Friends and relatives as sources of prescription opioids for misuse among young adults: The significance of physician source and race/ethnic differences

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Abstract

Background: Given the public health issues associated with prescription opioid misuse, there is surprisingly little research on sources of prescription opioids for misuse. We know that free from friends/relatives is the most common source, that source is associated with patterns of misuse, and that sources vary based on the sociodemographic characteristics. The current research assesses how friends/relatives obtain the prescription opioids they freely share with others.

Methods: Data were from the 2009–2014 National Survey on Drug Use and Health and focused on respondents aged 18 to 25 (N = 106,845), as they report the highest prevalence of opioid misuse and are also more likely to obtain prescription opioids free from friends/relatives. Analyses used weighted cross-tabulations and design-based logistic regression to examine the relationships between sources of prescription opioids shared by friend/relatives and sociodemographic characteristics, substance use disorders, and risk behavior.

Results: The most common source was from one physician (68.8%) and 18.4% of respondents reported multiple sources of opioids. We also found significant differences in friend/relative sources based on school enrollment, sex, and race/ethnicity of the person obtaining the opioids. Notably, White respondents were more likely to report theft/fake prescription, purchased, and multiple sources. Finally, friends/relatives sources were significantly associated with substance use disorders and other risk behaviors.

Conclusions: The current research assesses the sharing of prescription opioids between friends/relatives, highlights physicians as a major source, and identifies Whites as a vulnerable group. Policy implications associated with the sharing of prescription opioids among friends/relative are discussed.

Keywords

prescription opioids; young adults; diversion; source

Introduction

Prescription opioid misuse (POM) is a major public health concern in the United States, as demonstrated by the rising number of opioid related overdose deaths.[1] Between 1999 and 2016 more than 200,000 deaths were attributable to opioids, and the number of opioid related deaths was five times higher in 2016 than 1999.[2] While recent spikes in drug overdose deaths are largely attributable to synthetic narcotics such as fentanyl, prescription opioids still accounted for 24.24%, or 17,029 out of 70,237 of all drug overdose deaths in 2017.[1] POM is still a common form of substance use in the U.S., as data from the National Survey on Drug Use and Health estimated that 10.7 million people aged 12 or older misused prescription opioids in the past year, including 1.5 million new initiates.[3]

Because of this, POM has received increased attention by researchers.[4–10] Prior research has focused on correlates for misuse,[4,6,11,12] motives for misuse and routes of administration, [13,14] and negative outcomes associated with misuse.[4,5,8,12] Much of the research on prescription drug misuse in general, and prescription opioid misuse specifically, focuses on the young adults because they have the highest prevalence of misuse. One topic of particular interest in recent years has been sources of prescription drugs, which examine the various ways users obtain prescription drugs.[15–21] See Hulme et al. 2018 for recent review and meta-analysis of this topic.[22]

A number of important findings have emerged from the research on sources of prescription drug for misuse. First, the most common source of prescription drugs is free from a friend or relative.[20,22,23] Data from the 2017 National Survey on Drug Use and Health indicates that 40% of respondents obtained prescription opioids in the past year free from friends/relatives. The next most common source was from one doctor, mentioned by 30% of respondents. Research on prescription drug misuse has documented that sharing prescription drugs is widely viewed as being socially acceptable.[24,25] Friends/relatives are likely a common source because drug users tend to socialize with other drug users and often share drugs with one another.[22] In addition, obtaining prescription drugs from friends/relatives reduces scrutiny from health care providers and risk associated with buying prescription drugs from dealers or strangers.[26] To date little research has assessed how friends/relatives obtain the prescription drugs that they freely share with others. Given that friends/relatives are a major source of prescription drugs, assessing how friends/relatives obtain these medications will provide a more thorough understanding of prescription drug diversion.

Second, sources of prescription drugs for misuse are linked to patterns of misuse and outcomes associated with prescription drug misuse. A number of studies have shown that certain sources are significantly associated with increased risk for substance use and other risky behaviors. Individuals who report buying prescription drugs from dealers or strangers are at increased risk for other types of substance use and substance use disorders, while obtaining prescription drugs from physicians or free from friends and family members

reduces risk.[16,20,23,27,28] While the current research suggests that fewer negative outcomes are associated with prescription drug misuse when the source is a friend/relative there is likely important variation in this relationship based on how friends/relatives obtain the prescription drugs they freely share.

Third, research on sources of prescription drugs for misuse shows that sources vary based on a number of important sociodemographic factors. Given that source is associated with substance use and other risky behaviors, identifying how sources vary by sociodemographic factors is likely to have important implications for prevention and interventions. With regard to age, friends/relatives are the most common source of prescription drugs among young adults aged 18 to 25, with nearly 57% of young adults obtaining prescription opioids free from friends/relatives.[27] Young adults are an important age group to study, as the transition from adolescent to adulthood comes with a greater responsibility for managing their own medications. Given this newfound autonomy and the widespread sharing of prescription drugs, young adults are an important age group to study prescription drug diversion.

In addition to age, sources of prescriptions drugs also vary based on sex, race/ethnicity, and educational attainment of the people who obtain these drugs. Females are more likely to obtain prescription opioids from a friend/relative; whereas, males are more likely to purchase opioids from a friend or drug dealer.[3,15,16,23] Males have also been found to be more likely to acquire prescription opioids from more than one doctor.[3,15,16] Studies examining racial/ethnic differences in sources of prescription drugs have produced mixed results. Some research suggests that Whites are more likely to divert prescription medications,[5,17] while others suggest that African-Americans are more likely to divert prescription medications.[20] Additionally, Whites are more likely to obtain prescription opioids free from friends/relatives and to purchase compared to African Americans and Hispanics, while African Americans are more likely to obtain them from physicians than Whites or Hispanics.[20] Finally, research on school enrollment shows that young adults who are college graduates are more likely to acquire prescription drugs free from friends/relatives and less likely to acquire prescription drugs by buying them compared to individuals not in college.[30] Given these findings it is important to assess how sources of prescription opioids shared between friends/relatives vary based on the sociodemographic characteristics of those who obtain them.

The current research fills an important gap in the scientific knowlege on sources of prescription drugs by examining sources of prescription drugs shared between friends/relatives. Prior research has found that the most common source is free from a friend/relative, especially among young adults.[22] However, we know relatively little about how friends/relatives obtain the prescription drugs that they divert to other people. The current research identifies how friends/relatives obtain the prescription opioids that they freely share with others, how sources of friends/relatives prescription opioids vary based on the sociodemographic characteristics of the individuals who obtain them, and how sources of friends/relatives prescription opioids are associated with substance use and other risky behaviors among those who obtain the drugs. To address this gap in the literature we use data from the National Survey on Drug Use and Health, which includes questions related to

sources of prescription drugs for misuse, to provide a more thorough understanding of the sharing of prescription opioids among friends/relatives.

Methods

NSDUH Design

The National Survey on Drug Use and Health, or NSDUH, is an annual US-wide survey of substance use, mental health and other associated behaviors. It uses an independent, multistage area probability sample for all 50 states and Washington, DC and creates population-based weights to provide nationally representative estimates. The NSUDH asks all sensitive questions (e.g., opioid misuse, major depression) using audio computer-assisted self-interviewing (ACASI) to maximize honest reporting and preserve privacy. The 2009–14 NSDUH versions included skip-outs and consistency checks based on previous answers to promote full responding and data consistency, and participants were paid $30 at survey completion. Weighted screening response rates varied from 88.4% (2009 and 2010) to 81.9% (2014), and full interview response rates varied from 75.6% (2009) to 71.2% (2014). More information on the NSDUH, including on psychometrics, is available elsewhere.[31]

Participants

Participants were restricted to those 18 to 25 years of age, inclusive, in the 2009–14 NSDUH public use files; 106,845 (unweighted) young adults provided data. We focus on young adults as they have the highest prevalence of prescription opioid misuse and free from a friend/relative is the most common source of prescription opioids in this age group. Additionally, as adolescents transition into young adulthood they begin to take on more responsibility for their prescription medications, which makes them an important age group to study in order to gain a more complete understanding of sources of prescription opioids. Within the young adult sample, 49.7% of the weighted sample was female, and the three most common (weighted) racial or ethnic groups were white/Caucasian (57.6%), African-American (14.2%) and Hispanic/Latino (20.1%). For age, 13.8% were 18, 12.4% were 19, 12.5% were 20, 12.5% were 21, 24.7% were either 22 or 23 and 24.0% were 24 or 25 years of age. In terms of educational attainment, 9.4% did not complete high school, 33.3% were high school graduates not in college, 41.5% were in college and 9.1% were college graduates.

Measures

To aid recall, the NSDUH used trade and generic drug names, including Vicodin®, Percocet® and hydrocodone, and medication pictures. In those endorsing past-month prescription opioid misuse, questions are asked about the source of the opioid medication that the participant misused. Participants are instructed: "Earlier, the computer recorded that, during the past 30 days, you used prescription pain relievers that were not prescribed for you or that you took only for the experience or feeling they caused. How did you get these prescription pain relievers? Please enter all of the ways that you got the prescription pain relievers you used in the past 30 days." Ten choices, aggregated here in six categories, are offered: (1) physician ("got from one doctor" or "got from more than one doctor"), (2) stole/fake prescription ("took from friend or relative without asking," "wrote fake prescription,"

or "stole from doctor's office, clinic, hospital, or pharmacy"), (3) free from friend or relative ("got from friend or relative for free"), (4) purchased ("bought from friend or relative," "bought from drug dealer or other stranger," or "bought on the internet"), (5) other ("got some other way"), and (6) multiple sources (use of two or more sources).

Among respondents endorsing "free from friend or relative" (n = 2,255 respondents aged 18 to 25), a follow-up question is asked about the source of that friend or family member's opioid. The item is: "You reported that you got the prescription pain relievers you used in the past 30 days from a friend or relative for free. How did your friend or relative get the prescription pain relievers that you used? Please enter all of the ways that your friend or relative got the prescription pain relievers you used in the past 30 days." The ten ultimate sources and six aggregated categories noted above are also used here.

Included sociodemographic variables were: _sex_ (Table 2), _ethnicity_ (Table 2; white, African-American and Hispanic/Latino), and _educational status_ (Table 1; currently in school/college graduate versus not in school/non-college graduate), and _age_ (only included as a control variable in multivariable analyses; coded in the NSDUH public use file as 18, 19, 20, 21, 22–23, 24–25).

Substance use disorder (SUD; Table 3) outcomes were: _past-year opioid use disorder_, _past-year any SUD_, and _past-year any substance dependence_. All SUD outcomes are assessed using DSM-IV criteria, with strong psychometrics.[33,34]

Risk behavior correlates (Table 4) were: _past-month binge drinking_, _past-month marijuana use_, _past-year driving under the influence (DUI) of alcohol or drugs_, _past-year major depression_, _past-year arrest and booking_, and _current medical insurance status (dichotomized as yes/no)_. Past-month binge drinking was defined as one past-month occasion ("at the same time or within a couple of hours of each other") of consuming 5/4 (men/women) or more alcoholic drinks. Major depression was assessed based on the DSM-IV (American Psychiatric Association [APA], 2000), with good psychometrics[33,35] Past-month marijuana use, past-year DUI, past-year arrest and booking and current insurance status were all single-item assessments.

Analyses

Analyses utilized STATA 15.1 (College Station, TX). Data were weighted, clustered on primary sampling units, and stratified; adjusted person-level weights (weight/2) created unbiased population-based estimates. The Taylor series approximation was used, with adjusted degrees of freedom, to create robust variance estimates. Initial analyses (Table 1) employed weighted cross-tabulations to estimate prevalence and 95% confidence intervals for friend or family opioid sources for diversion; Rao-Scott chi-square tests[36] evaluated difference in friend or family sources by educational status (Table 1) or sex (Table 2). Further analyses used weighted cross-tabulations and design-based logistic regression to examine the relationships between the friend or family member's opioid source for diversion and race/ethnicity (Table 2), opioid use disorder, any SUD or any substance dependence (Table 3) and the six risk behaviors outlined above (Table 4). These analyses used a

Bonferroni-corrected p-value of 0.05 or less for significance testing, and controlled for age, sex and race/ethnicity (when applicable).

Results

Non-Exclusive Friend/Relative Opioid Diversion Sources in Young Adults

To begin we report the prevalence for sources of prescription opioids among young adults in the last 30 days, not shown in Table 1. The most common source was free from friends/relatives (34.37%), followed by purchased (14.56%), and then from a physician (11.61%). The main analysis focuses on the 34.37% (n = 2,255) respondents who reported friends/relatives as a source of prescription opioids. As captured in Table 1, physician sources (73.2%) were the most common source of opioids for friends/relatives who diverted to the young adult respondent. With 68.8% of participants endorsing that their friend/relative had obtained opioids from one doctor, and 9% reporting that friends/relatives used two or more doctors, physician source use outpaced other sources. The second most common category was purchases by the friend/relative, at 21.4%. While use of the internet by friends/relatives to obtain diverted opioids was quite rare (0.7%), over one in ten participants endorsed that their friend/relative purchased opioids from other friends/relatives (16.1%) or strangers/drug dealers (11.4%).

Nearly 15% of participants stated that the friend/relative who gave them an opioid obtained that medication from another friend/relative. Least common was use of theft or a fake prescription by friends/relatives to obtain an opioid (6.6%), with theft from another friend/relative (5.4%) primarily accounting for this category. Finally, 18.4% of friends/relatives who diverted the opioid utilized multiple sources. As also captured in Table 1, prevalence rates of opioid sources used by friends/relatives by educational status were examined. After comparing young adults in school or who had graduated college to those not currently in school and not college graduates, only use of the internet by friends/relatives differed ($p = 0.009$). Only 0.1% of those in school or who had graduated college stated that their friend/relative source used the internet to obtain opioids, versus 1.2% of those not in school.

Sex and Racial/Ethnic Differences in Friend/Relative Opioid Diversion Sources in Young Adults

Investigation of sex-based differences in opioid sources endorsed by friends/relatives indicated only two Bonferroni-corrected significant differences: use of any physician source and use of one physician source (ps < 0.05). In both cases, females were more likely to endorse that friends/relatives diverted from the physician source (any physician(s): female = 76.2%, male = 70.2%; one physician: female = 71.7%, male = 66.1%). All sex-based outcomes are captured in Table 2.

A greater number of racial/ethnicity-based differences were found in opioid sources used by friends/relatives who gave the respondent the medication (all Bonferroni-corrected ps < 0.05). African-American young adults (2.3%) were much less likely to endorse use of theft or a fake prescription by friends/relatives than were either Hispanic/Latino or white participants (7.4% and 6.8%, respectively). African-American young adults were also less

likely to endorse that their friends/relatives used theft from a friend/relative, aggregated purchases and purchases either from a friend/relative or from a stranger/drug dealer than white participants. Specific prevalence rates for these outcomes are provided in Table 2. Finally, white participants were more likely to use purchases (23.8%) or multiple sources (20.5%) than Hispanic/Latino young adults were (15.6% and 9.8%, respectively).

Past-Year Opioid Use Disorder, Any SUD and Any Substance Dependence as a Function of Friend/Relative Opioid Sources

As captured in Table 3, individuals obtaining opioids from friends/relatives that were diverted from physician sources, had lower rates of past-year opioid use disorder (16.9%) than those whose friends/relatives obtained the opioid via purchases (34.0%) or use of multiple sources (42.9%; Bonferroni-corrected $ps < 0.05$). Similarly, those whose friends/relatives used other friends/relatives () to obtain opioids for diversion had lower rates of past-year opioid use disorder (16.9%) than those using multiple sources (Bonferroni-corrected $p < 0.05$).

Participants endorsing that their diverted opioids from friends/relatives were obtained from physician sources or other friends/relatives also had the lowest rates of any past-year DSM-IV SUD, at 54.8% and 56.7%, respectively. These SUD rates were significantly lower (Bonferroni-corrected $ps < 0.05$) than in those stating that their friends/relatives obtained opioids from purchases or multiple sources, at 80.0% and 73.6%, respectively. Finally, young adults whose friends/relatives obtained the diverted opioid from physician sources (37.8%) were less likely to endorse any past-year DSM-IV substance dependence diagnosis than those whose friends/relatives diverted from multiple sources (57.1%; Bonferroni-corrected $p < 0.05$).

Friend/Relatives Opioid Diversion Sources and Risk Behavior Correlates

As compared to respondents whose friends/relatives obtained opioid medication for diversion from physician sources, those using purchases or multiple sources had significantly higher odds of past-month marijuana use (purchases AOR = 2.13, 95% CI = 1.30–3.51; multiple sources AOR = 1.70, 95% CI = 1.22–2.37) and past year DUI (purchases AOR = 2.30, 95% CI = 1.39–3.80; multiple sources AOR = 3.99, 95% CI = 2.83–5.63). Furthermore, respondents who friends/relatives used multiple diversion sources had higher odds of past-month binge alcohol use (AOR = 1.44, 95% CI = 1.02–2.03)) than those with physician sources for diversion. Conversely, those with family/relatives who diverted opioids they stole or obtained via a fake prescription had lower odds of past-month binge alcohol use (AOR = 0.29, 95% CI = 0.09–0.96) or a past-year arrest and booking incident (AOR = 0.15, 95% CI = 0.04–0.56) than those whose friends/relatives diverted from a physician source.

Discussion

Research on prescription drug misuse has documented that the sharing of medications between friends/relatives is widespread. While this is well-known, little research examines how friends/relatives obtain the prescription drugs that they freely share with others. This is

problematic, as research highlights the importance of sources of prescription drugs for misuse. The current research adds to the literature on sources of prescription drugs for misuse by focusing on the sharing of medications among friends/relatives. Several important findings are worth noting. First, the overwhelming majority (73.2%) of respondents who obtained prescription opioids freely from friends/relatives identified "physician" as the original source of the prescription. This finding highlights the central role of physicians as a source for prescription opioids and suggests that prior research on sources of prescription drugs may underestimate physicians as a source.

Second, sources of prescription opioids shared between friends/relatives vary significantly based on the sociodemographic characteristics of the people who were given these drugs. The findings associated with race/ethnicity stand out the most. White respondents were more likely to report theft or fake prescriptions and purchased compared to African American respondents. In addition, Hispanic respondents were more likely than African American respondents to report theft or a fake prescription, but less likely to purchase or report multiple sources compared to White respondents. This is important as research shows that people who obtain prescription drugs from certain sources, such as dealers, are at increased risk for frequent misuse, substance use disorders symptoms, and other health risk behaviors. [16,20] This finding is also consistent with research that shows prescription drug misuse is associated with increased morbidity and mortality among Whites in the U.S.[28,37] Case and Deaton Case outlined how substance use and mental health problems has led to an increase in drug overdose deaths and suicides among middle-aged White adults.[37] The increased morbidity and mortality, among Whites, outlined in the deaths of despair framework is supported by the various sources of prescription opioids that were more likely to be reported by Whites in this research.

Additionally, the analysis focusing on race/ethnicity supports the idea that substance use is often racialized, with certain racial/ethnic groups being more likely to use certain types of drugs.[38,39] Prescription opioid misuse has widely been reported as a drug for "White" people, with OxyContin® even being given the nickname "hillbilly heroin".[40] This is likely due to the fact that Whites have higher rates of health insurance coverage and greater access to prescription medications.[41,42] With greater access to prescription opioids, among Whites, it makes sense that they would have greater access from their friends/relatives.

With regard to sex, females were more likely to report physician sources compared to males. This finding is supported by the concept of doing gender, which argues that gender is socially structured.[43] In short, men and women enact culturally appropriate gender roles (e.g. masculinity and femininity) during social interactions. A few studies have applied the idea of doing gender to criminal behavior or drug use.[44,45] These scholars argue that gender does not influence criminal behavior or drug use, rather criminal behavior or drug use can be a way for people to construct their gender identity by engaging in socially acceptable masculine or feminine behaviors. This helps us understand why females are more likely to obtain prescription drugs from a doctor while males are more likely to purchase drugs from a dealer.[3,15,16,20] Relying on a more conventional source such as a doctor fits with cultural expectations of femininity, as it is more socially acceptable.

Third, friend/relative sources of opioids for misuse were significantly associated with substance use disorders and other risk behaviors. We found evidence to suggest that reporting purchased and citing multiple sources increases risk for substance use disorders. This finding makes sense as individuals with substance use disorders would be using pills on a more regular basis and would need to rely on multiple sources to obtain these pills. This is also consistent with prior research on sources of prescription drugs.[16] We also found that friends/relatives sources were significantly associated with a few risk behavior correlates. Theft and fake prescriptions were associated with a decreased risk for both binge drinking and arrest. It is important to note that this category consists of a few different sources, with taking medications from family/relatives being the most commonly mentioned. While taking medications from family/relatives without asking is considered theft, it is qualitatively different from stealing medications from a medical source or writing fake prescriptions. In addition, respondents who reported purchased were at increased risk for both marijuana use and driving under the influence of alcohol or drugs. This finding is consistent with prior research on sources of prescription drugs.[20] Finally, respondents who reported multiple sources were at increased risk for binge drinking, marijuana use, and driving under the influence. Given the strong link between prescription drug misuse and other types of drug use, these findings are expected.

Limitations

First, the data are both cross-sectional and self-report. Self-report bias was possible, and no causal inferences should be made. Nonetheless, research indicates that self-report substance use data are unreliable and valid, though underreporting and participant misclassification is likely.[46,47] In addition, use of medication pictures, numerous trade and generic medication names and ACASI self-interview methods should reduce self-report bias.[32] Second, self-selection bias was also likely, as some selected individuals refused participation in either the screening or interview phases. Third, the measure of friend/relative sources is based on survey respondents reporting on someone else's behavior. Respondents who report they got pills from friends/relatives are then asked to report how their friends and family members obtained those drugs. Thus, some misclassification is likely. Finally, the landscape of the opioid epidemic is rapidly evolving. While prescription opioids still play an important role, deaths associated with heroin use and fentanyl have increased dramatically in recent years.

Clinical Implications and Summary

Focusing on young adults, a population at increased risk for prescription opioid misuse, the current research examines the sharing of prescription opioids between friends/relatives. Clinically, these findings highlight the prominence of physician sources for opioid medication. Research clearly identifies free from friends/relatives as the primary source of prescription opioids. However, findings from the current research indicate that 73% of young adults who obtain prescription opioids freely from friends/relatives believe that physicians are the original source of these prescriptions. This is likely due to patients often having leftover medications and people believe prescription drugs are safer than street drugs. [22,24,25] Recent declines in the amount of opioid prescribing[48] and use of the updated CDC guidelines[49] should help limit the availability of opioid medication for diversion and help reduce the associated consequences. However, educational based interventions are still

needed to change normative perceptions associated with prescription drugs. Additionally, a number of new role responsibilities marks the transition from adolescence to adulthood, resulting in young adults being more responsible for the control of their prescription drugs. Findings suggest a need for reinforcing the importance of the appropriate storage and disposal or leftover prescription medications among young adults, a population with high rates of sharing medications with friends/relatives.

The current research also highlights sex differences, differences based on race/ethnicity, and the importance of purchases and multiple sources as markers of increased consequences in those engaged in POM. White males appeared to be a more vulnerable group based on their engagement with friends/relatives using sources to obtain opioids that were associated with substance use disorders and other risk behaviors. Greater attention to this subgroup and to the friend/relative sources used can help identify those in need of greater intervention (e.g., substance use snorkeling). Ultimately, these results suggest that in addition to the need to assess sources of misused medication among young adults, clinicians should follow-up to ascertain all of the sources used to obtain prescription drugs; as such knowledge can identify those at elevated risk for opioid and other substance use disorder consequences.

Acknowledgments

References

[1]. Centers for Disease Control and Prevention. CDC grand rounds: Prescription drug overdoses — a U.S. epidemic. MMWR. Morb Mort Wkly Rep. 2012;61:10–13.

[2]. Seth P, Rudd RA, Noonan RK, Haegerich TM. Quantifying the epidemic of prescription opioid overdose deaths. Am J Public Health. 2018;108:500–502. [PubMed: 29513577]

[3]. Lipari RN, Hughes A. How people obtain the prescription pain relievers they misuse. The CBHSQ Report. Rockville, MD Substance Abuse and Mental Health Services Administration: Rockville 2017.

[4]. Boyd CJ, Teter CJ, West BT, Morales M, McCabe SE. Non-medical use of prescription analgesics: A three-year national longitudinal study. J Addict Dis. 2009;28:232–242. [PubMed: 20155592]

[5]. Cicero TJ, Kuehn BM. Driven by prescription drug abuse, heroin use increases among suburban and rural whites. JAMA. 2014;312:118–119. [PubMed: 25005636]

[6]. Ford JA, Rigg KK. Racial/ethnic differences in factors that place adolescents at risk for prescription opioid misuse. Prev Sci. 2015;16:633–641. [PubMed: 25344348]

[7]. Ford JA, Pomykacz C, Veliz P, McCabe SE, Boyd CJ. Sports involvement, injury history, and non-medical use of prescription opioids among college students: An analysis with a national sample. Am J Addict. 2018;27:15–22. [PubMed: 29280290]

[8]. Lankenau SE, Teti M, Silva K, Bloom JJ, Harocopos A, Treese M. Initiation into prescription opioid misuse amongst young injection drug users. Int J Drug Policy. 2012;23:37–44. [PubMed: 21689917]

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

[10]. Schepis TS. Nonmedical use of prescription opioids by adolescents: A review of the literature. Pain Manag. 2011;1:53–59. [PubMed: 24654585]

[11]. Havens JR, Stoops WW, Leukefeld CG, Garrity TF, Carlson RG, Falck R, Wang J, Booth BM. Prescription opiate misuse among rural stimulant users in a multistate community-based study. Am J Drug Alcohol Abuse. 2009;35:18–23. [PubMed: 19152201]

[12]. Keyes KM, Cerda M, Brady JE, Havens JR, Galea S. Understanding the rural-urban differences in nonmedical prescription opioid use and abuse in the United States. Am J Public Health. 2014;104:52–59.

[13]. McCabe SE, Cranford JA, Boyd CJ, Teter CJ. Motives, diversion and routes of administration associated with nonmedical use of prescription opioids. Addict Behav. 2007;32:562–575. [PubMed: 16843611]

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

[15]. Cicero TJ, Kurtz SP, Surratt HL, Ibanez GE, Ellis MS, Levi-Minzi MA, Inciardi JA. Multiple determinants of specific modes of prescription opioid diversion. J Drug Issues. 2011;41:283–304. [PubMed: 22287798]

[16]. Ford JA, Lacerenza C. The relationship between source of diversion and prescription drug misuse, abuse, and dependence. Subst Use Misuse. 2011;46:819–827. [PubMed: 21174499]

[17]. Harris S, Nikulina V, Gelpi-Acosta C, Morton C, Newsome V, Gunn A, Hoefinger H, Aikins R, Smith V, Barry V, Downing MJ Prescription drug diversion: Predictors of illicit acquisition and redistribution in three U.S. metropolitan areas. AIMS Public Health. 2015;2:762–783. [PubMed: 26690813]

[18]. Inciardi JA, Surratt HL, Lugo Y, Cicero TJ. The diversion of prescription opioid analgesics. Law Enforc Exec Forum. 2007;7:127–141. [PubMed: 25267926]

[19]. McCabe SE, West BT, Teter CJ, Ross-Durow P, Young A, Boyd CJ. Characteristics associated with the diversion of controlled medications among adolescents. Drug Alcohol Depend. 2011;118:452–458. [PubMed: 21665384]

[20]. Schepis TS, Krishnan-Sarin S. 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. 2009;48:828–836. [PubMed: 19564803]

[21]. Wang KH, Fiellin DA, Becker WC. Source of prescription drugs used nonmedically in rural and urban populations. Am J Drug Alcohol Abuse. 2014;40:292–303. [PubMed: 24853143]

[22]. Hulme S, Bright D, Nielsen S. The source and diversion of pharmaceutical drugs for non-medical use: A systematic review and meta-analysis. Drug Alcohol Depend. 2018;186:242–256. [PubMed: 29626777]

[23]. Schepis TS, Wilens TE, McCabe SE. Prescription drug misuse sources of controlled medications in adolescents. J Am Acad Child Adolesc Psychiatry.

[24]. Goldsworthy R, Schwartz N, Mayhorn C. Beyond abuse and exposure: Framing the impact of prescription-medication sharing. Am J Public Health. 2008;98:1115–1121. [PubMed: 18445792]

[25]. Beyene KA, Sheridan J, Aspden T. Prescription medication sharing: A systematic review of the literature. Am J Public Health. 2013;104:15–26. [PubMed: 24228679]

[26]. Anglin MK, White JC. Poverty, health care, and problems of prescription medication: A case study. Subst Use Misuse. 1999;34:2073–2093. [PubMed: 10573305]

[27]. Schepis TA, McCabe SE, Teter CJ. Sources of opioid medication for misuse in older adults: Results from a nationally representative survey. Pain. 2018;159:1543–1549 [PubMed: 29624517]

[28]. Han B, Compton WM, Jones CM, Cai R. Nonmedical prescription opioid use and use disorders among adults aged 18 through 64 years in the United States, 2003–2013. JAMA. 2015;314:1468–1478. [PubMed: 26461997]

[29]. Garnier LM, Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Sharing and selling of prescription medications in a college student sample. J Clin Psychiatry. 2010;71:262–269. [PubMed: 20331930]

[30]. McCabe SE, Teter CJ, Boyd CJ, Wilens TE, Schepis TS. Sources of prescription medication misuse among young adults in the United States. J Clin Psychiatry. 2018;79:1–8.

[31]. McCabe SE, West BT, Teter CJ, Boyd CJ. Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. Addict Behav. 2014;39:1176–1182. [PubMed: 24727278]

[32]. Center for Behavioral Health Statistics and Quality. 2014 National Survey on Drug Use and Health public use file codebook. Rockville, MD: Substance Abuse and Mental Health Services Administration 2015.

[33]. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-IV-TR. (4th ed.). Washington, DC: American Psychiatric Association, 2000..

[34]. Substance Abuse and Mental Health Services Administration. Reliability of Key Measures in the National Survey on Drug Use and Health. Rockville, MD Office of Applied Studies, Methodology Series M-8, HHS Publication No. SMA 09–4425 2010.

[35]. Zanarini MC, Frankenburg FR. Attainment and maintenance of reliability of axis I and II disorders over the course of a longitudinal study. Compr Psychiatry. 2001;42:369–374. [PubMed: 11559863]

[36]. Rao JNK, Scot, AJ. On chi-squared tests for multi-way tables with cell proportions estimated from survey data. Ann Stat. 1982;12:46–60.

[37]. Case A, Deaton A. Rising morbidity and mortality in midlife among white non-Hispanic Americans in the 21st century. Proc Natl Acad Sci. 2015;112:15078–15083. [PubMed: 26575631]

[38]. Wallace JM. Explaining race differences in adolescent and young adult drug use: The role of racialized social systems. Drugs & Society. 1998;14:21–36.

[39]. Hansen H, Netherland J. Is the prescription opioid epidemic a white problem? Am J Public Health. 2016;106:2127–2129. [PubMed: 27831792]

[40]. Inciardi J, Cicero TJ. Black beauties, gorilla pills, footballs, and hillbilly heroin: Some reflections on prescription drug abuse and diversion research over the past 40 years. J Drug Issues. 2009;39:101–114.

[41]. Berchick ER, Hood E, Barnett JC. Current Pupulation Reports, P60–264, Health Insurance Coverage in the United States: 2017, U.S. Government Printing Office, Washington, DC, 2018.

[42]. Anderson KO, Green CR, Payne R. Racial and ethnic disparities in pain: Causes and consequences of unequal care. J Pain. 2009;10:1187–1204. [PubMed: 19944378]

[43]. West C, Zimmerman DH. Doing gedner. Gender & Society. 1987;1:125–151.

[44]. Messerschmidt JW. Masculinities and Crime: Critique and Reconceptualization of a Theory. 1993 Lanham, MD: Rowan & Littlefield.

[45]. Measham F "Doing gender"--"doing drugs": Conceptualizing the gendering of drug cultures. Contemporary Drug Problems. 2002;29:335–373.

[46]. Johnson LD, O'Malley PM. Issues of validity and population coverage in student surveys of drug use. NIDA Res Monogr. 1985;57:31–54. [PubMed: 3929114]

[47]. O'Malley PM, Bachman JG, Johnston LD. Reliability and consistency in self-reports of drug use. Int J Addict. 1983;18: 805–824. [PubMed: 6605313]

[48]. Dowell D, Haegerich T, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain--United States. 2016. JAMA, 2016;315:1624–1645. [PubMed: 26977696]

[49]. Guy JG, Zhang K, Bohm MK, Losby J, Lewis B, Young R, Murphy LD, Dowell D. Vital Signs: Changes in Opioid Prescribing in the United States, 2006–2015. MMWR Morb Mort Wkly Rep. 2017;66:697–704.

Table 1.

Friend/relative opioid diversion sources across the young adult sample and based on school enrollment/college graduate status

Friend/Relative Opioid Diversion Sources	Total Sample (n = 2,255)	In School or College Graduate	Not in school or a College Graduate	School-based Post-hoc comparison
	% (95% CI)	% (95% CI)	% (95% CI)	
Physician Sources	73.2% (70.5–75.7)	72.6% (68.7–76.3)	73.6% (70.4–76.6)	no difference
One Physician	68.8% (65.9–71.6)	70.0% (65.9–73.8)	67.7% (64.3–71.0)	no difference
Two or More Physicians	9.0% (7.3–10.9)	7.8% (5.4–10.8)	10.0% (8.1–12.4)	no difference
Theft/Fake Prescription	6.6% (5.3–8.3)	7.7% (5.8–10.2)	5.6% (4.0–7.9)	no difference
Fake Prescription	0.9% (0.4–1.9)	1.0% (0.3–3.3)	0.8% (0.4–2.0)	no difference
Stolen from a Medical Source	1.4% (0.8–2.4)	1.7% (0.8–3.6)	1.2% (0.6–2.3)	no difference
Stolen from Friend/Relative	5.4% (4.1–7.2)	5.9% (3.9–9.0)	5.0% (3.5–7.1)	no difference
Friend/Relative for Free	14.9% (13.1–16.9)	14.5% (11.5–18.2)	15.2% (13.3–17.5)	no difference
Purchased	21.4% (19.1–23.8)	22.9% (19.7–26.6)	20.1% (17.7–22.7)	no difference
Bought from Friend/Relative	16.1% (14.1–18.5)	17.5% (14.2–21.4)	15.0% (12.8–17.4)	no difference
Bought from Stranger/Dealer	11.4% (9.8–13.2)	10.5% (8.4–12.9)	12.2% (10.2–14.7)	no difference
Bought from Internet	0.7% (0.3–1.5)	0.1% (0.02–0.4)	1.2% (0.5–2.8)	$p = 0.009$
Other source	5.6% (4.4–7.0)	4.8% (3.2–7.0)	6.3% (4.9–8.0)	no difference
Multiple sources	18.4% (16.5–20.5)	17.9% (15.0–21.2)	18.8% (16.4–21.4)	no difference

Source: NSDUH, 2009–2014 cohorts.

All pairwise comparisons were based on logistic models adjusted for age, sex and race.

Table 2.

Sex- and race/ethnicity-based differences in friend/relative opioid diversion sources among young adult prescription drug misusers

Friend/Relative Opioid Diversion Sources	Males	Females	Caucasian	African-American	Hispanic or Latino	Post-hoc comparisons
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	
Physician Sources	70.2% (66.3–73.9)	76.2% (75.9–79.3)	72.7% (69.7–75.5)	79.8% (71.1–86.4)	71.0% (63.7–77.3)	F > M
One Physician	66.1% (62.1–69.9)	71.7% (68.0–75.1)	68.6% (65.4–71.7)	72.2% (63.3–79.6)	67.8% (60.1–74.6)	F > M
Two or More Physicians	8.6% (6.8–10.8)	9.3% (6.9–12.5)	8.8% (6.9–11.1)	10.1% (6.5–15.4)	5.8% (3.6–9.2)	
Theft/Fake Prescription	7.0% (4.8–10.0)	6.2% (4.3–9.0)	6.8% (5.3–8.8)	2.3% (1.0–5.0)	7.4% (4.1–12.9)	H/L, C > AA
Fake Prescription	1.5% (0.6–3.3)	0.3% (0.1–1.7)	1.1% (0.5–2.6)	no cases	0.7% (0.2–2.7)	
Stolen from a Medical Source	2.1% (1.1–4.2)	0.7% (0.3–1.7)	1.3% (0.6–2.5)	1.0% (0.4–2.8)	2.0% (0.7–5.7)	
Stolen from Friend/Relative	4.9% (3.2–7.5)	5.9% (4.1–8.6)	5.7% (4.3–7.5)	1.7% (0.6–4.3)	5.1% (2.3–10.7)	C > AA
Friend/Relative for Free	14.4% (11.7–17.5)	15.4% (12.7–18.6)	15.2% (13.2–17.5)	13.3% (9.0–19.1)	12.2% (7.7–19.0)	
Purchased	20.9% (17.7–24.5)	21.9% (18.8–25.4)	23.8% (20.9–26.9)	9.9% (5.9–16.0)	15.6% (10.0–23.6)	C > AA, H/L
Bought from Friend/Relative	15.9% (12.8–19.4)	16.4% (13.8–19.5)	18.2% (15.8–20.9)	6.9% (4.2–11.2)	12.4% (7.5–19.7)	C > AA
Bought from Stranger/Dealer	10.5% (8.5–13.0)	12.3% (10.0–15.0)	13.0% (10.9–15.5)	4.9% (2.5–9.3)	7.1% (4.0–12.1)	C > AA
Bought from Internet	0.6% (0.2–1.7)	0.8% (0.2–2.5)	0.8% (0.3–1.9)	no cases	no cases	
Other source	6.0% (4.3–8.3)	5.1% (3.7–7.0)	5.7% (4.3–7.5)	5.3% (2.3–11.8)	4.3% (2.4–7.5)	
Multiple sources	17.6% (14.6–21.1)	19.2% (16.1–22.7)	20.5% (17.7–23.6)	12.4% (6.3–23.1)	9.8% (5.9–15.7)	C > H/L

Source: NSDUH, 2009–2014 cohorts.

All pairwise comparisons were Bonferroni-corrected for multiple comparisons, with comparisons only noted when they differ at a p-level of 0.05 or less. The post-hoc comparisons were based on logistic models adjusted for age, sex, and race.

Table 3.

Prevalence of substance use disorders as a function of prescription drug misuse sources

Friend/Relative Opioid Diversion Sources	Opioid Use Disorder	Any Substance Use Disorder[2]	Any Substance Dependence[3]
	% (95% CI)	% (95% CI)	% (95% CI)
Physician Sources	16.9% (14.4–19.9)	54.8% (51.2–58.5)	37.8% (34.5–41.3)
Theft/Fake Prescription	28.5% (6.5–69.5)	45.6% (18.1–76.1)	40.3% (15.7–71.0)
Friend/Relative for Free	16.9% (9.7–27.6)	56.7% (45.0–67.8)	40.8% (29.4–53.3)
Purchased	34.0% (24.8–44.6)	80.0% (70.4–87.0)	54.1% (41.6–66.2)
Other source	25.6% (13.5–43.0)	57.2% (41.9–71.2)	49.4% (34.9–64.0)
Multiple sources	42.9% (37.3–48.6)	73.6% (66.8–79.4)	57.1% (51.2–62.9)
Pairwise comparisons[4]	Physician < Purchased, Multiple; Friend/Relative for Free < Multiple	Physician, Friend/Relative for Free < Purchased, Multiple	Physician < Multiple

Source: NSDUH, 2009–2014 cohorts.

[2] Any substance use disorder refers to individuals who self-reported symptoms consistent with DSM-IV substance abuse or dependence involving alcohol, cannabis, heroin, cocaine, hallucinogen, inhalant, methamphetamine, prescription opioids, prescription stimulants, or prescription sedatives/tranquilizers based on the NSDUH instrument.

[3] Any substance dependence refers to individuals who self-reported symptoms consistent with DSM-IV substance dependence involving alcohol, cannabis, heroin, cocaine, hallucinogen, inhalant, methamphetamine, prescription opioids, prescription stimulants, or prescription sedatives/tranquilizers based on the NSDUH instrument.

[4] All pairwise comparisons were Bonferroni-corrected for multiple comparisons, with comparisons only noted when they differ at a *p*-level of 0.05 or less. The post-hoc comparisons were based on logistic models adjusted for age, sex and race.

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Table 4.

Opioid misuse sources and risk-behavior correlates

Friend/Relative Opioid Diversion Sources	Past-Month Binge Drinking	Past-Month Marijuana Use	Past-Year DUI (Alcohol and/or Drugs)	Past-Year Major Depression	Past-Year Arrest and Booking	Current Health Insurance Coverage
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Physician Sources	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Theft/Fake Prescription	**0.29 (0.09–0.96)** *	0.73 (0.23–2.32)	0.34 (0.09–1.28)	0.84 (0.21–3.29)	**0.15 (0.04–0.56)** *	0.75 (0.21–2.69)
Friend/Relative for Free	1.47 (0.83–2.61)	1.45 (0.87–2.40)	0.92 (0.56–1.50)	0.65 (0.30–1.41)	0.70 (0.32–1.55)	1.23 (0.68–2.23)
Purchased	1.36 (0.84–2.19)	**2.13 (1.30–3.51)** *	**2.30 (1.39–3.80)** *	1.21 (0.66–2.22)	1.00 (0.51–1.96)	0.92 (0.52–1.64)
Other source	0.67 (0.34–1.30)	1.49 (0.73–3.02)	0.56 (0.30–1.03)	0.99 (0.44–2.21)	1.57 (0.71–3.48)	1.27 (0.61–2.64)
Multiple sources	**1.44 (1.02–2.03)** *	**1.70 (1.22–2.37)** *	**3.99 (2.83–5.63)** *	1.57 (0.99–2.51)	1.40 (0.97–2.02)	1.23 (0.90–1.69)

Source: NSDUH, 2009–2014 cohorts.

Notes: Ref = Reference group; DUI = Driving under the influence

AORs controlled for age, sex and educational status; all categories, except for the multiple sources group, include individuals who used only that source in the past 30 days.

*
denotes significantly different from physician source group at a *p* 0.05 level;