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Medical Use, Medical Misuse, and Nonmedical Use of Prescription Opioids: Results from a Longitudinal Study

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Abstract

Objective—To examine the prevalence and patterns associated with past-year medical use, medical misuse, and nonmedical use of prescription opioids (NMUPO) among adolescents over a two-year time period and to examine substance abuse, sleeping problems, and physical pain symptoms associated with these patterns of medical use, medical misuse, and NMUPO.

Design—A Web-based survey was self-administered by a longitudinal sample of 2,050 middle and high school students in 2009–2010 (Year 1) and again in 2010–2011 (Year 2).

Setting—Two southeastern Michigan school districts.

Participants—The longitudinal sample consisted of 50% females, 67% Whites, 28% African-Americans, and 5% from other racial/ethnic categories.

Main Outcome Measures—Past-year medical use, medical misuse, and NMUPO.

Results—Of those reporting appropriate medical use of prescription opioids in Year 1, approximately 34% continued medical use in Year 2. Of those reporting past-year NMUPO in Year 1, approximately 25% continued NMUPO in Year 2. Appropriate medical use and NMUPO for pain relief was more prevalent among girls than boys. Multiple logistic regression analyses indicated that the odds of a positive screen for substance abuse in Year 2 were greater for adolescents who reported medical misuse or NMUPO for non-pain relief motives in Year 1 compared with those who did not use prescription opioids.

Conclusions—The findings indicate an increased risk for substance abuse among adolescents who report medical misuse or NMUPO for non-pain relief motives over time. The findings have important clinical implications for interventions to reduce medical misuse and NMUPO among adolescents.

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Introduction

There has been an increase in the prescribing of opioids among adolescents and young adults in the United States over the past two decades.^{1–3} Recent research suggests that approximately four in every five adolescents who were prescribed opioids in the past year used their medications appropriately while the remaining 20% misused their own medications which consisted predominantly of “using too much” with fewer reporting “intentionally getting high.”⁴ Appropriate medical use of prescription opioids was not associated with an increased risk for substance abuse while medical misuse was associated with an increased risk for substance abuse.⁴ Based on the lack of longitudinal research, there is a need to examine the patterns associated with medical use and misuse of prescription opioids over time among adolescents.

The *National Survey on Drug Use and Health (NSDUH)* indicates that two million people aged 12 or older in the United States initiated nonmedical use of prescription opioids (NMUPO) within the past year.⁵ The *NSDUH* defined NMUPO as the use of prescription pain relievers that were not prescribed for you or that you took for the experience or feeling they caused.⁵ The estimated number of emergency department visits involving prescription opioids more than doubled between 2004 and 2008 for patients younger than 21 years of age.⁶ Although there have been recent advances in the understanding of prescription opioid use and misuse among adolescents, considerable gaps in knowledge remain due to limitations in measures and study designs. For instance, many existing studies such as the *NSDUH* often fail to distinguish between (1) individuals who use someone else’s prescription opioids one time to relieve physical pain; (2) individuals who use someone else’s prescription opioids daily to get high; (3) individuals who use their own prescription opioids appropriately for the feeling they caused; and (4) those who misuse their own prescription opioids daily to get high. As a result, these individuals are often combined in national estimates of NMUPO. In order to improve existing knowledge and develop more effective intervention efforts, a more nuanced understanding of NMUPO is needed which takes into account motivations for NUPO and whether an individual has been prescribed opioids and used them appropriately.

For this study, medical use of prescription opioids refers to the appropriate use of these medications prescribed by a doctor, dentist, or nurse. Medical misuse of prescription opioids refers to engaging in behaviors not intended by the prescriber such as using too much or intentionally getting high. NMUPO refers to the non-prescribed use of these medications. Despite the cross-sectional studies regarding NMUPO and medical misuse of prescription opioids, there remains a lacuna of knowledge regarding the patterns of these risky behaviors over time among adolescents. The aims of this longitudinal study were to assess the prevalence and patterns associated with medical use, medical misuse of prescription opioids, and NMUPO among secondary school students over a two-year time period, and to examine the substance use behaviors, sleeping problems, and physical pain associated with these patterns.

Methods

This study was conducted during a 17-month period between December 2009 and April 2011, drawing on the entire population of middle and high school students attending two public school districts in the Detroit metropolitan area. The study received approval from the University of Michigan Institutional Review Board and a certificate of confidentiality was obtained from the National Institutes of Health. All parents in the school districts were sent letters requesting permission for their children to participate in the Secondary Student Life Survey (SSLS), explaining that participation was voluntary, describing the relevance of the

study, and assuring that all responses would be kept confidential. The SSLS was maintained on a hosted secure Internet site running under the secure sockets layer protocol to insure safe transmission of data.

The SSLS was used to collect data at both Year 1 and Year 2. The SSLS assesses demographic characteristics and adolescent problem behaviors (e.g. bullying, gambling, etc.), and also includes items from several national studies of alcohol and other drug use.^{5,7} The Youth Self Report questionnaire (YSR)⁸ is a widely used self-report instrument measuring childhood behavioral problems and was embedded in the SSLS to collect data about sleeping problems and physical pain symptoms.

Medical use of prescription opioids was measured using the following question: “The following questions are about the use of prescribed medicines. We are not interested in your use of over-the-counter medicines that can be bought in drug or grocery stores without a prescription, such as aspirin, Sominex®, Benadryl®, Tylenol PM®, cough medicine, etc. On how many occasions in the past 12 months has a doctor, dentist, or nurse prescribed the following types of medicine for you?” A separate question was asked for six different classes of prescription medications including “Prescribed pain medication (e.g., opioids such as Vicodin®, OxyContin®, Tylenol 3® with codeine, Percocet®, Darvocet®, morphine, hydrocodone, oxycodone).” The response scale ranged from (1) 0 occasions to (7) 40 or more occasions.

Medical misuse of prescription opioids was assessed by asking about the following behaviors as they relate to prescribed use of opioid medications: 1) “On how many occasions (if any) in the past 12 months have you...a) ...used too much (e.g., higher doses, more frequent doses) of your prescribed medication?” b) “...intentionally gotten high with your prescribed medication or used it to increase other drug or alcohol effects?” The response scale was identical to that for medical use of prescription opioids.

Nonmedical use of prescription opioids (NMUPO) was assessed with the following question: “On how many occasions in the past 12 months have you used the following types of medicines, not prescribed to you? Pain medication (e.g., opioids such as Vicodin®, OxyContin®, Tylenol 3® with codeine, Percocet®, Darvocet®, morphine, hydrocodone, oxycodone).” The response scale was identical to that for medical use of prescription opioids.

Motives for NMUPO were assessed by asking students who reported NMUPO to respond to the following statement: “Please provide the reason(s) why you used pain medication not prescribed to you?” Respondents were asked to select all that apply from a list of nine motives based on previous research (e.g., relieve pain, experimentation, get high, help sleep, decrease anxiety, counteract the effects of other drugs, safer than street drugs, addicted, other).^{9–12}

Prescription opioid use behaviors were assessed with the following mutually exclusive five-category measure based on past-year medical use, medical misuse, and motives for NMUPO: 1) no medical or NMUPO, 2) medical use only, 3) medical misuse only, 4) NMUPO for pain relief only, 5) NMUPO for non-pain relief.

The *Drug Abuse Screening Test, Short Form (DAST-10)* is a self-report instrument that can be used in clinical and non-clinical settings to screen for probable drug abuse or dependence on a wide variety of substances other than alcohol.¹³ Respondents were asked whether they had experienced ten drug-related problems in the past 12 months. If a respondent positively endorsed three or more DAST-10 items, this was considered a “positive” screening test result denoting risk for probable drug abuse or dependence.^{13–15} The DAST-10 has been

shown to have good reliability, concurrent validity, and temporal stability and identifies individuals who need more intensive assessment for substance abuse problems.^{14,16} In addition, the DAST-10 was evaluated using DSM-IV drug use disorder diagnosis as the criterion and found levels of sensitivity and specificity of .70 and .80, respectively, when using a cutpoint of three.¹⁷ Cronbach's alpha for the DAST-10 items in the present study for Year 2 was 0.96 (n=424). Based on the objectives of the present study, we also considered DAST results without the item regarding "non-medical reasons" for drug use resulting in nine DAST items. Based on previous research, if a respondent positively endorsed two or more DAST-9 items, this was considered a "positive" screening test result.¹³⁻¹⁵ Cronbach's alpha for the DAST-9 items in the present study for Year 2 was 0.96 (n=424).

The *CRAFFT* is a brief self-report alcohol and other drug screening test developed specifically for adolescents.¹⁸ *CRAFFT* is a mnemonic based on the six yes/no questions. The *CRAFFT* has acceptable reliability ($\alpha = .79$) and is highly correlated ($r = 0.84$) with the Personal Involvement with Chemicals Scale (PICS).¹⁸ A score of 2 or higher on the *CRAFFT* had sensitivity and specificity of 0.80 and 0.86, respectively, for detecting any substance abuse or dependence; similarly, a score of 2 or higher had sensitivity and specificity of 0.92 and 0.80, respectively, for detecting substance dependence.¹⁹

Sleeping problems were assessed with the following YSR item: "I have trouble sleeping" in the past six months. The response scale ranged from (1) not true to (3) very true or often true. Consistent with previous research, sleeping problems were defined as responses of "somewhat or sometimes true" or "very true or often true."²⁰

Physical pain symptoms were assessed with the following three YSR items: "headache," "stomach aches," or "aches and pains (not stomach or headaches)" in the past six months. The response scale and coding scheme was identical to that for sleeping problems.

All analyses focused on the sample of students responding to the survey in both years ($n = 2,050$). Demographic characteristics of this sample and prescription opioid use behaviors in Year 1 were described using simple frequency tables. Pearson chi-square analyses were used to test bivariate associations between prescription opioid use behaviors in Year 1 and selected past-year behaviors at Year 2. Finally, logistic regression models were used to examine differences between the five groups defined by Year 1 prescription opioid use behaviors in the odds of selected health-related outcomes in Year 2, controlling for sex, race/ethnicity, school district, and grade level. Additional models controlled for indicators of the same outcomes in Year 1 to examine whether any differences between the five groups remained after accounting for past outcomes. All analyses were conducted using the SPSS software (Version 20).

Results

The final response rate for students in 7th – 11th grade in year 1 was 62.3%. Of those in 7th – 11th grade who participated in year 1, 89.3% also participated at year 2, which compares favorably with *The Monitoring the Future* national longitudinal school-based survey of substance use among high school seniors in the United States.⁷ As illustrated in Table 1, the longitudinal sample consisted of 2,050 middle and high school students (50% female and 50% male). The racial/ethnic distribution of the sample was 66.9% White, 27.9% Black, and 5.2% from other racial/ethnic categories. Attrition analyses compared those who participated at both years with those who participated in year 1 but not year 2. Results showed that retention rates were very similar for females (89.6%) and males (89.0%). There was a statistically significant association between race/ethnicity and attrition status, and retention was higher among Whites, Asians, and Hispanics (94.0%, 92.7%, and 92.6%, respectively)

compared to Blacks and Native Americans (79.5% and 70.0%, respectively), $\chi^2(4) = 111.4$, $p < .05$.

As illustrated in Table 2, approximately 84% of respondents reported no past-year medical use of prescription opioids or NMUPO at Year 1 while 11% reported only past-year medical use or misuse of prescription opioids and 5% reported any past-year NMUPO in Year 1. Of those reporting any past-year medical use of prescription opioids in Year 1, we found that approximately 20% reported past-year medical *misuse* of prescription opioids consisting of using too much, intentionally getting high, or using to increase alcohol or other drug effects. Among those reporting any past-year NMUPO in Year 1, we found that approximately 76% ($n=72$) reported past-year NMUPO for pain relief only while 24% ($n=23$) reported past-year NMUPO for non-pain relief motives. We found no racial differences in the prevalence of medical use, medical misuse, and NMUPO but there were significant gender associations ($\chi^2 = 54.3$, $df = 4$, $p < 0.001$). In particular, no past-year medical use or NMUPO was more prevalent among boys (78.0% girls vs. 90.0% boys) while past-year medical use only of prescription opioids (12.9% girls vs. 5.2% boys), and past-year NMUPO for pain relief only (5.3% girls vs. 2.2% boys) were more prevalent among girls.

As illustrated in Table 3, among those reporting *no* past-year medical use of prescription opioids or NMUPO in Year 1, approximately 10.5% reported past-year medical use of prescription opioids in Year 2 while 3% reported NMUPO in Year 2. Of those reporting only appropriate past-year medical use in Year 1, approximately 35% continued to report past-year medical use in Year 2 while 8% reported medical *misuse* of prescription opioids in Year 2. The chi-square test results presented in Table 3 indicate strong bivariate associations between the type of prescription opioids use in Year 1 and subsequent Year 2 outcomes. Additional bivariate analyses revealed no significant differences in Year 2 outcomes shown in Table 3 between medical misusers who reported only “using too much” ($n=20$) and those medical misusers who reported any “intentionally getting high or using to increase alcohol or other drug effects” ($n=20$) in Year 1 (results not shown).

As illustrated in Table 4, the bivariate associations between past-year medical and nonmedical use of prescription opioids status in Year 1 (2009–2010) and substance use, probable substance abuse, sleeping problems, and physical pain in Year 2 (2010–2011) were examined using chi-square analysis and revealed significant associations for all outcomes ($p < .001$). For example, the past-year prevalence of experiencing two or more DAST-9 items in Year 2 was 6.5% among past-year nonusers, 9.7% for past-year medical users of prescription opioids, 22.5% for past-year medical misusers only, 11.1% for past-year nonmedical users for pain relief only and 39.1% for past-year nonmedical users for non-pain relief motives ($p < .001$).

Additional analyses were conducted examining Year 2 outcomes shown in Table 4 between medical misusers who reported only “using too much” ($n=20$) and those medical misusers who reported any “intentionally getting high or using to increase alcohol ” ($n=20$) in Year 1 (results not shown). Although the subgroups were too small to conduct multivariate analysis, the bivariate results indicated medical misusers who reported only “using too much” reported considerably lower prevalence rates than medical misusers who reported “intentionally getting high” of Year 2 substance abuse based on the DAST-9 (5% vs. 40%, $p < 0.01$), DAST-10 (5% vs. 40%, $p < 0.01$) and CRAFFT (15% vs. 60%, $p < 0.01$) but no differences in sleeping problems or physical pain.

As illustrated in Table 5, the logistic regression results supported the bivariate findings. The odds of a positive screen for lifetime and past-year substance abuse in Year 2 did not differ significantly between past-year appropriate medical users and past-year nonusers of

prescription opioids after adjusting for sex, race/ethnicity, school district, and grade level. Similarly, the odds of a positive screen for lifetime and past-year substance abuse in Year 2 did not differ significantly between past-year nonmedical users for pain relief only and past-year nonusers. In contrast, the odds of a positive screen for lifetime and past-year substance abuse in Year 2 among past-year medical misusers were three to five times greater than past-year nonusers. In Year 2, the odds of a positive screen for lifetime and past-year substance abuse among past-year nonmedical users for non-pain relief motives were six to nine times greater than past-year nonusers.

The odds of sleeping problems in Year 2 were greater among medical users, nonmedical users for pain relief only, and nonmedical users for non-pain relief as compared to nonusers. The odds of physical pain in Year 2 were higher among medical users, nonmedical users motivated by pain relief only, and medical misusers as compared to nonusers. Finally, we examined potential gender interactions and found no significant associations with the following exception: the effect of medical use only on past 6-month sleeping problems at Year 2 is much larger and significantly more positive for males than for females.

Discussion

This study represents the first attempt to examine the longitudinal patterns associated with past-year medical use and misuse of prescription opioids, and NMUPO among secondary school students. More than a third of adolescents who reported medical use of prescription opioids in Year 1 continued to report such behavior in Year 2. Previous cross-sectional work has shown that appropriate medical use of prescription opioids was not associated with an increased risk for drug abuse while medical misuse was associated with an increased risk for drug abuse.⁴ In the present study, we found that medical users and non-users in Year 1 had notable differences in the prevalence of adverse health behaviors in Year 2; these appear clinically significant, representing several-fold increases in the risk of adverse health behaviors such as NMUPO and substance abuse. While the present study was under-powered to detect some of these differences between medical users and non-users as statistically significant, it is important to note that such differences could represent important public health problems.

There are several important clinical implications for these findings to those who prescribe opioid medications to adolescents. First, we found that approximately four out of every five adolescents prescribed opioids in Year 1 and Year 2 used their medications as intended by the prescribing doctor, dentist, or nurse. While the overwhelming majority of adolescents prescribed opioids used their scheduled medications appropriately, there is some cause for concern among prescribers because at least 20% reported past-year *misuse* of prescription opioids consisting of using too much, intentionally getting high, or using to increase alcohol or other drug effects. In general, medical misuse of prescription opioids was associated with higher rates of adverse health behaviors. Notably, medical misusers who reported only “using too much” reported considerably lower prevalence rates of Year 2 positive screens for lifetime and past-year substance abuse as compared to medical misusers who reported “intentionally getting high or using to increase alcohol or other drug effects.” Based on these findings, it is clear that more studies are needed to examine the motives associated with medical misuse of prescription opioids with larger samples. Second, nearly half of adolescents who reported appropriate medical use of prescription opioids experienced sleeping problems and the effect of appropriate medical use on sleeping problems was much larger among adolescent boys. Prescribers should be aware of potential sleeping problems among adolescents who use their medications appropriately especially given the impact pain and opioids can have on sleep.^{21,22} Third, we found that more than 3 in every 4 individuals who reported medical use, medical misuse, or NMUPO in Year 1

experienced physical pain in the past six months in Year 2. These findings suggest adolescents with physical pain and sleep problems were more likely to use and misuse opioids.

The present study found that prescribers had direct contact with the majority of adolescents who engage in NMUPO and/or medical misuse of their own prescription opioids. Past research has shown those adolescents who report medical misuse of scheduled medications are significantly more likely to divert their medication and meet the criteria for substance use disorders.^{4,23} Therefore, prescribers can play an important role in reducing medical misuse, nonmedical use and diversion of prescription opioids. Screening and brief interventions at the time of direct contact with patients have shown promise in reducing alcohol and illicit drug misuse^{24–26} and could have promise in reducing medical misuse, nonmedical use, and diversion of scheduled medications among adolescent patients.

Consistent with previous research, there was evidence for heterogeneity associated with adolescents' NMUPO based on cross-sectional and longitudinal results.^{9,12,27,28} Approximately 76% of nonmedical users of prescription opioids were motivated solely by pain relief which is consistent with at least one other study of secondary school students that found 69% of nonmedical users were motivated solely for pain relief.⁹ We also found that NMUPO solely for pain relief was more prevalent among girls which is consistent with at least one other study that found higher prevalence among college females.²⁹ The present study indicated that approximately 75% of those who reported NMUPO in Year 1 had ceased this behavior in Year 2 which is similar with at least one nationally representative longitudinal study of adults 18 years or older that found approximately 80% of those who engaged in NMUPO ceased using 3 years later.²⁹

The results of the present study provide strong evidence that the prevalence rates for the adverse health behaviors were consistently the highest among those reporting NMUPO for non-pain relief while NMUPO for pain relief only was associated with sleeping problems and physical pain symptoms over time. Previous cross-sectional work has shown that NMUPO for pain relief was not associated with an increased risk for substance abuse while NUPO for non-pain relief was associated with an increased risk for substance abuse.¹² The present longitudinal study extends these earlier findings to other adverse health behaviors and represents the first study to demonstrate these same results hold true over a two-year time period.

This study has several important strengths, including the use of longitudinal data and two valid substance use disorder screening tests. Furthermore, the study considered motives associated with NMUPO in more detail than national studies. Despite these strengths, there are some limitations that should be taken into account when considering implications of the findings. First, the study did not assess the exact dosage and pain diagnoses among adolescents who were prescribed opioids in the past 12 months. Second, the results cannot be generalized to other adolescent populations, because our sample was from two school districts in Michigan and did not include individuals who were not willing to participate in the survey or whose parents refused to provide consent (refusals) and (b) those who have dropped out of school (dropouts). Nonrespondents generally have prevalence rates for nonmedical use of prescription drugs that are higher than the rates for those who remain in school based on previous research so the nonmedical use and medical misuse estimates reported in this study are likely underestimates.⁷ Third, differential nonresponse across racial/ethnic groups may have introduced bias in the estimates reported in the present study, and the estimates reported in the study are subject to potential bias introduced when assessing sensitive behaviors via self-report surveys. Finally, the two-year design of the study and sample size presented some limitations; longer term studies with larger samples

are needed to examine adverse outcomes associated with medical use, misuse and NMUPO over time in the general population.

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Table 1

Demographic characteristics of the longitudinal sample

	Overall sample of secondary school students (n = 2,050) % (n)
Sex	
Female	50.0 (n = 1,026)
Male	50.0 (n = 1,024)
Race	
White	66.9 (n = 1,371)
Black	27.9 (n = 571)
Other	5.2 (n = 108)
Grade level (Year 1)	
7 th	21.1 (n = 433)
8 th	21.8 (n = 447)
9 th	20.6 (n = 423)
10 th	17.9 (n = 366)
11 th	18.6 (n = 381)

Table 2

Medical use, medical misuse, and nonmedical use of prescription opioids in Year 1, 2009–2010

	Overall	Female	Male	Sex difference
Past-year use of prescription opioids in Year 1 (2009–2010)				
Groups:				
No medical or nonmedical use	83.9% (n = 1,618)	78.0 (n = 757)	90.0 (n = 861)	51.5, df = 1, p < 0.001
Medical use only	9.1% (n = 175)	12.9 (n = 125)	5.2 (n = 50)	34.2, df = 1, p < 0.001
Medical misuse only	2.1% (n = 40)	2.4 (n = 23)	1.8 (n = 17)	0.8, df = 1, p = 0.362
Nonmedical use for pain relief only ^a	3.7% (n = 72)	5.3 (n = 51)	2.2 (n = 21)	12.5, df = 1, p < 0.001
Nonmedical use for non-pain relief ^a	1.2% (n = 23)	1.5 (n = 15)	0.8 (n = 8)	2.1, df = 1, p = 0.152

Note: There were 122 respondents who responded “rather not say” or had missing data.

^aNonmedical use for pain relief only included the those who endorsed “because it relieves pain” as their sole motive for nonmedical use.

^bNonmedical use for non-pain relief included those who endorsed at least one of the following motives: because it gives me a high, because it counteracts the effects of other drugs, because of experimentation, because it is safer than street drugs, because it helps me sleep, because it decreases anxiety, because I am addicted, other (specify).

Table 3

Medical use, medical misuse, and nonmedical use of prescription opioids over time, Year 1 (2009–10) and Year 2 (2010–11)

Past-year medical and nonmedical use of prescription opioids in Year 1 (2009–2010)	Past-year behaviors at Wave 2 (2010–2011)				
	Any past-year medical use in Year 2 % (n)	Any past-year medical misuse in Year 2 % (n)	Any past-year NMUPO for pain relief in Year 2 % (n)	Any past-year NMUPO for non-pain relief in Year 2 % (n)	Any past-year NMUPO in Year 2 % (n)
Groups:					
No medical or nonmedical use	10.5 (164/1559)	2.0 (29/1424)	1.7 (26/1559)	1.3 (20/1556)	3.0% (46/1556)
Medical use only	34.9 (59/169)	7.6 (9/119)	4.0 (7/173)	2.9 (5/172)	7.0% (12/172)
Medical misuse only	28.2 (11/39)	12.5 (4/32)	10.3 (4/39)	5.1 (2/39)	15.4% (6/39)
Nonmedical use for pain relief only	31.9 (22/69)	4.1 (2/49)	21.7 (15/69)	4.3 (3/69)	26.1% (18/69)
Nonmedical use for non-pain relief	21.7 (5/23)	14.3 (3/21)	13.6 (3/22)	9.1 (2/22)	22.7% (5/22)
Chi-square(4), p-value	102.83, < 0.001	33.82, < 0.001	110.67, < 0.001	15.72, 0.003	109.30, < 0.001

Table 4

Medical use, medical misuse, nonmedical use of prescription opioids in Year 1 (2009–10) and other health behaviors over time in Year 2 (2010–11)

Past-year medical and nonmedical use of prescription opioids in Year 1 (2009–2010)	Past-year positive DAST-9 screen in Year 2 % (n)	Past-year positive DAST-10 screen in Year 2 % (n)	Lifetime positive CRAFFT screen in Year 2 % (n)	Past-year other nonmedical drug use in Year 2 % (n)	Past 6-month sleeping problems in Year 2 % (n)	Past 6-month physical pain in Year 2 % (n)
Groups:						
No medical or nonmedical use	6.5 (105/1617)	5.3 (86/1617)	10.0 (162/1615)	1.7 (26/1545)	34.2 (551/1609)	58.3 (939/1610)
Medical use only	9.7 (17/175)	9.7 (17/175)	17.1 (30/175)	4.0 (7/173)	48.0 (84/175)	78.3 (137/175)
Medical misuse only	22.5 (9/40)	22.5 (9/40)	37.5 (15/40)	2.6 (1/38)	40.0 (16/40)	77.5 (31/40)
Nonmedical use for pain relief only	11.1 (8/72)	6.9 (5/72)	11.3 (8/71)	1.6 (1/62)	56.3 (40/71)	76.4 (55/72)
Nonmedical use for non-pain relief	39.1 (9/23)	30.4 (7/23)	52.2 (12/23)	18.2 (4/22)	69.6 (16/23)	78.3 (18/23)
Chi-square(4), p-value	49.90, < 0.001	45.65, < 0.001	71.09, < 0.001	32.00, < 0.001	36.37, < 0.001	41.47, < 0.001

Table 5

Odds of substance abuse and other health outcomes in Year 2 as a function of medical use, misuse and nonmedical use of prescription opioids in Year 1

Groups:	Past-year medical and nonmedical use of prescription opioids in Year 1 (2009–2010)	Past-year positive DAST-9 screen in Year 2 AOR (95% CI)	Past-year positive DAST-10 screen in Year 2 AOR (95% CI)	Lifetime positive CRAFT screen in Year 2 AOR (95% CI)	Past-year other nonmedical drug use in Year 2 AOR (95% CI)	Past 6-month sleep problems in Year 2 AOR (95% CI)	Past 6-month physical pain in Year 2 AOR (95% CI)
No medical or nonmedical use	--	--	--	--	--	--	--
Medical use only	1.5 (0.8, 2.6)	1.8 (1.0, 3.1)	1.8 (1.0, 3.1)	1.6 (1.0, 2.5)	2.2 (0.9, 5.3)	1.5 (1.1, 2.1) *	2.2 (1.5, 3.2) ***
Medical misuse only	3.8 (1.7, 8.4) **	4.7 (2.1, 10.8) ***	4.7 (2.1, 10.8) ***	5.1 (2.4, 10.6) ***	1.4 (0.2, 11.1)	1.2 (0.6, 2.4)	2.2 (1.0, 4.7) *
Nonmedical use for pain relief only	1.6 (0.7, 3.6)	1.2 (0.5, 3.2)	1.2 (0.5, 3.2)	0.9 (0.4, 1.9)	0.9 (0.1, 7.0)	2.1 (1.3, 3.5) **	1.9 (1.1, 3.4) *
Nonmedical use for non-pain relief	8.0 (3.2, 19.7) ***	6.4 (2.4, 16.9) ***	6.4 (2.4, 16.9) ***	9.6 (3.9, 23.6) ***	9.3 (2.8, 30.9) ***	3.8 (1.5, 9.5) **	2.0 (0.7, 5.6)
Analysis Sample Size	1927	1927	1927	1924	1840	1918	1920

Adjusted for sex, race/ethnicity, school district, and grade level.

p < 0.001,

**
p < 0.01,

*
p < 0.05