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Medical and Nonmedical Use of Prescription Benzodiazepine Anxiolytics among U.S. High School Seniors

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Abstract

Objectives—To examine the lifetime prevalence of medical and nonmedical use of prescription benzodiazepine anxiolytics among U.S. high school seniors and to assess substance use behaviors based on lifetime histories of medical and nonmedical use of prescription benzodiazepine anxiolytics.

Methods—Nationally representative samples of high school seniors were surveyed during their senior year via self-administered questionnaires. The sample consisted of 11,248 high school seniors (modal age 18 years) from five independent cohorts (2007-2011). The sample was 52% female, 65% White, 12% African-American, 15% Hispanic, and 7% other.

Results—The lifetime prevalence of medical use of prescription benzodiazepine anxiolytics was 4.9%, while the lifetime prevalence of nonmedical use was 7.5%. Although lifetime prevalence rates were relatively stable over time, there were notable sex and racial/ethnic differences in medical and nonmedical use behaviors. Among those who were ever prescribed benzodiazepine anxiolytics (n=530), approximately 40.6% reported medical use only, 27.4% reported medical use prior to nonmedical use, and 32.0% reported nonmedical use prior to medical use. The odds of substance use behaviors were greater among those who reported any history of nonmedical use relative to non-users while the odds of substance use behaviors did not differ between medical users only and non-users.

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Conclusions—One in every ten U.S. high school seniors has ever had some exposure to prescription benzodiazepine anxiolytics either medically or nonmedically. Benzodiazepine anxiolytics prescribed to adolescents should be closely monitored, safely stored, and properly disposed to reduce nonmedical use due to leftover medication and peer diversion.

Keywords

Benzodiazepines; Adolescents; Nonmedical use; Medical use; Prescription Drugs; Tranquilizers

1. Introduction

The prescribing of controlled medications (including benzodiazepine anxiolytics) nearly doubled among U.S. adolescents and young adults over the past two decades (Fortuna, Robbins, Caiola, Joynt, & Halterman, 2010). Although prescription benzodiazepine anxiolytics are highly efficacious when used properly for the treatment of anxiety disorders, one possible consequence of an increase in prescribing rates is an increase in the nonmedical use of prescription benzodiazepine anxiolytics and related consequences due to greater availability and abuse potential of these medications (Augustin, 2001; Griffiths & Wertz, 1997; Johnston, O'Malley, Bachman, & Schulenberg, 2012; Centers for Disease Control and Prevention, 2010). Notably, the past-year nonmedical use of prescription benzodiazepine anxiolytics has doubled among U.S. high school seniors over the past two decades (Johnston et al., 2012). Furthermore, the estimated number of emergency department (ED) visits involving the nonmedical use of prescription benzodiazepine anxiolytics in the U.S. nearly doubled between 2004 and 2008 (from 143,500 ED visits to 271,700 ED visits) (Centers for Disease Control and Prevention, 2010).

At least one study of secondary public school students in the Detroit metropolitan area indicates that approximately 70% of adolescents prescribed benzodiazepine anxiolytics used their controlled medications correctly as prescribed while about 30% medically used their prescribed benzodiazepine anxiolytics incorrectly (e.g., used too much, intentionally got high, or used their medication to increase other drug effects) (McCabe et al., 2011). The study also found that medical users of controlled medications were significantly more likely to report nonmedical use of prescription medications than individuals never prescribed controlled medications (McCabe et al., 2011). An earlier study of secondary public school students in the Detroit metropolitan area found that most lifetime nonmedical users of prescription benzodiazepine anxiolytics reported a history of medical use of prescription benzodiazepine anxiolytics (McCabe, Boyd, & Young, 2007). Despite findings from these small regional studies, a recent review concluded that there remains a lack of research assessing the medical and nonmedical use of prescription benzodiazepine anxiolytics in national samples of adolescents (Young, Glover, & Havens, 2012).

The transition from adolescence to adulthood represents an important time to examine medical and nonmedical use of prescription benzodiazepine anxiolytics because many individuals become responsible for their own medication management during this developmental period. Notably, adolescents serve as the leading diversion source of controlled medications for their peers and most nonmedical users of prescription

benzodiazepine anxiolytics obtain these medications for free from friends (Johnston et al., 2012; McCabe & Boyd, 2005). For example, among collegiate past-year nonmedical users who specified where they obtained prescription benzodiazepine anxiolytics, approximately 84% reported peers (e.g., friends), 14% reported family members (e.g., parent), and 2% reported other sources (e.g., drug dealer) (McCabe & Boyd, 2005). Among nonmedical users in high school who indicated where they obtained prescription benzodiazepine anxiolytics, approximately 58% indicated they were given them for free by a friend (Johnston et al., 2012).

The majority of nonmedical users of prescription benzodiazepine anxiolytics initiate their use during the transition from adolescence to adulthood (McCabe, West, Morales, Cranford, & Boyd, 2007; Substance Abuse and Mental Health Services Administration, 2012). Individuals who initiated nonmedical use of prescription benzodiazepine anxiolytics at 18 years of age or younger in the U.S. were significantly more likely to develop substance use disorders than those who initiated nonmedical use of prescription benzodiazepine anxiolytics later in life (McCabe, West, et al., 2007). To date, there are no known national studies of medical and nonmedical use of prescription benzodiazepine anxiolytics among U.S. high school students. The objectives of the present study are to 1) assess the lifetime prevalence of medical and nonmedical use of prescription benzodiazepine anxiolytics in a national sample of high school seniors; and 2) assess the associations between the history of lifetime medical and nonmedical use of prescription benzodiazepine anxiolytics and other substance use behaviors.

2. Methods

2.1 Study Design

The Monitoring the Future (MTF) study annually surveys a cross-sectional, nationally representative sample of high school seniors in approximately 125 public and private schools in the coterminous U.S., using self-administered paper-and-pencil questionnaires in classrooms. The samples analyzed in this study consisted of high school seniors from five independent cohorts (senior years 2007-2011), and the MTF study used a multi-stage sampling procedure in each year. In stage 1, geographic areas (or primary sampling units) are selected; in stage 2, schools within primary sampling units are selected (with probability proportionate to school size); and in stage 3, students within schools are selected. Corrective weighting was used in the analyses to adjust for the unequal probabilities of selection that occurred at any stage of sampling. The student response rates for high school seniors ranged from 79% to 85% between 2007 and 2011. Because so many questions are included in the MTF study, much of the questionnaire content is divided into six different questionnaire forms which are randomly distributed. This approach results in six virtually identical subsamples. Medical use of prescription benzodiazepine anxiolytics was only asked on Form 1, so this study focuses on the cross-sectional subsamples receiving Form 1 within each year cohort. Additional details about the MTF design and methods are available elsewhere (Johnston et al., 2012). Institutional Review Board approval was granted for this study by the University of Michigan Institutional Review Board Health Sciences.

2.2 Sample

The study sample included 11,248 individuals who completed questionnaires during the spring of their senior year between 2007 and 2011. The sample represented a target population that was 52% female, 65% White, 12% African-American, 15% Hispanic, and 7% other / not reported. The modal age of the individuals in the sample was 18 years of age.

2.3 Measures

The MTF study assesses a wide range of demographic characteristics, behaviors, attitudes, and values and we have selected specific measures from a larger set of questions for the present study including sex (male, female), race/ethnicity (White, African-American, Hispanic, other), high school senior cohort year (2007, 2008, 2009, 2010, 2011), school geographical region (Northeast, Midwest, South, West), metropolitan statistical areas as defined by the U.S. Census (yes, no), standard measures of substance use behaviors (e.g., binge drinking, cigarette use, medical and nonmedical use of prescription medications, marijuana and other drug use).

Medical use of prescription benzodiazepine anxiolytics was assessed by asking respondents whether they had ever taken prescription benzodiazepine anxiolytics (tranquilizers) because a doctor told them to use the medication. Respondents were informed that prescription benzodiazepine anxiolytics are sometimes prescribed by doctors to calm people down or quiet their nerves. The following were listed as examples of prescription benzodiazepine anxiolytics: Ativan®, Klonopin®, Librium®, Serax®, Valium®, Xanax®. The response options included: 1) No; 2) Yes, but I had already tried them on my own; 3) Yes, and it was the first time I took any.

Nonmedical use of prescription benzodiazepine anxiolytics was assessed by asking respondents on how many occasions (if any) in their lifetime they used prescription benzodiazepine anxiolytics (tranquilizers) on their own—that is, without a doctor telling you to take them. The response scale ranged from 1) no occasions to 7) 40 or more occasions.

Cigarette use was measured by asking respondents how frequently they smoked cigarettes during the past 30 days. The response scale ranged from 1) none to 7) 2 or more packs per day. *Binge drinking* was measured with a single item focused on the frequency of having five or more drinks in a row during the past 2 weeks. The response scale ranged from 1) none to 6) 10 or more times. *Marijuana and other drug use*—including marijuana, LSD, other psychedelics, crack cocaine, other cocaine, heroin, prescription stimulants, prescription sedatives, prescription opioids—were measured by asking respondents how many occasions (if any) they used [specified drug] in their lifetime. The response scale for these items ranged from 1) no occasions to 7) 40 or more occasions.

2.4 Data Analysis

The estimated prevalence rates for medical and nonmedical use of prescription benzodiazepine anxiolytics - across population subgroups defined by sex, race/ethnicity, and substance use behaviors - were computed using cross-tabulations incorporating the MTF sampling weights. Rao-Scott Chi-square tests of homogeneity (Rao & Scott, 1984) and

design-based logistic regression analyses, or logistic regression analyses incorporating the complex sample design features of the MTF (including the sampling weights) and the effects of these features on variance estimates (Heeringa, West, & Berglund, 2010; West & McCabe, 2012), were conducted to determine whether a lifetime history of medical and nonmedical use of prescription benzodiazepine anxiolytics was significantly associated with various substance use behaviors. The multiple logistic regression models included covariates that were significantly associated with lifetime medical and nonmedical use of benzodiazepine anxiolytics (race/ethnicity, cohort survey year, school geographical region, and metropolitan statistical area status of the school); sex and age were initially tested as possible covariates, and the relationships of these demographic factors with the use outcomes were not found to be significant. Each of these covariates was treated as a categorical factor in the logistic regression models. The following five mutually exclusive lifetime subgroups were compared in the analyses: 1) no medical or nonmedical use, 2) medical use only, 3) medical use prior to nonmedical use, 4) nonmedical use prior to medical use, and 5) nonmedical use only. Estimated (linearized) variances of weighted estimates were multiplied by an average MTF design effect factor prior to the construction of confidence intervals (West & McCabe, 2012), and weighted Pearson chi-square statistics were divided by this same design effect factor (Rao & Scott, 1984) per the recommendation of Johnston and colleagues (Johnston et al., 2012). All statistical analyses were performed using commands for the analysis of complex sample survey data in the Stata software (version 12.1; StataCorp).

3. Results

Approximately 9.7% of U.S. high school seniors had some lifetime exposure to prescription benzodiazepine anxiolytics either medically or nonmedically between 2007 and 2011. The estimated lifetime prevalence of medical use of prescription benzodiazepine anxiolytics was 4.9%, while the estimated lifetime prevalence of nonmedical use of prescription benzodiazepine anxiolytics was 7.5%. Across the five study cohorts, the estimated lifetime prevalence of medical use of prescription benzodiazepine anxiolytics was 5.3% in 2007, 6.0% in 2008, 4.4% in 2009, 3.9% in 2010, and 5.0% in 2011, while the lifetime prevalence of nonmedical use of prescription benzodiazepine anxiolytics was 8.2% in 2007, 7.9% in 2008, 7.2% in 2009, 6.5% in 2010, and 7.7% in 2011. None of these changes were significant, suggesting that the lifetime prevalence rates were relatively stable over time.

As illustrated in Table 1, there were a few sex differences in lifetime medical and nonmedical use of prescription benzodiazepine anxiolytics. Women had higher rates of lifetime exposure to prescription benzodiazepine anxiolytics either medically or nonmedically. For example, the lifetime prevalence of any medical use of prescription benzodiazepine anxiolytics was 5.6% among women and 3.9% among men while the lifetime prevalence of nonmedical use was 8.1% among women and 6.4% among men. Among those who were ever prescribed benzodiazepine anxiolytics in their lifetime ($n=530$), approximately 40.6% reported medical use only, 27.4% reported medical use prior to nonmedical use, and 32.0% reported nonmedical use prior to medical use.

As illustrated in Table 2, there were notable racial/ethnic differences with respect to the history of medical and nonmedical use of prescription benzodiazepine anxiolytics. White students had higher rates of both medical and nonmedical use compared to African-Americans and Hispanics, and correspondingly lower rates of non-use. For example, the estimated lifetime prevalence of any medical use was 6.0% among White students, 1.7% among African-Americans and 3.5% among Hispanics ($p < 0.001$) while the lifetime prevalence of nonmedical use was 8.2% among White students, 1.7% among African-Americans and 5.5% among Hispanics ($p < 0.001$).

Bivariate analyses were used to initially examine the associations among lifetime medical and nonmedical use of prescription benzodiazepine anxiolytics and other substance use behaviors (see Table 3). Rao-Scott Chi-square tests revealed significant associations between lifetime history of prescription benzodiazepine anxiolytic use and each measure of substance use ($p < 0.001$). Multiple logistic regression results reinforced the bivariate findings; the odds of reporting substance use were considerably higher among individuals who reported any lifetime nonmedical use after adjusting for relevant covariates, including race/ethnicity, cohort survey year, school geographical region, and metropolitan statistical area status of the school (see Table 4). The prevalence of various substance use behaviors among individuals who reported nonmedical use prior to medical use was generally similar to individuals who reported lifetime nonmedical use only. In contrast, individuals who reported only lifetime medical use of prescription benzodiazepine anxiolytics reported similar odds of substance use behaviors as individuals who reported no lifetime medical use or nonmedical. Finally, most of the odds of individuals who reported medical use prior to nonmedical use were significantly greater than those who reported no lifetime medical or nonmedical use, but considerably lower than those who reported only lifetime nonmedical use or those who reported nonmedical use prior to medical use. For example, after adjusting for the covariates, the odds of marijuana use were over ten times greater among participants who endorsed nonmedical use prior to medical use (AOR = 10.7, 95% CI = 6.8, 16.6, $p < 0.001$) and nonmedical use only (AOR = 13.7, 95% CI = 10.4, 18.0, $p < 0.001$), over two times greater among participants who endorsed medical use prior to nonmedical use (AOR = 2.4, 95% CI = 1.2, 4.5, $p < 0.01$), and did not differ between those who reported medical use only relative to individuals who reported no lifetime medical and nonmedical use of benzodiazepine anxiolytics.

The associations among lifetime medical and nonmedical use of prescription benzodiazepine anxiolytics and specific diversion sources were also examined (results not shown). We found that across these five MTF study cohorts, an estimated 63.9% of nonmedical users of prescription benzodiazepine anxiolytics (95% CI = 58.9%, 68.7%) had obtained these controlled medications for free from a friend or relative. The results indicated that the leading diversion sources differed as a function of history of lifetime medical and nonmedical use of prescription benzodiazepine anxiolytics. For example, across these five MTF cohorts, of those who reported nonmedical use prior to medical use, an estimated 71.0% reported nonmedical use with prescription benzodiazepine anxiolytics they had bought from a friend, relative, drug dealer or stranger. Next, of those who reported nonmedical use only, an estimated 66.9% reported nonmedical use with prescription

benzodiazepine anxiolytics they were given for free from a friend or relative. Finally, of those who reported medical use prior to nonmedical use, an estimated 64.5% reported nonmedical use with the prescription benzodiazepine anxiolytics they had been previously prescribed.

4. Discussion

This study found that nearly one in every ten U.S. high school seniors had some lifetime exposure to prescription benzodiazepine anxiolytics either medically or nonmedically between 2007 and 2011. We found that approximately one in every twenty (4.9%) high school seniors reported medical use of prescription benzodiazepine anxiolytics at least once in their lifetime, while about one in every thirteen (7.5%) high school seniors reported nonmedical use of prescription benzodiazepine anxiolytics. The lifetime prevalence rate of nonmedical use of prescription benzodiazepine anxiolytics in the present study remained relatively stable over time and was similar to other national studies of adolescents and young adults (SAMHSA, 2012; McCabe, 2005). For example, the lifetime prevalence of nonmedical prescription benzodiazepine anxiolytic use in a national study of 10,904 U.S. college students was 7.8% (McCabe, 2005). The lifetime prevalence of medical use of prescription benzodiazepine anxiolytics found in the present study was lower than smaller regional-based studies. For example, a study conducted in the Detroit metropolitan area found that 7.3% of high school students reported lifetime medical use of prescription benzodiazepine anxiolytics (McCabe et al., 2007).

One important contribution of this study was the sex and racial/ethnic differences found with respect to medical and nonmedical use of prescription benzodiazepine anxiolytics. The results of this study indicated that women and White students were significantly more likely than their peers to report medical and nonmedical use of prescription benzodiazepine anxiolytics. In this national study, sex and racial/ethnic differences found in nonmedical use may be influenced by the sex and racial/ethnic differences in medical availability, especially since we found that two-thirds of high school seniors who reported a history of medical use prior to nonmedical use obtained these medications from their own previous prescription. Furthermore, peers serve as the leading source of diversion among adolescents, which could have further contributed to the sex and racial/ethnic differences found in this study (Johnston et al., 2012; McCabe & Boyd, 2005).

The findings of the present study have several important implications for clinical practice. We found that the majority of U.S. high school seniors who were ever prescribed benzodiazepine anxiolytics also reported a lifetime history of nonmedical use of prescription benzodiazepine anxiolytics. Indeed, we found that more high school seniors reported nonmedical use of prescription benzodiazepine anxiolytics than medical use of prescription benzodiazepine anxiolytics in their lifetime which differs from a small regional study of high school students (McCabe et al., 2007). In addition, the present study found that the majority of nonmedical users of prescription benzodiazepine anxiolytics had obtained these controlled medications for free from a friend or relative which is consistent with other studies indicating the leading diversion source of prescription benzodiazepine anxiolytics for nonmedical use among adolescents and young adults are friends or relatives, with no cost

involved (Johnston et al., 2012, McCabe et al., 2011; SAMHSA, 2012). Interestingly, we found that about 65% of nonmedical users of prescription benzodiazepine anxiolytics with an earlier history of medical use had obtained and used prescription benzodiazepine anxiolytics from their own previous prescription. Taken together, these findings suggest that prescription benzodiazepine anxiolytics should be carefully prescribed, closely monitored, safely stored, and properly disposed to reduce diversion between peers and subsequent nonmedical use of leftover medication.

A unique contribution of this study was that individuals who reported medical use of prescription benzodiazepine anxiolytics without a history of nonmedical use of prescription benzodiazepine anxiolytics were not at increased risk for substance use behaviors (e.g., cigarette smoking, binge drinking, marijuana and other drug use) compared to their peers who had no lifetime exposure to prescription benzodiazepine anxiolytics either medically or nonmedically (i.e., non-users). Although this finding should provide some reassurance to clinicians that prescription benzodiazepine anxiolytics can be safely prescribed to adolescents, at least one previous study of secondary public school students in the Detroit metropolitan area indicates that about 30% medically used their prescribed benzodiazepine anxiolytics incorrectly by using too much, intentionally getting high with their medication, or using their medication to increase other drug effects (McCabe et al., 2011). In addition, the present study found that substance use behaviors were much more prevalent among individuals who reported any history of nonmedical use of prescription benzodiazepine anxiolytics as compared to non-users. Prescribers are encouraged to screen patients for any history of nonmedical use of prescription benzodiazepine anxiolytics and other substance abuse problems when assessing the risk for misusing and diverting controlled medications. Interestingly, the prevalence of substance use behaviors among individuals who endorsed medical use prior to nonmedical use fell between non-users and among individuals who reported any history of initiating nonmedical use of prescription benzodiazepine anxiolytics. These results suggest that adolescents prescribed benzodiazepine anxiolytics should be closely monitored, because we estimate that more than one in every four high school seniors ever prescribed benzodiazepines reported starting nonmedical use after initiating medical use during these five years. Individuals with a legitimate need for prescription benzodiazepine anxiolytics who have a history of medical misuse, nonmedical use, or other substance abuse problems should not be denied these medications. Instead, careful prescribing, close monitoring and consultation with an addictionologist should be considered for such individuals.

This study has noteworthy strengths, including the analysis of self-administered survey data collected from a large national sample of U.S. high school seniors from public and private high schools. Further, this study represents the first attempt to assess the lifetime prevalence of medical and nonmedical use of prescription benzodiazepine anxiolytics nationally among adolescents. Despite these strengths, the results of our analyses should be tempered by some methodological limitations that should be considered. First, since the present study consists of secondary analyses, the survey items in the MTF limited the variables that were examined in some cases. For example, medical use of benzodiazepine anxiolytics was only assessed for the lifetime timeframe and the list of prescription benzodiazepine anxiolytics (i.e., Ativan®, Klonopin®, Librium®, Serax®, Valium®, Xanax®) that appeared in the MTF

survey also included a muscle relaxant medication (i.e., Soma®) which represented limitations in the present study given the focus on benzodiazepine anxiolytics. Fortunately, the MTF study also contains additional questions which ask individuals about the specific medications they have used to help identify those who have used Soma® only versus prescription benzodiazepine anxiolytics. Using these additional questions, only seven individuals were identified out of 11,248 high school seniors from five independent cohorts (2007-2011) who used Soma® only. All of the analyses in the present study were conducted with and without these seven individuals and there were no changes in significance levels for any of the findings. Second, the results cannot be generalized to all adolescents because this sample only included high school seniors and did not include individuals who had dropped out of school or were not present in school on the day of survey administration. Third, the data are subject to potential bias introduced when assessing sensitive behaviors via self-report surveys administered in a school setting. Finally, the cross-sectional nature of the study presented some limitations; longitudinal studies are needed with more diverse age groups of adolescents and measures of current use to examine patterns of medical and nonmedical use of prescription benzodiazepine anxiolytics.

In conclusion, we found that nearly one in every ten U.S. high school seniors had some lifetime exposure to prescription benzodiazepine anxiolytics either medically or nonmedically. The findings of the present study should be treated very seriously by prescribers and parents; we found that there were more nonmedical users of benzodiazepine anxiolytics than medical users of benzodiazepine anxiolytics, presumably due in large part to leftover medications and peer diversion. Indeed, this study indicates that the quantity of prescription benzodiazepine anxiolytics prescribed to adolescents should be closely monitored, safely stored, and properly disposed to reduce subsequent nonmedical use due to leftover medication and peer diversion.

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Highlights

- We examined medical and nonmedical use of prescription benzodiazepines in the U.S.
- One in every ten adolescents had lifetime exposure to prescription benzodiazepines.
- Women and White students had the highest exposure to prescription benzodiazepines.
- Any history of nonmedical use can be used to identify high risk for substance abuse.

Weighted prevalence estimates of medical and nonmedical use of prescription benzodiazepine anxiolytics among U.S. high school seniors by sex, 2007 to 2011

Table 1

Lifetime medical and nonmedical use of benzodiazepine anxiolytics	Overall (N = 11,241) % (95% CI)	Male (n = 5,135) % (95% CI)	Female (n = 5,624) % (95% CI)	Missing (n = 482) % (95% CI)	Sex differences <i>p-value</i> *
No medical or nonmedical use	90.4 (89.6, 91.2)	92.0 (90.9, 93.0)	89.5 (88.4, 90.6)	83.7 (78.9, 88.4)	< 0.001
Medical use only	2.0 (1.6, 2.4)	1.6 (1.1, 2.1)	2.4 (1.8, 2.9)	2.0 (0.2, 3.8)	NS
Medical use prior to nonmedical use	1.3 (1.0, 1.6)	0.9 (0.5, 1.2)	1.6 (1.1, 2.1)	3.0 (0.8, 5.1)	< 0.01
Nonmedical use prior to medical use	1.6 (1.2, 1.9)	1.4 (1.0, 1.9)	1.6 (1.2, 2.1)	2.5 (0.5, 4.5)	NS
Nonmedical use only	4.7 (4.2, 5.3)	4.1 (3.4, 4.9)	4.9 (4.1, 5.6)	9.0 (5.3, 12.6)	<0.01

* NOTE: Sample sizes due not sum to full sample size due to 482 missing values on sex. Uncorrected Pearson chi-square statistics adjusted using a generalized design effect of 2.0 (Rao and Scott, 1984). Estimates are weighted using the MTF survey weights. 95% confidence intervals computed using linearized estimates of the standard errors for the weighted estimates, and the adjustment method of West and McCabe (2012), with an average MTF design effect of 2.0.

Table 2

Weighted prevalence estimates of medical and nonmedical use of prescription benzodiazepine anxiolytics among U.S. high school seniors by race/ethnicity, 2007 to 2011

Lifetime medical and nonmedical use of benzodiazepine anxiolytics	White (n = 6,559) % (95% CI)	Black (n = 1,285) % (95% CI)	Hispanic (n = 1,588) % (95% CI)	Other/Missing (n = 1,809) % (95% CI)	Racial/ethnic differences <i>p</i>-value[*]
No medical or nonmedical use	88.3 (87.2, 89.4)	97.7 (96.5, 98.9)	93.2 (91.5, 95.0)	90.6 (88.6, 92.5)	< 0.001
Medical use only	2.6 (2.0, 3.1)	0.6 (0.0, 1.2)	1.4 (0.5, 2.2)	1.4 (0.6, 2.2)	< 0.01
Medical use prior to nonmedical use	1.6 (1.2, 2.1)	0.7 (0.1, 1.4)	0.9 (0.2, 1.5)	1.1 (0.4, 1.7)	NS
Nonmedical use prior to medical use	1.8 (1.3, 2.3)	0.4 (0.0, 1.0)	1.2 (0.4, 1.9)	1.9 (1.0, 2.8)	< 0.05
Nonmedical use only	5.7 (4.9, 6.5)	0.6 (0.0, 1.2)	3.4 (2.1, 4.7)	5.1 (3.6, 6.6)	< 0.001

* NOTE: Sample sizes due not sum to full sample size due to 1,809 missing values on race / ethnicity for these five cohorts. Uncorrected Pearson chi-square statistics adjusted using a generalized design effect of 2.0 (Rao and Scott, 1984). Estimates are weighted using the MTF survey weights. 95% confidence intervals computed using linearized estimates of the standard errors for the weighted estimates, and the adjustment method of West and McCabe (2012), with an average MTF design effect of 2.0.

Table 3

Weighted prevalence estimates of substance use behaviors as a function of medical and nonmedical use of prescription benzodiazepine anxiolytics, 2007 to 2011

Lifetime medical and nonmedical use of benzodiazepine anxiolytics	Any cigarette smoking in the past 30 days % (95% CI)	Any binge drinking in the past 2 weeks % (95% CI)	Any marijuana use in lifetime % (95% CI)	Any illicit drug use other than marijuana in lifetime % (95% CI)	Any nonmedical use of other prescription medications in lifetime % (95% CI)
No medical or nonmedical use	16.9 (15.9, 18.0)	16.7 (15.7, 17.8)	7.0 (6.3, 7.7)	6.9 (6.2, 7.6)	12.0 (11.0, 12.9)
Medical use only	14.4 (7.9, 20.8)	16.5 (9.5, 23.4)	5.2 (1.1, 9.3)	13.0 (6.7, 19.3)	17.7 (10.6, 24.8)
Medical use prior to nonmedical use	30.2 (19.7, 40.7)	23.8 (13.9, 33.7)	15.6 (7.4, 23.9)	37.0 (25.7, 48.2)	56.3 (44.9, 67.7)
Nonmedical use prior to medical use	63.5 (53.2, 73.7)	53.4 (42.6, 64.3)	43.8 (33.3, 54.3)	59.3 (48.7, 69.8)	81.0 (72.7, 89.4)
Nonmedical use only	64.4 (58.5, 70.2)	51.6 (45.5, 57.7)	50.7 (44.7, 56.7)	61.3 (55.3, 67.3)	81.2 (76.4, 86.0)

NOTE: Rao-Scott Chi-square tests of homogeneity adjusted using a generalized design effect of 2.0 (Rao and Scott, 1984) were conducted to determine whether history of medical and nonmedical use of prescription benzodiazepine anxiolytics was significantly associated with each substance use behavior and all tests were significant with $p < 0.001$.

Estimates are weighted using the MTF survey weights, and standard errors for parameter estimates are design-adjusted using the method of West and McCabe (2012).

Binge drinking in the past 2 weeks was defined as consuming five or more drinks in a row.

Any illicit drug use other than marijuana included LSD, other psychedelics, crack cocaine, other cocaine, or heroin.

Any nonmedical use of other prescription medications included stimulants, sedatives, or opioids.

Table 4

Estimated relationships of medical and nonmedical use of prescription benzodiazepine anxiolytics with the odds of substance use behaviors based on logistic regression analyses, 2007 to 2011

Lifetime medical and nonmedical use of benzodiazepine anxiolytics	Any cigarette smoking in the past 30 days	Any binge drinking in the past 2 weeks	Any marijuana use in lifetime	Any illicit drug use other than marijuana in lifetime	Any nonmedical use of other prescription medications in lifetime
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
No medical or nonmedical use	Reference	Reference	Reference	Reference	Reference
Medical use only	0.8 (0.4-1.3)	0.9 (0.5-1.4)	0.7 (0.3-1.6)	1.9 (1.1-3.4)*	1.4 (0.9-2.4)
Medical use prior to nonmedical use	2.0 (1.2-3.4)**	1.4 (0.8-2.5)	2.4 (1.2-4.5)**	7.9 (4.7-13.0)***	9.0 (5.6-14.5)***
Nonmedical use prior to medical use	8.1 (5.1-12.8)***	5.6 (3.5-8.9)***	10.7 (6.8-16.6)***	19.1 (12.1-30.1)***	30.0 (17.3-52.1)***
Nonmedical use only	8.2 (6.3-10.8)***	4.8 (3.7-6.3)***	13.7 (10.4-18.0)***	20.6 (15.6-27.4)***	30.0 (21.6-41.9)***
	10933	10793	11079	10598	10895

The reference group is no medical or nonmedical use.

Sample sizes for the regression models ranged from 10,598 (any illicit drug use other than marijuana) to 11,079 (any marijuana use) due to missing data.

Binge drinking in the past 2 weeks was defined as consuming five or more drinks in a row.

Any illicit drug use other than marijuana included LSD, other psychedelics, crack cocaine, other cocaine, or heroin.

Any nonmedical use of other prescription medications included stimulants, sedatives, or opioids.

Multivariate logistic regression adjusting for race/ethnicity, cohort survey year, school geographical region, and standard metropolitan statistical areas.

Estimates are weighted using the MTF survey weights, and standard errors for parameter estimates are design-adjusted using the method of West and McCabe (2012).

* p < 0.05

** p < 0.01

*** p < 0.001.