

Nonmedical Use of Prescription Drugs and Sexual Risk Behaviors

Heather B. Clayton, PhD, MPH,^a Richard Lowry, MD, MS,^a Euna August, PhD, MPH, MCHES,^b Sherry Everett Jones, PhD, MPH, JD^a

abstract

BACKGROUND: Substance use is associated with sexual risk behaviors among youth, but little is known about whether nonmedical prescription drug use, an increasingly common behavior, is associated with sexual risk behaviors.

METHODS: Data from the 2011 and 2013 national Youth Risk Behavior Surveys, cross-sectional surveys conducted among nationally representative samples of students in grades 9 to 12 were combined ($n = 29\,008$) to examine the association between ever taking prescription drugs without a doctor's prescription and sexual risk behaviors (ever having sexual intercourse, current sexual activity, lifetime number of sexual partners, condom use, and alcohol or drug use before last sexual intercourse). Using logistic regression models (adjusted for sex, race/ethnicity, grade, ever injection drug use, and use of alcohol, marijuana, heroin, cocaine, methamphetamines, ecstasy, and inhalants), we estimated adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs).

RESULTS: Nonmedical use of prescription drugs (NMUPD) was associated with ever having sexual intercourse (aPR 1.16 [95% CI 1.11–1.22]), being currently sexually active (1.26 [1.20–1.33]), having ≥ 4 lifetime sexual partners (1.45 [1.34–1.57]), drinking alcohol or using drugs before last sexual intercourse (1.32 [1.17–1.48]), and not using a condom at last sexual intercourse (1.14 [1.05–1.23]). As the frequency of NMUPD increased, the association between NMUPD and each of the sexual risk behaviors increased in strength, suggesting a dose–response relationship.

CONCLUSIONS: NMUPD is associated with sexual behaviors that put high school students at risk for sexually transmitted infections. These findings can be used to inform clinical and school-based interventions developed to reduce drug use and sexually transmitted infections.

FREE

Divisions of ^aAdolescent and School Health, and ^bHIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, Atlanta, Georgia

Dr Clayton conceptualized and designed the study, conducted the analysis, and drafted the initial manuscript; Dr Lowry participated in the analysis; Drs Lowry, August, and Everett Jones assisted with the conceptualization of the study and critically reviewed and revised drafts of the manuscript; and all authors approved the final manuscript as submitted. Dr Clayton had full access to all of the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis.

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. This is a work product of the US government.

DOI: 10.1542/peds.2015-2480

Accepted for publication Oct 21, 2015

WHAT'S KNOWN ON THIS SUBJECT: Nonmedical prescription drug use among youth is associated with negative outcomes such as decreased academic performance, delinquency, and other substance use, but no nationally representative studies have examined the association between nonmedical prescription drug use and sexual risk behaviors.

WHAT THIS STUDY ADDS: Using nationally representative data, this study found an independent association between nonmedical prescription drug use and sexual risk behaviors among high school students, as well as a dose–response relationship in the association between frequency of use and sexual risk behaviors.

To cite: Clayton HB, Lowry R, August E, et al. Nonmedical Use of Prescription Drugs and Sexual Risk Behaviors. *Pediatrics*. 2016;137(1):e20152480

Nonmedical use of prescription drugs (NMUPD) is an important public health issue in the United States. Since 1999, drug overdose deaths involving opioid analgesics have increased, and in 2011, misuse or abuse of pharmaceuticals accounted for 1.4 million emergency department visits.^{1,2} Two national studies estimate that the lifetime prevalence of NMUPD among 9th- to 12th-grade students is 17.8%, and 19.9% among 12th-grade students.^{3,4} Studies suggest that NMUPD among youth is associated with negative outcomes such as decreased academic performance, delinquency, dropping out of school, and other substance use.⁵⁻⁸

Studies conducted among adolescents have identified an association between substance use (eg, alcohol, marijuana, cocaine, and heroin) and sexual risk behaviors (SRBs) (eg, ever having sexual intercourse, having multiple sexual partners, not using a condom at last intercourse, and pregnancy before age 15 years), but there is a dearth of information on the association between NMUPD and SRBs among adolescents.⁹⁻¹⁷ The few studies that exist focused on special populations such as homeless youth or were conducted in small geographic or clinical settings.¹⁷⁻¹⁹ One such study surveyed sexually active adolescents and young adults aged 14 to 20 years in an emergency department setting and observed an association between each class of prescription drugs (stimulants, opioids, and sedatives) and SRBs.¹⁷ Adolescents who used >1 class of prescription drugs were significantly more likely to report inconsistent condom use, multiple sexual partners, and substance use before sexual intercourse.¹⁷ Another study, conducted among homeless youth in Los Angeles, observed an association between current prescription drug misuse and unprotected anal or vaginal sex at last sexual intercourse.¹⁹ Additionally, a

study in Michigan among students in grades 7 through 12 found an association between sexual activity and use of prescription drugs for sensation seeking.¹⁸ The limited studies on NMUPD and SRBs among adult populations have found an association between NMUPD and SRBs.²⁰⁻²²

This study used nationally representative data to address the research gap in the possible association between NMUPD and SRBs among high school students in the United States. Our primary objectives were to (1) determine if NMUPD is independently associated with SRBs and (2) explore an association by demographic subgroups (eg, sex, race/ethnicity, grade).

METHODS

Study Population

The Centers for Disease Control and Prevention's (CDC) cross-sectional national school-based Youth Risk Behavior Survey (YRBS) has been conducted biennially since 1991. Each national YRBS uses a similar independent 3-stage cluster sample design to obtain a nationally representative sample of public and private school students in grades 9 to 12 in the 50 states and the District of Columbia.²³ Data from the 2011 and 2013 cycles were combined for this analysis to provide sufficient sample size to conduct subgroup analyses of SRBs among students engaging in NMUPD.

Student participation in the YRBS is anonymous and voluntary, and the YRBS is conducted in accordance with local parental permission procedures. YRBS participants complete a self-administered questionnaire during a regular class period and record their responses on a computer-scannable questionnaire booklet or answer sheet. For 2011 and 2013, school response rates

were 81% and 77%, respectively; student response rates were 87% and 88%; and overall response rates (product of the school and student response rates for each year) were 71% and 68%. The sample size was 15 425 for 2011 and 13 583 for 2013. The data were weighted to adjust for school and student nonresponse and oversampling of black and Hispanic students. Missing data were not imputed. Details of the YRBS sampling strategies have been reported elsewhere.^{3,23} The national YRBS was reviewed and approved by an institutional review board at the CDC.

Measures

NMUPD was measured by the question, "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?" Response options included 0, 1 or 2, 3 to 9, 10 to 19, 20 to 39, and ≥ 40 times. Lifetime use was defined as taking prescription drugs without a doctor's prescription 0 versus ≥ 1 times; frequency of use was defined as 0, 1 or 2, 3 to 19, and ≥ 20 times. We evaluated the association between lifetime and frequency of NMUPD and 5 SRBs: (1) ever had sexual intercourse (question: "Have you ever had sexual intercourse?"); (2) ≥ 4 lifetime sexual partners (question: "During your life, with how many people have you had sexual intercourse?"); (3) currently sexually active (question: "During the past 3 months, with how many people did you have sexual intercourse?"); (4) did not use a condom at last sexual intercourse (question: "The last time you had sexual intercourse, did you or your partner use a condom?"); and (5) drank alcohol or used drugs before last sexual intercourse (question: "Did you drink alcohol or use drugs before you had sexual intercourse the last time?"). Questions without

a dichotomous response option were collapsed into 2 categories, 0 versus ≥ 1 . Sexual intercourse with ≥ 4 people during lifetime was used as the cutoff point, as it is the classification used by CDC in prevalence reports.³ Analyses included students who were non-Hispanic black (“black”), non-Hispanic white (“white”), Hispanic (who might be of any race), and from other racial/ethnic groups, but the results for other racial/ethnic groups are not presented, as the numbers were too small for meaningful interpretation.

The psychometric properties of the majority of YRBS questions have been assessed.²⁴ Although reliability data are not available for the relatively new questions focused on NMUPD, condom use at last sexual intercourse, and using alcohol or drugs at last sexual intercourse, the majority of items assessing substance use and sexual behaviors have demonstrated substantial test-retest reliability.

Data Analysis

The association between demographic and other substance use variables with lifetime NMUPD was explored by calculating unadjusted prevalence ratios (PRs) and corresponding 95% confidence intervals (CIs) using logistic regression. Prevalence ratios are appropriate estimates for studies using cross-sectional data, particularly for behaviors that are not considered to be rare.^{25,26} Logistic regression was used to calculate adjusted prevalence ratios (aPRs) and 95% CIs for the association between NMUPD and each of the SRBs. In addition to the independent NMUPD variable, models included the following variables as potential confounders: sex, race/ethnicity, grade, injection drug use (IDU), and use of alcohol, marijuana, cocaine, heroin, methamphetamines, inhalants, and ecstasy. Analyses for

students who did not use a condom at last intercourse and drank alcohol or used drugs before last sexual intercourse were restricted to students who were currently sexually active, whereas all other models included the full sample. To ensure that potential associations between NMUPD and ≥ 4 lifetime sexual partners or current sexual activity were not confounded by ever having had sexual intercourse, a sensitivity analysis was conducted, whereby models were restricted to those who had ever had sexual intercourse. Because findings were consistent with models that included the full sample (data not shown), only full-sample models for these 2 variables are reported. To examine the independent contribution of NMUPD in the context of multisubstance use, substance use behaviors were operationalized into a composite variable (0 substances used; 1 substance used, but no NMUPD; 2 substances used, but no NMUPD; 3 substances used, but no NMUPD [referent group]; or 3 substances used plus NMUPD). Substances included in this composite variable were alcohol, marijuana, and ≥ 1 other illegal drug (cocaine, heroin, ecstasy, inhalants, or methamphetamines). IDU was not included in the composite variable because it is considered a method of drug use; however, models using this composite variable were adjusted for IDU. A small proportion of students in the NMUPD group (2.8% of the total NMUPD group) had no other substance use behaviors and thus were excluded as a category in the composite variable because of sparse data. Finally, potential interactions between exposures of interest (ie, NMUPD and the composite multisubstance use variable) and demographic characteristics for each of the SRBs were assessed. When meaningful, stratified analyses are presented.

The inclusion of other substance use behaviors in the logistic regression models was necessary, as researchers have found that adolescents and young adults who report NMUPD are also more likely to use other substances.²⁷⁻²⁹ Furthermore, IDU is an important behavioral covariate, as it has been associated with HIV infection and SRBs and may be related to NMUPD: NMUPD has been implicated as a gateway behavior for later IDU.²⁹⁻³¹ However, adjusting for highly correlated variables introduced a concern for multicollinearity in our models. Therefore, we assessed multicollinearity by calculating the variance inflation factor for each model and did not observe values that were outside of an acceptable range.

To account for the complex sample design of the survey, we conducted all analyses using SUDAAN statistical software (Research Triangle Institute, Research Triangle Park, NC).

RESULTS

The percentages of male and female students in the sample were approximately equal (Table 1). Most students were white (56.3%), followed by Hispanic (20.5%) and black (14.2%). Students were fairly evenly distributed across grades 9 to 12. The most common substances used were alcohol (68.6%) and marijuana (40.3%); fewer students used inhalants (10.2%), ecstasy (7.4%), cocaine (6.2%), methamphetamines (3.5%), or heroin (2.6%). IDU was reported by 2.0% of students. The overall prevalence of NMUPD was 19.3%. Compared with white students, NMUPD was significantly less common among black students (PR 0.67 [95% CI 0.59–0.77]) and was less common among 9th-grade than 10th-grade (1.22 [1.05–1.42]), 11th-grade (1.52 [1.35–1.72]), and 12th-grade (1.62

TABLE 1 Prevalence Estimates and PRs for NMUPD by Demographic Characteristics and Substance Use Among US High School Students, Youth Risk Behavior Surveillance System, 2011 to 2013

Characteristic	Total Sample	Ever Took Prescription Drugs Without a Doctor's Prescription		
	<i>n</i> (%) ^a	<i>n</i> (%) ^a	PR	95% CI
Total	29 008 (100)	5373 (19.3)		
Sex				
Female	14 329 (49.2)	2382 (18.5)	Referent	
Male	14 606 (50.8)	2718 (20.0)	1.08	1.00–1.17
Race/ethnicity				
White ^b	11 620 (56.3)	725 (20.9)	Referent	
Black ^b	5760 (14.2)	2419 (14.1)	0.67	0.59–0.77
Hispanic	8022 (20.5)	1388 (19.3)	0.92	0.82–1.03
Grade				
9	7362 (27.5)	989 (14.5)	Referent	
10	6845 (25.8)	1154 (17.8)	1.22	1.05–1.42
11	7317 (23.9)	1400 (22.1)	1.52	1.35–1.72
12	7256 (22.9)	1522 (23.5)	1.62	1.44–1.81
Ever drank alcohol				
No	8342 (31.4)	276 (3.2)	Referent	
Yes	18 930 (68.6)	4636 (26.7)	8.30	6.95–9.92
Ever used marijuana				
No	16 165 (59.7)	888 (5.7)	Referent	
Yes	12 004 (40.3)	4065 (38.9)	6.82	6.12–7.59
Ever used inhalants				
No	25 073 (89.8)	3565 (15.0)	Referent	
Yes	2852 (10.2)	1481 (57.6)	3.84	3.56–4.13
Ever used ecstasy				
No	25 457 (92.6)	3481 (14.8)	Referent	
Yes	2167 (7.4)	1516 (75.4)	5.08	4.72–5.47
Ever used cocaine				
No	26 763 (93.8)	3789 (15.3)	Referent	
Yes	1832 (6.2)	1271 (77.8)	5.08	4.65–5.54
Ever used methamphetamines				
No	27 307 (96.4)	4299 (17.1)	Referent	
Yes	983 (3.5)	749 (82.1)	4.80	4.43–5.19
Ever used heroin				
No	26 612 (97.4)	4458 (17.8)	Referent	
Yes	712 (2.6)	535 (80.8)	4.53	4.17–4.93
Ever injected any illegal drug				
No	26 831 (98.0)	4519 (18.1)	Referent	
Yes	588 (2.0)	440 (80.9)	4.48	4.16–4.82

^a Sample *n* is unweighted; percentage is weighted.

^b Non-Hispanic.

[1.43–1.82]) students. NMUPD was most strongly associated with lifetime use of alcohol (8.30 [6.95–9.92]), marijuana (6.82 [6.12–7.59]), cocaine (5.08 [4.65–5.54]), and ecstasy (5.08 [4.72–5.47]), but was associated with each substance examined.

Students engaging in NMUPD, compared with students not engaging in NMUPD, had a higher prevalence of having had sexual intercourse (76.6% vs 39.9%; aPR 1.16 [95% CI 1.11–1.22]), ≥4 lifetime sexual partners (35.8% vs 10.1%; 1.45 [1.34–1.57]),

and current sexual activity (61.2% vs 27.2%; 1.26 [1.20–1.33]). Among students who were currently sexually active, students engaging in NMUPD, compared with students not engaging in NMUPD, had a higher prevalence of not using a condom at last sexual intercourse (48.2% vs 35.8%; aPR 1.14 [1.05–1.23]) and using alcohol or drugs before last sexual intercourse (38.0% vs 14.0%; 1.32 [1.17–1.48]) (Table 2). Because of a significant interaction between NMUPD and sex and race/ethnicity observed in models of SRBs,

we performed stratified analyses for NMUPD by these subgroups. Among male students, a significant association was observed between NMUPD and each SRB (aPR 1.17–1.32). Among female students, for all but 1 SRB (not using a condom at last sexual intercourse), a significant association was observed between NMUPD and SRBs (aPR 1.16–1.60). Among white students, NMUPD was significantly associated with all SRBs (aPR 1.15–1.50), but among black students, NMUPD was associated only with using alcohol or drugs before last sexual intercourse (aPR 1.50 [95% CI 1.24–1.81]). Among Hispanic students, for all but 1 SRB (did not use a condom at last sexual intercourse), a significant association was observed between NMUPD and SRBs (aPR 1.10–1.47).

Frequency of NMUPD was associated with SRBs (Table 3). After adjustment for covariates, the risk of having had sexual intercourse, having ≥4 lifetime sexual partners, current sexual activity, not using a condom at last sexual intercourse, and using alcohol or drugs before last sexual intercourse all increased as the frequency of NMUPD increased (*P* value for trend ≤.0001).

For each SRB except condom use at last sexual intercourse, associations between NMUPD and SRBs were observed when we examined level of multisubstance use (ie, composite substance use) (Table 4). Students who used 3 substances plus NMUPD were more likely to have had sexual intercourse (aPR 1.14 [95% CI 1.08–1.21]), have had ≥4 lifetime sexual partners (1.61 [1.41–1.84]), be currently sexually active (1.32 [1.21–1.44]), and have used alcohol or drugs before last sexual intercourse (1.57 [1.28–1.92]) than students who used ≥3 substances (ie, alcohol, marijuana, and ≥1 other illicit drug) but did not engage in NMUPD. Interactions between sex and the multisubstance use composite variable were observed

TABLE 2 Association Between NMUPD and Sexual Risk Factors for STI and HIV Infection, US High School Students, Youth Risk Behavior Surveillance System, 2011 to 2013

Characteristic	Ever Had Sexual Intercourse		Had ≥ 4 Lifetime Sexual Partners		Currently Sexually Active ^a		Did Not Use Condom at last Intercourse ^b		Used Alcohol or Drugs Before Last Sexual Intercourse ^b	
	n (%) ^c	aPR	n (%) ^c	aPR	n (%) ^c	aPR	n (%) ^c	aPR	n (%) ^c	aPR
Ever took prescription drugs without a doctor's prescription (NMUPD) ^d										
No	9282 (39.9)	—	2554 (10.1)	—	Referent	—	Referent	2288 (35.8)	—	Referent
Yes	3770 (76.6)	1.16	1753 (35.8)	1.45	1.34–1.57	1.26	1.20–1.33	1401 (48.2)	1.14	1.05–1.23
Sex ^e										
Female										
No NMUPD	4490 (39.0)	—	945 (8.2)	—	Referent	—	Referent	1426 (42.4)	—	Referent
Yes NMUPD	1687 (75.2)	1.16	685 (33.7)	1.60	1.41–1.80	1.26	1.18–1.35	726 (55.4)	1.11	1.00–1.23
Male										
No NMUPD	4769 (40.9)	—	1598 (12.0)	—	Referent	—	Referent	858 (28.3)	—	Referent
Yes NMUPD	2073 (77.9)	1.17	1063 (37.8)	1.32	1.20–1.45	1.26	1.17–1.37	669 (41.4)	1.19	1.04–1.36
Race/ethnicity ^f										
White ^g										
No NMUPD	3128 (35.3)	—	653 (7.4)	—	Referent	—	Referent	822 (36.3)	—	Referent
Yes NMUPD	1824 (76.5)	1.21	804 (34.5)	1.50	1.36–1.64	1.31	1.23–1.40	726 (49.0)	1.15	1.04–1.28
Black ^g										
No NMUPD	2571 (57.1)	—	1011 (21.9)	—	Referent	—	Referent	572 (33.2)	—	Referent
Yes NMUPD	543 (81.5)	1.06	311 (46.2)	1.16	0.98–1.38	1.08	0.94–1.25	147 (41.8)	1.13	0.87–1.47
Hispanic										
No NMUPD	2573 (42.4)	—	611 (9.3)	—	Referent	—	Referent	650 (37.1)	—	Referent
Yes NMUPD	998 (76.0)	1.10	442 (34.2)	1.45	1.26–1.67	1.29	1.18–1.39	385 (50.6)	1.12	0.97–1.30

^a Had sexual intercourse with ≥ 1 person during the 3 mo before the survey.

^b Among students who were currently sexually active.

^c Sample n is unweighted; percentage is weighted.

^d Adjusted for sex, race/ethnicity, grade, alcohol, marijuana, cocaine, heroin, methamphetamines, inhalants, ecstasy, and IDU.

^e Adjusted for race/ethnicity, grade, alcohol, marijuana, cocaine, heroin, methamphetamines, inhalants, ecstasy, and IDU.

^f Adjusted for sex, grade, alcohol, marijuana, cocaine, heroin, methamphetamines, inhalants, ecstasy, and IDU.

^g Non-Hispanic.

for having had sexual intercourse and for having ≥ 4 lifetime sexual partners (data not shown). Although the magnitude of the association between multisubstance use with NMUPD and these SRBs differed by sex, the direction of the association remained the same, and the associations were significant among both female and male students. Significant interactions also were observed for race/ethnicity and multisubstance use for having had sexual intercourse, having ≥ 4 lifetime sexual partners, and being currently sexual active (data not shown). Multisubstance use with NMUPD was not independently associated with having had sexual intercourse or being currently sexually active among black students; however, the direction and significance of the associations remained for white and Hispanic students for all 3 SRBs. Significant interactions were observed for multisubstance use with NMUPD and grade for having had sexual intercourse, having ≥ 4 lifetime sexual partners, and being currently sexual active (data not shown). When we stratified by grade, multisubstance use with NMUPD was associated with having ≥ 4 lifetime sexual partners or current sexual activity among 10th-, 11th-, and 12th-grade students and having had sexual intercourse among 11th- and 12th-grade students.

DISCUSSION

This study found that nearly 1 in 5 US high school students engaged in NMUPD in his or her lifetime, and this behavior was positively associated with SRBs that increase the risk for pregnancy and contribute to the burden of HIV and sexually transmitted infections (STIs) among high school students: having had sexual intercourse, having ≥ 4 lifetime sexual partners, being currently sexual active, not using a condom at last sexual intercourse,

TABLE 3 Association Between Frequency of NMUPD and Sexual Risk Factors For STI and HIV Infection, US High School Students, Youth Risk Behavior Surveillance System, 2011 to 2013

Characteristic	Ever Had Sexual Intercourse			Had ≥ 4 Lifetime Sexual Partners			Currently Sexually Active ^a			Did Not Use Condom at Last Intercourse ^b			Used Alcohol or Drugs Before Last Sexual Intercourse ^b		
	n (%) ^c	aPR ^d	95% CI	n (%) ^c	aPR ^d	95% CI	n (%) ^c	aPR ^d	95% CI	n (%) ^c	aPR ^d	95% CI	n (%) ^c	aPR ^d	95% CI
How often took prescription drugs without a doctor's prescription															
Never	9282 (39.9)	—	Referent	2554 (10.1)	—	Referent	6410 (27.2)	—	Referent	2288 (35.8)	—	Referent	921 (14.0)	—	Referent
1–2 times	1202 (66.0)	1.10	1.04–1.16	422 (23.4)	1.27	1.14–1.41	909 (51.4)	1.21	1.14–1.28	381 (42.4)	1.08	0.96–1.21	248 (26.7)	1.20	1.03–1.40
3–19 times	1584 (78.9)	1.19	1.11–1.28	729 (36.3)	1.50	1.35–1.67	1266 (63.3)	1.30	1.20–1.41	568 (46.5)	1.13	1.00–1.27	477 (37.2)	1.33	1.15–1.53
≥ 20 times	984 (88.4)	1.33	1.23–1.44	602 (53.4)	1.80	1.60–2.03	801 (72.1)	1.32	1.20–1.46	452 (57.0)	1.30	1.16–1.47	423 (51.2)	1.55	1.31–1.83

For all categories, P for trend $< .0001$.

^a Had sexual intercourse with ≥ 1 person during the 3 mo before the survey.

^b Among students who were currently sexually active.

^c Sample n is unweighted; percentage is weighted.

^d Adjusted for sex, race/ethnicity, grade level, alcohol, marijuana, cocaine, heroin, methamphetamines, inhalants, ecstasy, and IDU.

TABLE 4 Association Between Lifetime Substance Use Composite^a and Selected Sexual Risk Factors for STI and HIV Infection, US High School Students, Youth Risk Behavior Surveillance System, 2011 to 2013

Characteristic	Ever Had Sexual Intercourse			Had ≥4 Lifetime Sexual Partners			Currently Sexually Active ^b			Did Not Use Condom at Last Intercourse ^c			Used Alcohol or Drugs Before Last Sexual Intercourse ^e		
	n (%) ^d	aPR ^e	95% CI	n (%) ^d	aPR ^e	95% CI	n (%) ^d	aPR ^e	95% CI	n (%) ^d	aPR ^e	95% CI	n (%) ^d	aPR ^e	95% CI
Lifetime substance use															
No substances	1185 (15.2)	0.22	0.20–0.25	241 (2.7)	0.11	0.09–0.13	723 (9.4)	0.20	0.17–0.23	222 (31.3)	0.70	0.60–0.81	0	—	—
1 substance, no NMUPD	2805 (37.4)	0.51	0.47–0.55	553 (6.9)	0.26	0.22–0.32	1845 (24.3)	0.47	0.43–0.52	613 (53.0)	0.71	0.62–0.82	115 (6.7)	0.25	0.19–0.35
2 substances, no NMUPD	3867 (68.0)	0.87	0.83–0.93	1242 (20.2)	0.66	0.57–0.76	2827 (49.1)	0.90	0.81–0.99	1034 (56.4)	0.78	0.69–0.89	563 (19.9)	0.72	0.59–0.89
≥3 substances, no NMUPD	840 (75.7)	—	Referent	322 (28.3)	—	Referent	605 (53.0)	—	Referent	274 (48.0)	—	Referent	180 (28.6)	—	Referent
≥3 substances, plus NMUPD	1814 (87.8)	1.14	1.08–1.21	1005 (49.6)	1.61	1.41–1.84	1491 (73.0)	1.32	1.21–1.44	758 (52.5)	1.06	0.93–1.21	726 (48.4)	1.57	1.28–1.92

^a Composite includes lifetime use of alcohol, marijuana, ≥1 more illicit drugs (can include cocaine, inhalants, heroin, methamphetamines, or ecstasy), and ever took prescription drugs without a doctor's prescription.

^b Had sexual intercourse with ≥1 person during the 3 mo before the survey.

^c Among students who were currently sexually active.

^d Sample n is unweighted; percentage is weighted.

^e Adjusted for sex, race/ethnicity, grade, and IDU.

and using alcohol or drugs before last sexual intercourse. As the frequency of NMUPD increased, so too did the strength of the association between NMUPD and each of the SRB outcomes. Among students who used 3 substances plus NMUPD, the likelihood of having had sexual intercourse, having ≥4 lifetime sexual partners, being currently sexually active, and using alcohol or drugs before last sexual intercourse was higher than among students who used ≥3 substances but did not engage in NMUPD.

This study is the first to use nationally representative data to examine the association between NMUPD and SRBs among high school students. Our findings are consistent with other, smaller studies that have found associations between NMUPD and SRBs.^{17–22} When we investigated interactions between demographic characteristics and the association between NMUPD and SRBs, we observed significant subgroup differences among sex and racial/ethnic subgroups, but not grade, for several SRBs. The interaction results for race/ethnicity for NMUPD and SRBs is likely due to two factors: black students have a low prevalence of NMUPD compared with white and Hispanic students and also have a higher prevalence of SRBs such as having had sex, having ≥4 lifetime sexual partners, and being currently sexually active.³

There are several limitations to this study. First, the NMUPD survey question does not include street names for prescription drugs or account for use of prescribed medicine in a manner not prescribed (eg, higher doses); therefore, it is possible that NMUPD use is underreported. In addition, although much of the public health attention given to NMUPD has focused on opioids, young people also abuse prescription tranquilizers, stimulants, and sedatives, and that distinction is not captured with the

YRBS.^{8,17} Although the extent of underreporting or overreporting of NMUPD and SRBs cannot be determined, YRBS questions generally demonstrate good test-retest reliability.²⁴ Second, YRBS data are cross-sectional. It was not possible to determine the temporal relationship between NMUPD and SRBs. Third, these data apply only to youth who attend school, and therefore are not representative of all people in this age group.³ Nationwide, in 2009, of those aged 16 to 17 years, ~4% were not enrolled in a high school program and had not completed high school.³²

Healthy People 2020 objectives for adolescents are aimed at improving sexual health and reducing substance abuse behaviors, including NMUPD.³³ To achieve these objectives, it is important for adolescents to receive effective health education in schools, such as integrated evidenced-based concepts from alcohol and other drug use prevention efforts with HIV and other STI prevention efforts in the classroom. The Substance Abuse and Mental Health Services Administration maintains the National Registry of Evidence-Based Programs and Practices, a searchable online registry of evidence-based interventions for substance abuse interventions, with several programs that target adolescent substance abuse and

SRBs.³⁴ Drug use prevention efforts should focus on reducing opportunities for adolescents to access prescription drugs for nonmedical purposes. According to the 2014 National Survey on Drug Use and Health, a large proportion of individuals aged 12 to 17 who reported pain reliever use in the past year indicated that their most recent source for a pain reliever for nonmedical use was a friend or relative (43.1% received from a friend or relative for free, 9.4% bought from a friend or relative, 9.0% took from a friend or relative without asking), whereas 26.2% indicated that they obtained the drug from ≥ 1 doctors.³⁵ To prevent NMUPD, many states have enacted statutes that reduce “doctor shopping,” require tamper-resistant prescription forms, and require patient identification before dispensing as part of state-level prescription drug monitoring programs.³⁶ Programs also have been instituted to facilitate safe disposal of unused and expired medications.^{37,38} The American Medical Association has recommended point-of-care prescription drug monitoring programs that integrate into a physician’s workflow, as well as incentives to promote continuing education among physicians on current best prescribing practices that are tailored to specific practice/population needs.³⁹ In

addition, clinicians providing care for adolescents who disclose that they are sexually active or screen positive for STIs should consider the increased risk of NMUPD (and other substance use).

CONCLUSIONS

NMUPD was associated with SRBs that increase the risk for pregnancy, STIs, and HIV infection among US high school students. To better understand the association between NMUPD and SRBs, future research should explore the associations between NMUPD and SRBs by drug class (ie, opioids, sedatives, stimulants) and investigate the temporality of the association through longitudinal research.

ABBREVIATIONS

aPR: adjusted prevalence ratio
CDC: Centers for Disease Control and Prevention
CI: confidence interval
IDU: injection drug use
NMUPD: nonmedical use of prescription drugs
PR: prevalence ratio
SRB: sexual risk behavior
STI: sexually transmitted infection
YRBS: Youth Risk Behavior Survey

Address correspondence to: Heather Breeze Clayton, PhD, MPH, Division of Adolescent and School Health, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mailstop E-75, Atlanta, GA 30329. E-mail: hhc9@cdc.gov

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2016 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

REFERENCES

1. Warner M, Hedegaard H, Chen L. Trends in drug-poisoning deaths involving opioid analgesics and heroin: United States, 1999-2012. NCHS Health E-Stat, Updated December 2, 2014. Atlanta, GA: Centers for Disease Control and Prevention. Available at: www.cdc.gov/nchs/data/hestat/drug_poisoning/drug_poisoning.htm. Accessed August 10, 2015
2. Substance Abuse and Mental Health Services Administration. Highlights of the 2011 Drug Abuse Warning Network (DAWN) Findings on Drug-Related Emergency Department Visits.

- The Dawn Report. Rockville, MD: US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration; 2013. Available at: www.samhsa.gov/data/2k13/DAWN127/sr127-DAWN-highlights.htm. Accessed October 26, 2015
3. Centers for Disease Control and Prevention. Youth risk behavior surveillance – United States, 2013. *Surveill Summ*. 2014;63(4):1–168
 4. Miech RA, Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. Monitoring the Future: National Survey Results on Drug Use 1975-2014. Volume 1: Secondary School Students. Available at: www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2014.pdf. Accessed August 10, 2015
 5. McCabe SE, Boyd CJ, Teter CJ. Illicit use of opioid analgesics by high school seniors. *J Subst Abuse Treat*. 2005;28(3):225–230
 6. Schepis TS, Krishnan-Sarin S. Characterizing adolescent prescription misusers: a population-based study. *J Am Acad Child Adolesc Psychiatry*. 2008;47(7):745–754
 7. Sung HE, Richter L, Vaughan R, Johnson PB, Thom B. Nonmedical use of prescription opioids among teenagers in the United States: trends and correlates. *J Adolesc Health*. 2005;37(1):44–51
 8. Young AM, Glover N, Havens JR. Nonmedical use of prescription medications among adolescents in the United States: a systematic review. *J Adolesc Health*. 2012;51(1):6–17
 9. Zapata LB, Hillis SD, Marchbanks PA, Curtis KM, Lowry R. Methamphetamine use is independently associated with recent risky sexual behaviors and adolescent pregnancy. *J Sch Health*. 2008;78(12):641–648
 10. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Schootman M, Cottler LB, Bierut LJ. Number of sexual partners and associations with initiation and intensity of substance use. *AIDS Behav*. 2011;15(4):869–874
 11. Lowry R, Holtzman D, Truman BI, Kann L, Collins JL, Kolbe LJ. Substance use and HIV-related sexual behaviors among US high school students: are they related? *Am J Public Health*. 1994;84(7):1116–1120
 12. Cavazos-Rehg PA, Krauss MJ, Spitznagel EL, Schootman M, Cottler LB, Bierut LJ. Brief report: Pregnant by age 15 years and substance use initiation among US adolescent girls. *J Adolesc*. 2012;35(5):1393–1397
 13. Santelli JS, Robin L, Brener ND, Lowry R. Timing of alcohol and other drug use and sexual risk behaviors among unmarried adolescents and young adults. *Fam Plann Perspect*. 2001;33(5):200–205
 14. Valois RF, Oeltmann JE, Waller J, Hussey JR. Relationship between number of sexual intercourse partners and selected health risk behaviors among public high school adolescents. *J Adolesc Health*. 1999;25(5):328–335
 15. Jackson C, Sweeting H, Haw S. Clustering of substance use and sexual risk behaviour in adolescence: analysis of two cohort studies. *BMJ Open*. 2012;2:e000661
 16. Vasilenko SA, Lanza ST. Predictors of multiple sexual partners from adolescence through young adulthood. *J Adolesc Health*. 2014;55(4):491–497
 17. Bonar EE, Cunningham RM, Chermack ST, et al. Prescription drug misuse and sexual risk behaviors among adolescents and emerging adults. *J Stud Alcohol Drugs*. 2014;75(2):259–268
 18. Boyd CJ, Young A, Grey M, McCabe SE. Adolescents' nonmedical use of prescription medications and other problem behaviors. *J Adolesc Health*. 2009;45(6):543–550
 19. Rhoades H, Winetrobe H, Rice E. Prescription drug misuse among homeless youth. *Drug Alcohol Depend*. 2014;138:229–233
 20. Benotsch EG, Koester S, Luckman D, Martin AM, Gejka A. Non-medical use of prescription drugs and sexual risk behavior in young adults. *Addict Behav*. 2011;36(1–2):152–155
 21. Mateu-Gelabert P, Guarino H, Jessell L, Teper A. Injection and sexual HIV/HCV risk behaviors associated with nonmedical use of prescription opioids among young adults in New York City. *J Subst Abuse Treat*. 2015;48(1):13–20
 22. Wells BE, Kelly BC, Rendina HJ, Parsons JT. Prescription drug misuse and sexual behavior among young adults. *J Sex Res*. 2015;52(6):659–668
 23. Brener ND, Kann L, Shanklin S, et al; Centers for Disease Control and Prevention (CDC); Centers for Disease Control and Prevention (CDC). Methodology of the Youth Risk Behavior Surveillance System—2013. *MMWR Recomm Rep*. 2013;62(RR-1):1–20
 24. Brener ND, Kann L, McManus T, Kinchen SA, Sundberg EC, Ross JG. Reliability of the 1999 youth risk behavior survey questionnaire. *J Adolesc Health*. 2002;31(4):336–342
 25. Behrens T, Taege D, Wellmann J, Keil U. Different methods to calculate effect estimates in cross-sectional studies. A comparison between prevalence odds ratio and prevalence ratio. *Methods Inf Med*. 2004;43(5):505–509
 26. Zocchetti C, Consonni D, Bertazzi PA. Relationship between prevalence rate ratios and odds ratios in cross-sectional studies. *Int J Epidemiol*. 1997;26(1):220–223
 27. Kelly BC, Wells BE, Pawson M, LeClair A, Parsons JT. Combinations of prescription drug misuse and illicit drugs among young adults. *Addict Behav*. 2014;39(5):941–944
 28. McCabe SE, West BT, Schepis TS, Teter CJ. Simultaneous co-ingestion of prescription stimulants, alcohol and other drugs: a multi-cohort national study of US adolescents. *Hum Psychopharmacol*. 2015;30(1):42–51
 29. Mars SG, Bourgeois P, Karandinos G, Montero F, Ciccarone D. "Every 'never' I ever said came true": transitions from opioid pills to heroin injecting. *Int J Drug Policy*. 2014;25(2):257–266
 30. Centers for Disease Control and Prevention (CDC). HIV infection and HIV-associated behaviors among injecting drug users—20 cities, United States, 2009. *MMWR Morb Mortal Wkly Rep*. 2012;61(8):133–138
 31. Jones CM. Heroin use and heroin use risk behaviors among nonmedical users of prescription opioid pain relievers—United States, 2002-2004 and 2008-2010. *Drug Alcohol Depend*. 2013;132(1–2):95–100
 32. Chapman C, Laird J, Ifill N, KewalRamani A. Trends in High School

- Dropout and Completion Rates in the United States: 1972-2009. NCES 2012-006. Washington, DC: National Center for Education Statistics, US Department of Education. Available at: nces.ed.gov/pubs2012/2012006.pdf. Accessed September 17, 2015
33. Healthy People 2020 Objectives. Washington, DC: US Department of Health and Human Services. Updated September 15, 2015. Available at: www.healthypeople.gov/2020/topics-objectives/topic/adolescent-health/objectives. Accessed September 17, 2015
 34. Substance Abuse and Mental Health Services Administration. National Registry of Evidence-Based Programs and Practices. Updated August 27, 2015. Available at: www.nrepp.samhsa.gov/. Accessed September 17, 2015
 35. Substance Abuse and Mental Health Services Administration. Results from the 2014 National Survey on Drug Use and Health: Detailed Tables. Updated September 10, 2015. Available at: www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs2014/NSDUH-DetTabs2014.pdf. Accessed September 15, 2015
 36. State Laws on Prescription Drug Misuse and Abuse. Atlanta, GA: Centers for Disease Control and Prevention. Updated April 20, 2015. Available at: www.cdc.gov/phlp/publications/topic/prescription.html. Accessed September 20, 2015
 37. National Take-Back Initiative. Washington, DC: US Department of Justice. Available at: www.deadiversion.usdoj.gov/drug_disposal/takeback/index.html. Accessed September 17, 2015
 38. Disposal Act: General Public Fact Sheet. Springfield, VA: Drug Enforcement Administration. Available at: www.deadiversion.usdoj.gov/drug_disposal/fact_sheets/disposal_public.pdf. Accessed September 17, 2015
 39. Combating Prescription Drug Abuse and Diversion. Chicago, IL: American Medical Association. Available at: www.ama-assn.org/ama/pub/advocacy/topics/combating-prescription-drug-abuse-diversion.page. Accessed September 17, 2015