer use among middle-aged and older adults are especially concerning due to (1) the increased risk in SUDs associated with found in the present study and (2) recent increases in opioid misuse and tranquilizer misuse among older adults.³⁴

The current study found the risk of substance-specific SUD associated with PDM was considerably lower than the risk of any SUD. This finding was present across all age groups and was similar to a recent national study that found prescription sedative or tranquilizer misusers were at considerably greater risk for developing a non-sedative or tranquilizer SUD (45.0%) than a sedative or tranquilizer use disorder (4.3%).³⁵ These findings provide further evidence that individuals who misuse controlled medications tend to be polysubstance users, and reinforce the need to screen patients at all ages for a wide range of SUDs rather than assess only substance-specific SUDs. Furthermore, education is needed for prescribers

regarding the risk for medication-specific SUD and any SUD because few professional schools offer adequate training in addiction medicine.^{36,37}

Among those who report past-year PDM, the findings of the present study indicated that misuse with someone else's medication was the most prevalent PDM subtype for all age groups and medication classes, with one exception (for adults aged 50 year and older, misuse with one's own opioid medication was the most prevalent subtype for prescription opioid misuse). Notably, the majority of individuals who misused both someone else's and their own medication had at least one past-year SUD. This suggests that for individuals with a history of PDM, further identification of PDM subtypes could identify higher risk patients and candidates for heightened monitoring and more comprehensive SUD assessment.^{36,37} These findings suggest the need for clinical interventions directed at each of the three PDM subtypes rather than focusing solely on one PDM subtype.

Our findings indicate that the prevalence of past-year PDM and the prevalence of past-year SUD associated with PDM was highest among young adults. Indeed, nearly one in every two young adults with PDM had at least one past-year SUD (46.6%) and more than a third of adolescents with PDM had at least one past-year SUD (38.7%). Clinicians for adolescents and young adults therefore should discuss the risks of PDM and SUD with these patients and their families, only prescribe controlled substances when necessary, and regularly screen controlled substance users for PDM and SUDs at follow-up visits.

Our findings have important implications for clinical practice that are consistent with national guidelines and recommendations.^{37,38} The findings suggest that clinicians who prescribe controlled medications should routinely assess their patients for: 1) admitted misuse of the prescribed medication; 2) frequent requests for refills; and 3) prior SUD or active symptoms of SUDs. Furthermore, when appropriate and indicated, clinicians should request a toxicology screen.³⁶⁻³⁸ An evidence-based review concluded that the risk for developing SUDs can be dramatically decreased among those receiving controlled medications by preselecting patients for no prior or present SUD history.³⁹ Indeed, a history of SUD has been shown to be a significant risk factor for persistent opioid use after surgery among adolescents and young adults who were prescribed opioids.⁴⁰ If PDM is identified, our findings suggest that clinicians should determine the subtype of misuse, screen for SUD, and institute heightened monitoring and guidance. The findings of the present study suggest clinicians should use brief screening instruments to assess patients for a broad variety of potential SUDs in addition to SUDs specific to the prescribed medication, based on the high rates of polysubstance use associated with PDM.

The present study has several strengths worth highlighting. The NSDUH has one of the largest and most recent nationally representative U.S. samples of persons aged 12 and older; it also is the only national study to include the four most commonly misused medication classes and multiple PDM subtypes. Nevertheless, some limitations should be taken into account. First, these analyses likely underestimate PDM and SUDs prevalence estimates due to social desirability, data collection mode, and because some high-risk subgroups such as incarcerated adults and other institutionalized groups were not included.⁴¹ Second, causal inferences were not possible given the cross-sectional NSDUH data and longitudinal

research is needed to examine the prospective relationships among PDM subtypes and SUDs across different age groups. Third, there were small sample sizes for some subgroups, and future research with larger samples could produce more reliable estimates. Finally, the NSDUH medication use measures did not state the condition/disorder the medication was being used to treat, or whether the medication was used properly as prescribed.

In conclusion, in a large nationally representative household sample of U.S. individuals, the use of prescription opioids, sedatives, stimulants or tranquilizers was associated with an increased risk of past-year SUD compared to non-use in many instances, but associations varied by age group and medication class. Among U.S. adults who misused prescription medications, more than two in every five adults aged 18 and older had at least one past-year SUD (range 41.5%–48.6% across medication classes). The prevalence of past-year substance-specific SUD was considerably lower (range 9%–16.5%) than the prevalence of any SUD associated with PDM. Moreover, the prevalence of past-year SUD differs significantly by PDM subtype, with the highest prevalence occurring among individuals who misuse both someone else's and their own medication. Our findings highlight the need for clinicians to screen patients for PDM and SUD across a broad variety of substances and to provide heightened monitoring for patients with PDM, particularly those with PDM subtypes associated with a particularly high risk of SUDs.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Age-specific risk of substance use disorder (SUD) was examined in the U.S.
- Medication use was associated with higher risk of SUD but varied by age and drug class.
- Prescription drug misuse was associated with the highest risk of SUD for all ages.
- Nearly one in two young adults engaged in prescription drug misuse had a SUD.
- Misuse of one's own and someone else's medication had highest risk of SUD.
- Close medication monitoring and age-specific SUD screening tools are needed.

Table 1.

Weighted demographic characteristics among individuals aged 12 years and older in the U.S., 2015–2016

	Adolescents (12–17 years) n = 27,857	Young Adults (18–25 years) n = 28,213	Adults (26–49 years) n = 22,530	Adults (50 years and older) n = 17,608
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Female Sex	49.1 (48.3–49.8)	49.8 (49.1–50.5)	51.2 (50.3–52.1)	53.2 (52.1–54.3)
Race/Ethnicity				
White, non-Hispanic	53.5 (52.4–54.5)	54.8 (53.6–56.0)	58.5 (57.6–59.3)	73.2 (72.0–74.3)
African-American	13.8 (13.2–14.4)	14.3 (13.6–15.0)	12.6 (12.0–13.1)	10.3 (9.7–11.0)
Native American/Alaskan Native	0.6 (0.5–0.7)	0.7 (0.5–0.8)	0.6 (0.5–0.7)	0.5 (0.4–0.6)
Hawaiian/Pacific Islander	0.5 (0.3–0.6)	0.4 (0.4–0.5)	0.4 (0.3–0.5)	0.3 (0.2–0.4)
Asian American	5.2 (4.8–5.7)	6.0 (5.5–6.5)	6.8 (6.4–7.2)	4.0 (3.5–4.6)
Multiracial	3.2 (3.0–3.4)	2.4 (2.2–2.6)	1.6 (1.4–1.7)	1.5 (1.3–1.7)
Hispanic/Latino	23.3 (22.6–24.0)	21.5 (20.6–22.5)	19.6 (19.0–20.3)	10.2 (9.6–10.8)
Population Density				
In CBSA with 1 million or more persons	54.4 (53.4–55.3)	53.8 (52.8–54.8)	56.9 (55.8–58.0)	50.8 (49.5–52.1)
In CBSA with less than 1 million persons	40.1 (39.1–41.1)	41.8 (40.7–42.9)	37.9 (36.9–39.2)	42.4 (41.0–43.8)
Not in CBSA	5.6 (5.1–6.1)	4.4 (3.9–4.9)	5.2 (4.8–5.7)	6.8 (6.2–7.4)

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015–16 cohorts.

Abbreviation: CBSA = core-based statistical area.

Table 2.

Weighted numbers (in thousands) and estimates of persons with past-year prescription medication non-use, use and misuse in the U.S.

	Overall adult sample 18 years and older		Adolescents 12–17 years old		Young adults 18–25 years old		Adults 26–49 years		Adults 50 years and older	
	Number	% (SE)	Number	% (SE)	Number	% (SE)	Number	% (SE)	Number	% (SE)
Prescription Opioids	153,920	63.2	19,671	79.0	23,553	67.8	62,928	63.5	67,439	61.4 (0.44)
No use or misuse	78,649	(0.24)	4,288	(0.31)	8,490	(0.40)	30,596	(0.34)	39,563	36.0 (0.47)
Use without misuse	11,098	32.3	935	17.2	2,696	24.4	5,636	30.9	2,767	2.5 (0.15)
Misuse		(0.23)		(0.32)		(0.34)		(0.33)		
		4.6		3.8		7.8		5.7		
		(0.09)		(0.14)		(0.24)		(0.15)		
Prescription Tranquilizers	205,401	84.3	23,792	95.6	30,675	88.3	84,333	85.1	90,393	82.4 (0.30)
No use or misuse	32,566	(0.18)	687	(0.18)	2,186	(0.22)	12,257	(0.23)	18,123	(0.30)
Use without misuse	5,701	13.4	417	2.8	1,879	6.3	2,570	12.4	1,252	1.1 (0.10)
Misuse		(0.16)		(0.14)		(0.18)		(0.19)		
		2.3		1.7		5.4		2.6		
		(0.07)		(0.09)		(0.19)		(0.10)		
Prescription Sedatives	225,657	92.6	24,317	97.7	33,399	96.1	92,876	93.7	99,382	90.5 (0.33)
No use or misuse	16,554	(0.15)	485	(0.12)	1,070	(0.15)	5,613	(0.13)	9,871	9.0 (0.32)
Use without misuse	1,457	6.8	93	1.9	270	3.1	671	5.7	516	0.5 (0.06)
Misuse		(0.15)		(0.12)		(0.13)		(0.12)		
		0.6		0.4		0.8		0.7		
		(0.03)		(0.04)		(0.05)		(0.05)		
Prescription Stimulants	227,344	93.3	23,092	92.8	29,758	85.7	91,855	92.6	105,731	96.3 (0.19)
No use or misuse	11,264	(0.13)	1,358	(0.16)	2,377	(0.31)	5,196	(0.19)	3,692	3.4 (0.18)
Use without misuse	5,059	4.6	445	5.5	2,604	6.8	2,109	5.2	345	0.3 (0.06)
Misuse		(0.11)		(0.15)		(0.20)		(0.16)		
		2.1		1.8		7.5		2.1		
		(0.06)		(0.07)		(0.24)		(0.10)		
Four Medication Classes¹	132,640	54.5	18,267	73.6	19,994	57.7	54,863	55.4	57,782	52.7 (0.38)
No use or misuse	93,735	(0.23)	5,275	(0.34)	9,589	(0.40)	36,146	(0.33)	48,000	43.8 (0.40)
Use without misuse	17,013	38.5	1,273	21.3	5,100	27.7	8,004	36.5	3,909	3.6 (0.18)
Misuse		(0.21)		(0.37)		(0.35)		(0.31)		
		7.0		5.1		14.7		8.1		
		(0.12)		(0.17)		(0.31)		(0.19)		

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015–16.

Notes: There are some minor discrepancies in percentages due to rounding. Examples of prescription medications within each class include: Prescription opioids (e.g., hydrocodone, oxycodone, propoxyphene, codeine, morphine, tramadol), prescription stimulants (e.g., mixed amphetamine-dextroamphetamine, dextroamphetamine, methylphenidate), prescription sedatives (e.g., eszopiclone, temazepam, triazolam, zaleplon, zolpidem), and prescription tranquilizers (e.g., alprazolam, clonazepam, diazepam, lorazepam).

¹ Categories were calculated as the proportion of individuals with no use or misuse of any of the four medication classes, use without misuse of any class, and misuse of any class.

Table 3. Past-year substance use disorders as a function of past-year prescription medication use and misuse in the U.S.

	Past-year substance use disorder (prescription drug-specific) ¹					Past-year substance use disorder (any substance) ²				
	18 years and older % (SE) ³	12–17 years old % (SE) ³	18–25 years old % (SE) ³	26–49 years old % (SE) ³	50 years and older % (SE) ³	18 years and older % (SE) ³	12–17 years old % (SE) ³	18–25 years old % (SE) ³	26–49 years old % (SE) ³	50 years and older % (SE) ³
Prescription Opioids No use or misuse Use without misuse Misuse	-- -- 16.5 (0.66)	-- -- 15.0 (1.66)	-- -- 12.6 (1.00)	-- -- 18.8 (0.90)	-- -- 15.5 (1.86)	6.0 (0.14) 7.2 (0.21) 41.5 (0.99)	2.7 (0.16) 5.8 (0.52) 37.1 (1.90)	11.4 (0.32) 14.4 (0.43) 51.4 (1.32)	7.2 (0.22) 9.0 (0.31) 42.6 (1.39)	3.0 (0.18) 4.3 (0.29) 29.6 (2.61)
Prescription Tranquilizers No use or misuse Use without misuse Misuse	-- -- 10.2 (0.65)	-- -- 18.1 (2.39)	-- -- 11.2 (1.21)	-- -- 9.9 (0.89)	-- -- 9.4 (2.17)	6.5 (0.13) 10.2 (0.38) 48.6 (1.33)	3.4 (0.14) 12.9 (1.60) 54.8 (3.33)	12.1 (0.28) 22.6 (1.30) 58.2 (1.89)	7.9 (0.21) 14.5 (0.64) 48.8 (1.65)	3.4 (0.15) 5.8 (0.55) 33.6 (3.95)
Prescription Sedatives No use or misuse Use without misuse Misuse	-- -- 9.0 (1.26)	-- -- 31.6 (6.28)	-- -- 8.5 (1.93)	-- -- 10.1 (2.09)	-- -- 7.8 (2.76)	7.6 (0.11) 11.2 (0.46) 41.5 (2.22)	4.1 (0.16) 16.5 (2.10) 67.0 (6.11)	14.4 (0.35) 29.7 (2.12) 60.0 (4.61)	9.1 (0.20) 17.1 (0.96) 46.0 (2.88)	3.9 (0.16) 5.8 (0.57) 26.0 (4.65)
Prescription Stimulants No use or misuse Use without misuse Misuse	-- -- 9.2 (0.78)	-- -- 10.5 (1.71)	-- -- 6.7 (0.67)	-- -- 10.3 (1.17)	-- -- 21.5 (6.00)	6.8 (0.11) 14.9 (0.56) 47.1 (1.20)	3.4 (0.15) 11.7 (1.26) 44.7 (2.28)	11.6 (0.29) 23.7 (1.23) 49.4 (1.55)	8.6 (0.19) 14.7 (0.76) 46.8 (1.84)	3.9 (0.16) 9.5 (1.25) 31.6 (7.61)
Four Medication Classes ⁴ No use or misuse Use without misuse Misuse	-- -- 14.3 (0.46)	-- -- 15.8 (1.50)	-- -- 11.7 (0.63)	-- -- 16.5 (0.73)	-- -- 13.1 (1.33)	5.0 (0.16) 6.7 (0.19) 38.5 (0.75)	2.0 (0.14) 4.9 (0.39) 38.7 (1.72)	8.4 (0.30) 12.6 (0.38) 46.6 (1.09)	6.2 (0.22) 8.4 (0.25) 39.6 (1.05)	2.7 (0.23) 4.1 (0.27) 25.6 (2.21)

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015–16.

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¹ Prescription drug-specific substance use disorder refers to meeting criteria for past-year substance use disorder for the same prescription drug class (e.g., past-year prescription opioid misusers who met past-year criteria for past-year prescription opioid use disorder).

² Any past-year substance use disorder refers to meeting criteria for at least one past-year substance use disorder for the following substances: alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamine, prescription opioids, prescription tranquilizers, prescription sedatives or prescription stimulants.

³ Refers to the percentage of individuals in each use subgroup (e.g., non-use) with a substance use disorder.

-- not assessed.

⁴ Categories were calculated as the proportion of individuals with no use or misuse of any of the four medication classes, use without misuse of any class, and misuse of any class.

Table 4.

Logistic regression results: Association between any past-year substance use disorders and prescription drug use and misuse

	Past-year substance use disorder (any substance) ¹				
	18 years and older AORs (95% CIs) ²	12–17 years old AORs (95% CIs) ³	18–25 years old AORs (95% CIs) ²	26–49 years old AORs (95% CIs) ²	50 years and older AORs (95% CIs) ²
Prescription Opioids	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No use or misuse	1.01 (0.90–1.14)	1.34 (1.08–1.69)**	1.08 (0.96–1.21)	0.98 (0.88–1.10)	1.07 (0.81–1.41)
Use without misuse	3.54 (3.08–4.08)***	3.71 (2.73–5.05)***	2.39 (2.03–2.80)***	3.50 (2.92–4.18)***	5.04 (3.66–6.95)***
Prescription Tranquilizers	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No use or misuse	1.20 (1.07–1.34)**	0.82 (0.52–1.30)	1.04 (0.88–1.23)	1.22 (1.07–1.39)**	1.37 (1.06–1.77)*
Use without misuse	2.79 (2.35–3.30)***	1.72 (1.10–2.71)*	2.21 (1.77–2.75)***	2.61 (2.14–3.19)***	4.92 (3.21–7.55)***
Prescription Sedatives	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No use or misuse	1.00 (0.90–1.11)	1.36 (0.88–2.11)	1.02 (0.79–1.33)	1.16 (0.98–1.36)	0.82 (0.60–1.13)
Use without misuse	2.52 (1.81–3.53)***	3.76 (1.15–12.33)*	1.75 (1.13–2.71)*	2.34 (1.53–3.59)***	3.66 (1.79–7.49)***
Prescription Stimulants	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No use or misuse	1.17 (1.00–1.36)*	1.45 (1.02–2.04)*	1.17 (0.97–1.41)	0.98 (0.83–1.15)	1.46 (0.97–2.21)
Use without misuse	2.04 (1.75–2.38)***	1.53 (1.06–2.23)*	2.07 (1.71–2.50)***	1.92 (1.54–2.39)***	2.71 (0.91–8.05)
Four Medication Classes⁴	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
No use or misuse	1.17 (1.03–1.33)*	1.54 (1.27–1.88)***	1.27 (1.13–1.43)***	1.09 (0.97–1.22)	1.34 (0.98–1.83)
Use without misuse	4.26 (3.71–4.90)***	4.57 (3.36–6.20)***	3.42 (2.96–3.95)***	4.17 (3.67–4.75)***	5.88 (3.90–8.87)***

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015–16.

¹ Any past-year substance use disorder refers to meeting criteria for past-year substance use disorder for at least one of the following substances: alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamine, prescription opioids, prescription tranquilizers, prescription sedatives or prescription stimulants.

² Regressions controlled for age group, sex, race/ethnicity, educational attainment, employment status, marital status, income, population density of respondent geographic area (a marker of urban/rural status), health insurance, self-rated health, emergency department visits, major depressive episode, and the use of alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamines as well as use and misuse of prescription controlled medications.

³ Regressions controlled for age, sex, race/ethnicity, income, population density (urban vs. rural), health condition (i.e., self-rated health and past-year emergency department visits), health insurance, and the use of alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamines as well as use and misuse of prescription medications.

⁴ Categories were calculated as the proportion of individuals with no use or misuse of any of the four medication classes, use without misuse of any class, and misuse of any class.

* p 0.05,

** p 0.01,

*** p 0.001.

Table 5.

Logistic regression results: Association between any past-year substance use disorders and prescription drug misuse subtypes

Past-year prescription misuse subtypes ²	Past-year substance use disorder (any substance) ¹				
	18 years and older AORs (95% CIs) ³	12–17 years old AORs (95% CIs) ⁴	18–25 years old AORs (95% CIs) ³	26–49 years old AORs (95% CIs) ³	50 years and older AORs (95% CIs) ³
Prescription Opioids	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Misuse of someone else's Rx only	1.33 (1.11–1.58)**	1.32 (0.81–2.16)	1.09 (0.80–1.48)	1.50 (1.13–1.98)**	1.48 (0.87–2.52)
Misuse of one's own Rx only	1.75 (1.35–2.25)***	1.58 (0.78–3.23)	1.58 (1.10–2.28)*	1.47 (1.08–1.99)*	3.19 (1.23–8.22)*
Misuse of own and someone else's Rx					
Prescription Tranquilizers	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Misuse of someone else's Rx only	1.52 (1.08–2.12)*	1.86 (0.98–3.52)	1.31 (0.85–2.01)	2.42 (1.51–3.86)***	1.08 (0.36–3.25)
Misuse of one's own Rx only	2.42 (1.54–3.81)***	1.66 (0.63–4.37)	2.06 (1.20–3.54)**	2.94 (1.37–6.28)**	1.53 (0.27–8.72)
Misuse of own and someone else's Rx					
Prescription Sedatives	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Misuse of someone else's Rx only	1.69 (0.81–3.51)	--	1.26 (0.43–3.75)	3.66 (1.61–8.31)**	--
Misuse of one's own Rx only	0.48 (0.12–1.92)	--	0.25 (0.02–3.15)	1.28 (0.26–6.30)	--
Misuse of own and someone else's Rx					
Prescription Stimulants	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Misuse of someone else's Rx only	1.16 (0.86–1.57)	1.40 (0.76–2.58)	1.05 (0.71–1.55)	1.49 (1.00–2.23)*	--
Misuse of one's own Rx only	1.65 (1.19–2.29)**	3.12 (0.99–9.82)	1.68 (1.18–2.41)**	1.47 (0.66–3.29)	--
Misuse of own and someone else's Rx					
Four Medication Classes⁵	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)	1.00 (reference)
Misuse of someone else's Rx only	1.42 (1.21–1.66)***	1.49 (1.04–2.14)*	1.10 (0.85–1.42)	1.79 (1.41–2.26)***	1.56 (0.94–2.60)
Misuse of one's own Rx only	2.39 (1.94–2.94)***	2.02 (1.32–3.10)**	2.07 (1.64–2.63)***	2.10 (1.62–2.74)***	4.82 (2.57–9.04)***
Misuse of own and someone else's Rx					

Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2015–16.

¹ Any past-year substance use disorder refers to meeting criteria for past-year substance use disorder for at least one of the following substances: alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamine, prescription opioids, prescription tranquilizers, prescription sedatives or prescription stimulants.

² Past-year prescription drug misuse (PDM) subtypes consisted of misuse with someone else's medication, misuse of one's own medication only (i.e., using your own prescription medications in greater amounts, more often, longer than you were told to take the medication, or in some other way that the prescriber did not intend), and misuse of one's own and someone else's medication.

³ Regressions controlled for age, sex, race/ethnicity, income, population density (urban vs. rural), self-rated health, past-year emergency department visits, health insurance, and the use of alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamines as well as use and misuse of prescription medications.

⁴ Regressions controlled for age group, sex, race/ethnicity, educational attainment, employment status, marital status, income, population density of respondent geographic area (a marker of urban/rural status), health insurance, self-rated health, past-year emergency department visits, major depressive episode, and the use of alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, methamphetamines as well as use and misuse of prescription controlled medications.

-- low sample size.

⁵Categories were calculated as the proportion of individuals with no use or misuse of any of the four medication classes, use without misuse of any class, and misuse of any class.

**
p < 0.01,

p < 0.001.

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