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Heroin Use and Drug Injection among Youth Also Misusing Prescription Drugs

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Abstract

Objectives: We identified the prevalence of nonmedical prescription drug use and its relationship to heroin and injection drug use in 4 nationally representative samples of adolescents.

Methods: We used the most recent data (2009–2015) from the Youth Risk Behavior Surveillance System (N_{total} = 61,132). Prevalence rates and 95% confidence intervals for prescription drug misuse, heroin use, and injection drug use were calculated across time points, sex, and race/ethnicity subgroups. Using odds ratios, we determined the likelihood of youth reporting nonmedical prescription drug use also reporting heroin and drug injection.

Results: In 2015, one in 6 adolescents reported recent prescription drug misuse. High rates of nonmedical prescription drug use persisted or increased among Hispanic boys, black boys, and "other" youth, while declining among white youth. Youth who used prescription drugs nonmedically at least once were 17.5 times more likely to have used heroin (CI: 13.7, 22.4) and 14.6 times more likely to have injected drugs (CI: 11.2, 19.2) in their lifetime.

Conclusions: Public health programming focused on reducing prescription drug misuse also may reduce youth engagement in heroin and/or injection drug use. Preventive efforts to support communities of color in reducing rates of prescription drug misuse are crucial.

Keywords

adolescent health; prescription drug use; heroin use; injected drug use

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Human Subjects Statement

This study was deemed exempt by the Institutional Review Boards of Teachers College, Columbia University and New York University Medical Center.

Conflict of Interest Statement

The authors have no conflict of interest or benefit (financial or otherwise) that has arisen from the direct applications of this research.

Over the past 2 decades the prevalence of nonmedical prescription drug use has increased considerably, contributing to a 4-fold rise in prescription drug-related deaths between 1999 and 2009.[1–3] Among individuals aged 12 years and older, the highest prevalence of nonmedical prescription drug use occurs specifically with prescription opioids (POs) in comparison to tranquilizers, sedatives, and stimulants, thereby highlighting opioids as the most urgent priority for public health intervention.[4] A systematic review of the literature by Young et al[5] published in 2012 reports an average lifetime rate of nonmedical PO use in nationally representative samples of adolescents of approximately 13%, with reported monthly rates ranging from 2% to 14%.

However, among adolescents, the misuse of psychotropic prescription drugs more broadly – a category that includes benzodiazepines such as Klonopin, and stimulants such as Adderall, as well as opioid-based painkillers such as OxyContin – Is also prevalent. The misuse of stimulants, sedatives, and tranquilizers combined has remained steady at approximately 14.8% since 2008.[6] Therefore, although PO use is particularly concerning given its relationship with the onset of heroin use and injection drug use among adults, we also are interested in preventing the misuse of all types of psychotropic prescription drugs, which have multiple implications for adolescent health outcomes.[7]

Although self-reported rates of nonmedical prescription drug use among 12–17-year-olds (adolescents) are lower than those reported by 18–25-year-olds (emerging adults), this younger subset is particularly vulnerable to the effects of prescription drug misuse, given the established impact of substance use on adolescents' physical, emotional, and cognitive development.[8] Research demonstrates that adolescent substance use has serious health implications (including disturbed sleep patterns, malnutrition, negative impact on cognitive functioning, and increased risk for depression),[8] and can place youth at risk for engagement in a range of other risky behaviors such as unprotected sex and intimate partner violence.[9–14] It should be noted that injection drug use and needle sharing are particularly concerning for many health reasons, including increased risk of blood clots, bacterial infections, and increased risk for HIV and HCV transmission.[15] Additionally, prior research demonstrates that initiating regular substance use before age 18 is associated with later development of a more severe substance use problem.[16] There is also considerable work demonstrating that differences in youth substance use by sex exists.[17] Similarly, racial and ethnic disparities in youth substance use overall also persist.[18] Therefore, exploring differences in nonmedical prescription drug use across these demographic subgroups is crucial for improved understanding of this public health issue.

The nationwide spike in nonmedical PO use has been linked to increases in opioid dependence, accidental overdose, and death.[19–21] Simultaneously, the prevalence of heroin use has been steadily increasing, with a 150% increase in the number of US adults reporting such use between 2002 and 2012.[22] This increase may be due, in part, to PO users who transition from oral and/or intranasal PO use to heroin use, with POs providing an gateway to regular opioid use and heroin injection.[21,23–30] This transition from PO use to heroin injection has become increasingly common over the past decade. For example, Jones[21] described a 16% increase in 2002–2004 to 2008–2010 among persons reporting nonmedical PO use prior to their initiation of heroin use. Literature also demonstrates that a lifetime

history of heroin use is associated with greater-severity PO misuse among adults, confirming the importance of the present work.[31] We posit that a similar relationship between PO misuse and heroin use may exist among adolescents. However, given the negative health implications of prescription drug misuse in general for adolescents, there is reason to hypothesize that any type of prescription drug misuse during such a crucial developmental phase is serious and may be associated with an increased likelihood of engaging in heroin use and/or injection drug use. Additionally, although injection drug use is often associated with heroin,[32] injection of cocaine and other substances (for example, such as crystal methamphetamine) exists as well.[32,33] As such, we address heroin and injection drug use separately in this study.

Although rates of substance use among adolescents are reported every 2 years by the US Centers for Disease Control and Prevention (CDC), a detailed examination of nonmedical prescription drug, heroin, and injection drug use among successive, nationally representative samples of adolescents, across key demographic subgroups, and using the most current data from the CDC is less common. The relationship of nonmedical prescription drug use with heroin use and injection drug use specifically among adolescents also remains unclear. Furthermore, to our knowledge, specific recommendations for public health interventions for preventing the uptake and escalation of nonmedical use of prescription drugs among adolescents do not exist.

The aims of this study were to: (1) build upon existing knowledge regarding the prevalence of nonmedical prescription drug use in 4 successive, cross-sectional, and nationally representative samples of adolescents (2009, 2011, 2013, 2015) and to establish these prevalence estimates across key demographic subgroups; (2) to utilize 95% confidence intervals (CIs) to describe differences in prevalence across each time point and across demographic subgroups; (3) to utilize odds ratios (ORs) to assess the relationship of prescription drug misuse with heroin use and injection drug use in the most recent sample of youth; (4) to combine data on lifetime nonmedical prescription drug use from all 4 survey years and determine variations in frequency of use; and (5) to report the percentage of all youth engaging in lifetime nonmedical use of prescription drugs within each frequency response category who also reported any past heroin use and/or injection drug use.

METHODS

Data Source

This study was a secondary analysis of nationally representative, publicly available data collected through the CDC's Youth Risk Behavior Surveillance System (YRBSS). The purpose of the YRBSS is to estimate nationwide prevalence of adolescent engagement in a variety of risk behaviors, including drug and alcohol use, weapon possession, nutrition patterns, and sexual risk behaviors. YRBSS data are cross-sectional in nature and collected every 2 years using a reliable and valid instrument comprised of approximately 100 items – the Youth Risk Behavior Survey (YRBS). The survey is administered to a nationally representative sample of adolescents in grades 9–12 from public, private, and parochial high schools across the US. These students are sampled via a 3-stage cluster design in a process that has been outlined in extensive detail by the CDC.[34] The sampling strategy considers the

varying demography of each state and school size. Data are weighted to match national population proportions using a weight variable based on sex, race/ethnicity, and grade level, which also provides a representative sample of youth from across the US. The present study used cross-sectional data from the most recent 4 YRBS surveys: 2009 (N = 16,410),[35] 2011 (N = 15,425),[36] 2013 (N = 13,583),[37] and 2015 (N = 15,624).[38] We could not examine cohorts sampled prior to 2009 because 2009 was the first year that the YRBS asked about prescription drug use.

Sample Description

The CDC reports directly on the demographic breakdown of each YRBS sample. A summary of the 4 samples included in our study is presented here.[35–38] In 2015 (N = 15,624), 48.7% were female and 51.3% were male. All 4 high school grades were represented (9th grade: 27.2%, 10th grade: 25.7%, 11th grade: 23.9%, 12th grade: 23.1%). In this sample, 54.5% were white, 13.6% were black, 22.3% were Hispanic, and 9.7% identified as "other."[38] It should be noted that the "other" race/ethnicity category for all 4 survey years is defined as all non-Hispanic youth who identify as American Indian, Alaska Native, Asian, Native Hawaiian, and/ or other Pacific Islander.[39] In 2013 (N = 13,583), 50.0% were female and 50.0% were male. All 4 high school grades were represented (9th grade: 27.3%, 10th grade: 25.7%, 11th grade: 23.8%, 12th grade: 23.1%).[37] In this sample, 55.6% were white, 14.3% were black, 21.1% were Hispanic, and 8.9% identified as "other." In 2011 (N = 15,425), 48.4% were female and 51.6% were male. All 4 high school grades were represented (9th grade: 27.6%, 10th grade: 25.8%, 11th grade: 23.8%, 12th grade: 22.6%). In this sample, 56.9% were white, 14.2% were black, 20.0% were Hispanic, and 9.0% identified as "other."[36] Lastly, in 2009 (N = 16,410), 47.8% were female and 52.2% were male. All 4 high school grades were represented (9th grade: 28.0%, 10th grade: 26.2%, 11th grade: 23.5%, 12th grade: 22.2%). In this sample, 58.7% were white, 14.4% were black, 18.6% were Hispanic, and 8.4% identified as "other."[35]

Variables

Our analyses focused on the following questions: "During your life, how many times have you taken a prescription drug (such as OxyContin, Percocet, Vicodin, Codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?" "During your life, how many times have you used heroin (also called smack, junk, or China White)?" and "During your life, how many times have you used a needle to inject any illegal drug into your body?" The survey items regarding nonmedical prescription drug and heroin use used identical response categories (0 times; 1 or 2 times; 3 to 9 times; 10 to 19 times; 20 to 39 times; 40 or more times), whereas the question regarding injection drug use used only 3 response options (0 times; 1 time; 2 or more times).

Prevalence rates for nonmedical prescription drug use, heroin use, and injection drug use were calculated for all youth and for the following sex and race/ ethnicity subgroups: black males; black females; white males; white females; Hispanic males; Hispanic females; other males; and other females. Data were weighted, as per CDC protocol, considers the distribution of youth by grade, sex, and race/ethnicity in each survey district to match national population proportions. Missing data were removed from the dataset. Percent

missing data for each item was as follows: prescription drug use 2009: 8.5%, 2011: 9.2%, 2013: 1.0%; 2015: 1.6%; heroin use 2009: 4.1%, 2011: 8.8%, 2013: 2.4%; 2015: 1.3%; drug injection 2009: 1.6%, 2011: 8.8%, 2013: 1.7%; 2015: 5.4%. These rates are comparable to rates of missing data observed in other studies collecting survey data.[40] For a portion of our analyses, participants' responses to the 3 drug-related items of interest were dichotomized as either "Yes" (indicating lifetime use one or more times) or "No" (indicating zero instances of lifetime use). Similar binary classifications are utilized by the CDC when reporting risk prevalence estimates.[34]

Data Analysis

Given the cross-sectional nature of these data, descriptive analyses were used to estimate and compare the prevalence of nonmedical prescription drug use, heroin use, and injection drug use across each time point and across key demographic subgroups. Differences in prevalence across years and demographic subgroups were established via 95% confidence intervals (CI), in line with methods used by the CDC.[34] ORs and associated 95% CIs were subsequently calculated to determine the odds of youth reporting nonmedical use of prescription drugs, heroin use, and drug injection via standard epidemiological computations, also in line with CDC protocol.[34,41] Specifically, the OR of using prescription drugs nonmedically at least once and engaging in heroin use or injection drug use was calculated independently for the most recent available data (2015) by computing the ratio of participants using and not using prescription drugs nonmedically, alongside the frequency of participants using and not using heroin and/or injection drugs, respectively.[34,41] Data on lifetime nonmedical prescription drug use from all survey years (2009, 2011, 2013, 2015) were combined and subsequently split by response into the following categories (mirroring the response categories in the YRBS itself): 1–2 times; 3–9 times; 10–19 times; 20–39 times; and 40 or more times. The percentage of the total YRBS participants reporting lifetime nonmedical use of prescription drugs within each response category was computed. The percentage of these nonmedical prescription drug users who also reported any past heroin use and/or injection drug use was then determined. Additional details on this analysis process have been reported by the authors in previous work.[41]

RESULTS

Prevalence of Nonmedical Use of Prescription Drugs, Heroin Use, and Injection Drug Use

Nonmedical prescription drug use.—The prevalence of reported lifetime nonmedical prescription drug use among adolescents in 2015 (16.8% [CI: 16.2, 17.4]) was significantly lower than the prevalence observed in 2009 (20.2% [CI: 19.5, 20.8]) and in 2011 (20.7% [CI: 20.0, 21.3]). Though not statistically significant, this prevalence was also lower than rates observed in 2013 (17.8% [CI: 17.1, 18.4]). Nonmedical prescription drug use prevalence particularly among white youth was significantly lower in 2015 in comparison to the previous 3 years (Table 1). Conversely, the prevalence of nonmedical prescription drug use among black adolescents was significantly higher in 2015 (14.8% [CI: 13.3, 16.4]) in comparison to 2009 (11.8% [CI: 10.4, 13.2]). However, despite this increase, black youth still reported the lowest prevalence of use in 2015 in comparison to all other subgroups (Table 1). Using the most recent data, we also demonstrated that the highest rates of use

occurred among “other” youth, with no significant differences in prevalence observed among this demographic subgroup across years (2015: 18.6% [CI: 16.6, 20.6]. Hispanic boys also were found to have particularly high rates of use: (2015: 18.4% [CI: 16.6, 20.3]).

Heroin use.—The prevalence of heroin use among all youth was as follows: (2009: 2.5% [CI: 2.3, 2.7], 2011: 2.9% [CI: 2.6, 3.2], 2013: 2.2% [CI: 1.9, 2.4], 2015: 2.1% [CI: 1.9, 2.3]) (Table 2). Life-time prevalence of heroin use in 2015 was highest among boys classified as “other” (3.9% [2.5, 5.2]) and for black boys (3.8% [2.7, 5.0]). A statistically significant difference in heroin use was identified among white youth between 2011 (2.5% [CI: 2.2, 2.8]) and both 2013 (1.7% [CI: 1.4, 2.0] and 2015 (1.3 [CI: 1.0, 1.5]), with rates decreasing during this time (Table 2).

Injection drug use.—The prevalence of injection drug use was found to be similar to rates of heroin use, with overall prevalence fluctuating across years, ranging from its lowest point (1.7% in 2013) to its highest point (2.3% in 2011). Black boys emerged as having the highest rate of injection drug use in 2015 in comparison to all other subgroups (3.2% [CI: 2.1, 4.3]), despite having one of the lower rates of use in 2013 [1.7% [CI: 0.9, 2.6]). By comparison, the highest rates of drug injection in 2013 were observed among Hispanic and “other” boys, with levels among these subgroups consistently higher than those of the overall sample in the 2 previous survey years (2009, 2011) (Table 3).

Relationship of Nonmedical Prescription Drug Use with Heroin Use and Injection Drug Use

Using the 2015 data, we found that youth who have used prescription drugs nonmedically at least once were 17.5 times more likely to have used heroin (CI: 13.7, 22.4) and 14.6 times more likely to have injected drugs (CI: 11.2,19.2) in their life-times, as compared to youth who have not used prescription drugs nonmedically (Table 4).

In addition, as the frequency of nonmedical prescription drug use increased, the likelihood of these same youth also reporting heroin use or injection drug use increased as well (Table 4). For youth who reported the highest lifetime frequency of nonmedical prescription drug use (“40 or more times”), the odds of engaging in lifetime heroin use were 26.7 (CI: 20.7, 34.5). Similarly, the odds of reporting any lifetime injection drug use were 30.2 (CI: 23.0, 40.0) among youth who reported engaging in nonmedical prescription drug use “40 or more times” in their lifetimes. The odds of engaging in heroin use and injection drug use increased considerably among even those youth reporting low levels of nonmedical prescription drug use.

Combining data from all 4 survey years (Ntotal = 61,060) yielded 81.1% of all youth reporting no nonmedical prescription drug misuse. For this combined sample, the distribution of youth reporting various lifetime frequencies of nonmedical prescription drug use was as follows: 1–2 times: 35.9%, 3–9 times: 26.2%, 10–19 times: 14.2%, 20–39 times: 8.2%, and 40 or more times: 15.5%. Additionally, more frequent heroin users (those youth reporting lifetime use “40 or more times”) had remarkably high lifetime rates of nonmedical prescription drug use. Specifically, 88.6% of the highest-frequency heroin users reported lifetime nonmedical use of prescription drugs, many of whom also reported drug injection (83.2%). Similarly, of those youth reporting the highest-frequency lifetime nonmedical

prescription drug use (“40 or more times”), 33.9% reported also using injection drugs and/or heroin. Analysis of those youth injecting drugs at least twice in their lifetime demonstrated that 85.5% of these participants also reported some lifetime nonmedical prescription drug use.

DISCUSSION

Summary of Key Findings

The overall goals of this study were to identify and compare the prevalence of nonmedical prescription drug use in 4 nationally representative samples of adolescents, across key demographic subgroups, and to establish the relationships among prescription drug misuse, heroin use, and injection drug use. This study contributes substantially to the literature by describing the high prevalence of nonmedical prescription drug use in these samples of adolescents, identifying specific demographic subgroups at enhanced risk for prescription drug misuse, and determining that adolescents who report misusing prescription drugs are markedly more likely also to report heroin use and/or drug injection in comparison with youth who do not report misusing prescription drugs.

More specifically, our descriptive results high-lighted Hispanic boys and youth classified as “other” as vulnerable populations at enhanced and recent risk for engaging in nonmedical prescription drug use. In addition, we observed that black boys experienced a drop-in prescription drug misuse, heroin use, and injection drug use in 2013, only to experience an increase again in 2015. We also found that overall rates of prescription drug misuse decreased in 2015 from the previous 3 survey years (2009, 2011, and 2013). This finding is in line with patterns observed in other studies illustrating that rates of prescription drug misuse across the US population have decreased slightly over the past several years.[42] Despite this decrease in prevalence, rates of prescription drug misuse among adolescents remain high and the persistence of prescription drug misuse among some subgroups is concerning. Indeed, our work suggests that the overall decrease in prescription drug misuse appears to be driven by the patterns observed by white youth. Therefore, these findings indicate that current drug prevention and treatment efforts must explicitly address the needs of communities of color to reduce rates of prescription drug misuse. We posit that, given the media attention to prescription drug misuse among white youth, prevention efforts may have been focused on communities of white youth. Whereas such efforts are important, our results support that prevention efforts need to be implemented and sustained across all vulnerable subgroups even after decreases in prevalence are observed.

Our study also demonstrated that using prescription drugs nonmedically even once greatly increases the odds of heroin use and injection drug use. We concluded that even minimal involvement in prescription drug misuse can increase the risk for more severe forms of drug use. We found that most adolescents who injected drugs also used prescription drugs nonmedically, as well as heroin. This relationship holds even among those youth who only reported ever using heroin 1–2 times or injecting drugs once, thereby supporting the premise that subsets of adolescent nonmedical prescription drug users are at increased risk for heroin use and drug injection. These results are consistent with studies conducted with adult heroin

users, indicating that current heroin users are significantly more likely to engage in nonmedical prescription opioid misuse in comparison to non-heroin users.[21,26,27]

Limitations

There are limitations to this study, which must be considered when interpreting these results. First, each YRBS survey year (2009, 2011, 2013, and 2015) represents one unique, nationally representative sample. Individual students are not tracked through the YRBS, as the data are cross-sectional in nature. Therefore, it is possible some of the same youth were sampled in multiple years, though that information is not known given the de-identified nature of the data. Furthermore, and because these data are cross-sectional in nature, it is not possible to draw causal inferences between prescription drug misuse and heroin and injection drug use; future research should aim to determine if this causal relationship exists. However, because each sample is generated by a rigorous sampling procedure and is nationally representative at that point in time, the strength of these data overall is constant from year to year.

We also must consider the limitations of these data; particularly regarding the nature of the items themselves and the potential concerns associated with self-report.[43] For example, in comparison to the most recently available data reported by the Monitoring the Future Study, [44] the prevalence of prescription drug misuse among high school students as reported by the CDC has been consistently higher. Specifically, our identified prevalence of nonmedical prescription drug use among adolescents is higher than the <10% rate reported in previous research.[5,44] However, this is to be expected due to the inclusion of several prescription drug types within a single question in the YRBS survey. Unfortunately the CDC assesses prescription drug misuse among students via just one survey item, which collapses all prescription drugs (including opioids, stimulants, anxiolytics, and other groups of prescription drugs) into one category. The CDC also only assesses lifetime prescription drug use, which is limiting when trying to capture the most recent experiences of youth in this regard. Further, because the survey question referring to drug injection does not indicate the type of drug being injected, we were unable to account for specific injection drug subtypes. Given the complexity of prescription drug misuse and injection drug use among youth and the critical role the CDC plays in addressing threats to the health and safety of communities across the US, the need for more specific and thoughtfully designed items on the YRBS to assess the issue of prescription drug misuse is critical. In lieu of these concerns, however, it is worth noting that the YRBS overall has strong psycho-metric properties[46] and has been used in guiding research and practice implications on numerous public health issues over the past 2 decades.

We also acknowledge the lack of adjustment made in our analyses for the number of statistical comparisons run. The confidence intervals presented, however, are in line with existing CDC protocols for working with and presenting these data. The relatively tight CIs are also encouraging. At the same time, the relatively low prevalence of heroin use and injection drug use (~3% per year) in this sample warrants consideration of the possibility of false positives. To help address this, we aggregated data during 2009–2015 when possible, resulting in 1513 and 1248 participants reporting heroin use and drug injection, respectively.

Lastly, because the YRBS administers its data collection process in schools, the survey may not adequately sample extremely high-risk youth, as many older youths with more severe drug use patterns may not be included (for example, if they dropped out of school or were incarcerated).

Public Health Implications

There are several important implications of this work for promoting the healthy development of adolescents across the US. Youth access to prescription drugs is prevalent, with nearly one in 5 adolescents in this study reporting some prescription drug misuse. This finding is in line with previous work that demonstrates that most teenagers have unsupervised access to prescription medications at home,[46] despite efforts that have been made in many states to restrict illicit access to psychoactive prescription drugs and reduce prescribing rates. Thus, more directly and comprehensively addressing issues of access must be a component of future drug prevention efforts. In addition, and in light of our findings establishing a relationship among prescription drug misuse, heroin use, and injection drug use, the need to invest in effective prevention efforts targeting prescription drug misuse among adolescents is crucial. Indeed, all 3 forms of drug use have severe implications for the healthy physical, emotional, and cognitive development of adolescents. Our results demonstrate that the likelihood of adolescents engaging in heroin and/or injection drug use increases with even one instance of prescription drug misuse. Therefore, preventing isolated instances of prescription drug misuse in addition to preventing more frequent misuse of these drugs should be a public health priority.

In addition, little research on evidence-based health education and health promotion efforts to prevent prescription drug misuse among youth currently exists. As such, we also suggest that future health education programmatic and corresponding research efforts aim to implement and evaluate a multipronged approach to this complicated public health issue, in line with efforts with known effectiveness in the context of preventing other forms of substance misuse and preventing substance use disorders.[47,48] With our findings highlighting the heightened risk of prescription drug misuse among youth of color, the implementation of preventive efforts designed to reach and engage these key subgroups is warranted. Furthermore, simultaneous research efforts to understand the circumstances in which youth are choosing to use prescription drugs are also needed.

It should be noted that beyond the implications of heroin use for youth, drug injection can be especially risky for young, newly-initiated injectors, such as those who have recently transitioned from oral or intranasal prescription drug or heroin use to injection. A particularly concerning finding of this analysis is the overall prevalence of drug injection among US adolescents – 1.8% of adolescents in 2015 – which is higher than has been reported in some other studies.[49–51] Studies of young, new injectors have documented higher rates of injection-related risk behaviors such as syringe-sharing in comparison to older, more experienced drug injectors, behaviors which place youth at elevated risk for HIV and/or HCV transmission.[51–54]

Conclusions

The high rates of prescription drug misuse described in this study and the increased likelihood of engaging in heroin and/or injection drug use among youth misusing prescription drugs call for immediate prevention efforts targeting diverse groups of adolescents. This work highlights the importance of early detection and treatment of adolescent prescription drug misuse as a means of also addressing youth engagement in heroin use and injection drug use.

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Table 1

Nonmedical Prescription Drug Use, 2009–2015[a]

YRBS Year	2009 Prevalence (%) (95% CI)	2011 Prevalence (%) (95% CI)	2013 Prevalence (%) (95% CI)	2015 Prevalence (%) (95% CI)
Total	20.2 (19.5, 20.8)	20.7 (20.0, 21.3)	17.8 (17.1, 18.4)	16.8[b] (16.2, 17.4)
Boys	20.4 (19.5, 21.3)	21.5 (20.6, 22.5)	18.3 (17.4, 19.3)	17.8[b] (16.9, 18.6)
Girls	19.8 (18.9, 20.7)	19.8 (18.8, 20.7)	17.2 (16.3, 18.1)	15.6[b] (14.8, 16.5)
White	23.0 (22.1, 23.9)	22.9 (22.0, 23.8)	18.7 (17.8, 19.6)	16.5[c] (15.7, 17.3)
Black	11.8 (10.4, 13.2)	14.7 (13.2, 16.3)	13.3 (11.8, 14.9)	14.8[d] (13.3, 16.4)
Hispanic	17.2 (15.7, 18.6)	19.4 (17.9, 20.8)	19.2 (17.7, 20.6)	17.5 (16.3, 18.8)
Other	18.8 (16.5, 21.1)	18.5 (16.4, 20.6)	16.7 (14.5, 18.8)	18.6 (16.6, 20.6)
White Boys	22.8 (21.6, 24.0)	23.6 (22.3, 24.9)	19.4 (18.1, 20.7)	17.1[b] (16.0, 18.3)
White Girls	23.3 (22.0, 24.6)	22.2 (20.9, 23.5)	18 (16.8, 19.3)	15.9[b] (14.8, 17.1)
Black Boys	13.3 (11.2, 15.3)	17.5 (15.2, 19.9)	15.7 (13.4, 18.1)	18.1[d] (15.8, 20.4)
Black Girls	10.3 (8.5, 12.2)	11.9 (9.9, 14.0)	11.1 (9.1, 13.0)	10.7 (8.8, 12.7)
Hispanic Boys	17.8 (15.7, 19.8)	19.7 (17.6, 21.7)	18.5 (16.4, 20.5)	18.4 (16.6, 20.3)
Hispanic Girls	16.6 (14.6, 18.6)	19 (16.9, 21.0)	19.9 (17.8, 21.9)	16.5 (14.7, 18.3)
Other Boys	18.9 (15.6, 22.2)	18 (15.1, 21.0)	16.7 (13.6, 19.7)	17.9 (15.2, 20.7)
Other Girls	18.4 (15.1, 21.6)	19 (15.9, 22.0)	16.7 (13.7, 19.7)	18.3 (15.4, 21.2)

Note.

a: Risk behavior prevalence was calculated for the following race/ethnicity and sex subgroups: white, black, Hispanic, and other and further split by boys/girls. The 95% confidence intervals were used to identify significant differences in prevalence at each time point.

b: 2015 prevalence significantly lower (as per 95% confidence intervals) from previous years (2009 and 2011).

c: 2015 prevalence significantly lower (as per 95% confidence intervals) from all previous years (2009, 2011, 2013).

d: 2015 prevalence significantly higher (as per 95% confidence intervals) from previous year (2009).

Table 2

Heroin Use, 2009–2015[a]

YRBS Year	2009 Prevalence (%) (95% CI)	2011 Prevalence (%) (95% CI)	2013 Prevalence (%) (95% CI)	2015 Prevalence (%) (95% CI)
Total	2.5 (2.3, 2.7)	2.9 (2.6, 3.2)	2.2 (1.9, 2.4)	2.1 (1.9, 2.3)
Boys	3.2 (2.8, 3.6)	3.9 (3.4, 4.3)	2.8 (2.4, 3.2)	2.7 (2.3, 3.1)
Girls	1.7 (1.4, 2.0)	1.8 (1.5, 2.1)	1.6 (1.3, 1.9)	1.2 (1.0, 1.5)
White	2.2 (1.9, 2.5)	2.5[b] (2.2, 2.8)	1.7 (1.4, 2.0)	1.3 (1.0, 1.5)
Black	2.2 (1.6, 2.8)	2.7 (1.9, 3.4)	1.6 (1.0, 2.2)	2.7 (2.0, 3.4)
Hispanic	3.3 (2.6, 3.9)	3.3 (2.7, 4.0)	3.4 (2.8, 4.1)	2.6 (2.1, 3.1)
Other	3.2 (2.2, 4.2)	4.3 (3.2, 5.5)	2.9 (2.0, 3.9)	3.5 (2.6, 4.4)
White Boys	2.7 (2.3, 3.2)	3.4 (2.8, 3.9)	2.3 (1.8, 2.8)	1.7 (1.3, 2.1)
White Girls	1.6 (1.2, 1.9)	1.5 (1.2, 1.9)	1.1 (0.7, 1.4)	0.8 (0.6, 1.1)
Black Boys	3.6 (2.5, 4.7)	4.3 (3.0, 5.6)	2.4 (1.4, 3.4)	3.8 (2.7, 5.0)
Black Girls	0.7 (0.2, 1.2)	1.1 (0.4, 1.7)	0.8 (0.3, 1.4)	1.5 (0.7, 2.2)
Hispanic Boys	3.6 (2.6, 4.6)	4 (3.0, 5.0)	3.9 (2.9, 4.9)	3.2 (2.4, 4.1)
Hispanic Girls	2.9 (2.1, 3.8)	2.6 (1.8, 3.5)	3 (2.1, 3.9)	1.9 (1.2, 2.5)
Other Boys	4.6 (2.9, 6.4)	5.7 (3.9, 7.5)	3.4 (1.9, 4.9)	3.9 (2.5, 5.2)
Other Girls	1.5 (0.5, 2.5)	2.8 (1.5, 4.2)	2.5 (1.3, 3.8)	1.8 (0.8, 2.8)

Note.

a: Risk behavior prevalence was calculated for the following race/ethnicity and sex subgroups: white, black, Hispanic, and other and further split by boys/girls. The 95% confidence intervals were used to identify significant differences in prevalence at each time point.

b: 2011 prevalence significantly higher (as per 95% confidence intervals) from subsequent years (2013 and 2015).

Table 3

Injection Drug Use, 2009–2015[a]

YRBS Year	2009 Prevalence (%) (95% CI)	2011 Prevalence (%) (95% CI)	2013 Prevalence (%) (95% CI)	2015 Prevalence (%) (95% CI)
Total	2.1 (1.9, 2.3)	2.3 (2.0, 2.5)	1.7 (1.5, 1.9)	1.8 (1.6, 2.0)
Boys	2.7 (2.3, 3.0)	2.9 (2.5, 3.3)	2.2 (1.8, 2.5)	2.3 (2.0, 2.7)
Girls	1.4 (1.2, 1.7)	1.6 (1.3, 1.9)	1.3 (1.0, 1.5)	1.0 (0.8, 1.3)
White	1.6 (1.4, 1.9)	1.9 (1.6, 2.2)	1.5 (1.2, 1.8)	1.2 (0.9, 1.4)
Black	2.4 (1.8, 3.0)	2.4 (1.7, 3.1)	1.3 (0.8, 1.8)	2.5 (1.8, 3.2)
Hispanic	3.1 (2.5, 3.7)	2.9 (2.3, 3.5)	2.2 (1.7, 2.8)	2.2 (1.7, 2.7)
Other	2.9 (1.9, 3.9)	3 (2.1, 4.0)	2.3 (1.4, 3.1)	2.3 (1.5, 3.1)
White Boys	2.1 (1.7, 2.5)	2.3 (1.9, 2.8)	2.1 (1.6, 2.5)	1.7 (1.3, 2.1)
White Girls	1.1 (0.7, 1.4)	1.4 (1.0, 1.8)	0.9 (0.6, 1.2)	0.7 (0.4, 0.9)
Black Boys	3.5 (2.4, 4.6)	3.5 (2.3, 4.6)	1.7 (0.9, 2.6)	3.2 (2.1, 4.3)
Black Girls	1.2 (0.6, 1.8)	1.4 (0.6, 2.2)	0.8 (0.3, 1.4)	1.3 (0.6, 2.1)
Hispanic Boys	3.3 (2.4, 4.2)	3.5 (2.5, 4.5)	2.4 (1.6, 3.2)	2.8 (2.0, 3.6)
Hispanic Girls	2.9 (2.0, 3.7)	2.2 (1.4, 3.0)	2 (1.3, 2.8)	1.6 (1.0, 2.2)
Other Boys	4.5 (2.8, 6.2)	4 (2.5, 5.5)	2.7 (1.4, 4.1)	2.5 (0.5, 2.3)
Other Girls	1.1 (0.2, 1.9)	2 (0.9, 3.1)	1.8 (0.7, 2.9)	2.5 (1.4, 3.6)

Note.

[a]Risk behavior prevalence was calculated for the following race/ethnicity and sex subgroups: white, black, Hispanic, and other and further split by boys/girls. The 95% confidence intervals were used to identify significant differences in prevalence at each time point.

Table 4

Lifetime Heroin Use and Drug Injection according to Frequency of Nonmedical Prescription Drug Use, 2015

Frequency of Lifetime Nonmedical Prescription Drug Use	Lifetime Heroin Use		Lifetime Injection Drug Use	
	Odds Ratio	95% CI	Odds Ratio	95% CI
1 or more times	17.5	13.7, 22.4	14.6	11.2, 19.2
3 or more times	16.3	13.1, 20.4	16.6	13.0, 21.4
10 or more times	20.3	16.4, 25.3	22.1	17.3, 28.3
20 or more times	25.3	20.1, 31.8	26.1	20.2, 33.6
40 or more times	26.7	20.7, 34.5	30.2	23.0, 40.0