Nonmedical Prescription Opioid Use and Use Disorders Among Adults Aged 18 Through 64 Years in the United States, 2003-2013

Beth Han, MD, PhD, MPH; Wilson M. Compton, MD, MPE; Christopher M. Jones, PharmD, MPH; Rong Cai, MS

IMPORTANCE Since 1999, the United States has experienced increases in morbidity and mortality associated with nonmedical use of prescription opioids.

OBJECTIVE To assess national trends in and characteristics of nonmedical prescription opioid use and use disorders and the national trend in related mortality.

DESIGN, SETTING, AND PARTICIPANTS Prevalence of nonmedical use and use disorders and related risk factors were based on data from 472 200 persons aged 18 through 64 years who participated in the 2003-2013 National Surveys on Drug Use and Health. Mortality was based on the 2003-2013 National Vital Statistics System's Multiple Cause of Death Files.

EXPOSURES Prevalence of nonmedical use of prescription opioids.

MAIN OUTCOMES AND MEASURES Nonmedical prescription opioid use and use disorders.

RESULTS Among adults aged 18 through 64 years, the prevalence of nonmedical use of prescription opioids decreased from 5.4% (95% CI, 5.08%-5.70%) in 2003 to 4.9% (95% CI, 4.58%-5.22%) in 2013 (absolute difference, −0.5%; 95% CI, −0.11% to −0.89%), but the prevalence of prescription opioid use disorders increased from 0.6% (95% CI, 0.54%-0.76%) in 2003 to 0.9% (95% CI, 0.75%-1.01%) in 2013 (absolute difference, 0.3%; 95% CI, 0.03%-0.43%). The 12-month prevalence of high-frequency use (≥200 days) also increased from 0.3% (95% CI, 0.19%-0.35%) in 2003 to 0.4% (95% CI, 0.31%-0.48%) in 2013 (absolute difference, 0.1%; 95% CI, 0.01%-0.29%). Mortality assessed by drug overdose death rates involving prescription opioids increased from 4.5 per 100,000 (95% CI, 4.42-4.61) in 2003 to 7.8 per 100,000 (95% CI, 7.64-7.89) in 2013 (absolute difference, 3.3; 95% CI, 3.09-3.41) among adults aged 18 through 64 years. The mean number of days of nonmedical use of prescription opioids increased from 2.1 (95% CI, 1.83-2.37) in 2003 to 2.6 (95% CI, 2.27-2.85) in 2013 (absolute difference, 0.5; 95% CI, 0.05-0.86). The model-adjusted prevalence of having prescription opioid use disorders among nonmedical users increased to 15.7% (95% CI, 13.87%-17.67%) in 2010, 16.1% (95% CI, 14.36%-17.99%) in 2011, 17.0% (95% CI, 15.07%-19.12%) in 2012, and 16.9% (95% CI, 14.95%-19.03%) in 2013 from 12.7% (95% CI, 11.04%-14.53%) in 2003.

CONCLUSIONS AND RELEVANCE During the 2003-2013 years, among adults aged 18 through 64 years, the percentage of nonmedical use of prescription opioids decreased. In contrast, the prevalence of prescription opioid use disorders, frequency of use, and related mortality increased.
Since 1999, the United States has experienced increases in morbidity and mortality associated with nonmedical use of prescription opioids. During this period, emergency department (ED) visits and drug overdose deaths involving these drugs have increased rapidly. The prevalence of people aged 12 years or older who met Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for prescription opioid dependence increased from 0.4% in 2003 to 0.6% in 2013. Moreover, the estimated rates of ED visits involving prescription opioids more than doubled from 82.5 per 100 000 in 2004 to 184.1 per 100 000 in 2011. Furthermore, age-adjusted rates for drug-poisoning deaths involving prescription opioids more than tripled from 1.4 per 100 000 population in 1999 to 5.1 in 2013. Also in 2013, prescription opioids were involved in more deaths (>16 200) than all illicit drugs combined (14 775). Due to these increases in morbidity and mortality, prescription opioid abuse has become a US epidemic.

To fully understand the current status of the epidemic and to examine who is currently most affected, an examination of nationally representative US surveillance data is needed. To further develop a detailed picture of the public health implications, we used 2 national data sets to examine trends in the prevalence of nonmedical use of prescription opioids, prescription opioid use disorders, frequency of use, and drug overdose deaths involving prescription opioids. Because nonelderly adults are the main population at risk of chronic nonmedical use of prescription opioids and related morbidity and mortality, this study focused on adults aged 18 through 64 years.

Methods

Data Sources
First, we examined data of adults who participated in the 2003-2013 National Surveys on Drug Use and Health (NSDUH), which are conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). They provided nationally representative data on nonmedical use of prescription opioids and use disorders among the civilian, noninstitutionalized population aged 12 years or older in the United States. Excluded from NSDUH were persons without a household address (eg, homeless persons not living in shelters), active-duty military personnel, and institutional residents. The data collection protocol of the NSDUH was approved by the institutional review board at the Research Triangle Institute (RTI) International. Written informed consent was obtained from each study participant. The annual mean weighted response rate of the 2003-2013 NSDUH was 66.3% (range, 60.2%-70.2%), according to the definition of response rate 2 for in-person household surveys by the American Association for Public Opinion Research. Details regarding NSDUH data collection are provided elsewhere.

Second, we examined data from the 2003-2013 Multiple Cause of Death Files from the National Vital Statistics System. Drug overdose deaths were those assigned an underlying cause of death using the International Classification of Diseases, Tenth Revision (ICD-10) codes X40-X44 (unintentional), X60-X64 (suicide), X85 (homicide), and Y10-Y14 (undetermined intent). Prescription opioid overdose deaths were those assigned specific ICD-10 codes T40.2-T40.4. Similar to NSDUH analyses, we limited analyses to drug overdose deaths among adults aged 18 through 64 years in the United States.

Measures
The NSDUH defined 12-month nonmedical use of prescription opioids as use in the prior 12 months without a prescription or as use with a prescription simply for the experience or feeling caused by opioids. If respondents reported using prescription opioids nonmedically in the past year, they were asked to state the number of days they used them nonmedically. Consistent with previous work, we defined frequent users as those with 100 days or more of nonmedical opioid use in the past year and highly frequent users as those with 200 days or more. For persons reporting nonmedical prescription opioid use, NSDUH collected sources of the medications, including given by a friend or a relative for free, prescribed by 1 or more physicians, stolen from a friend or a relative, bought from a friend or a relative, and bought from a drug dealer or stranger. Age at first nonmedical use of prescription opioids was also assessed (<18, 18-29, or ≥30 years).

The NSDUH estimated past 12-month major depressive episodes (MDE) and each specific substance use disorder (dependence on or abuse of alcohol, marijuana, cocaine, hallucinogens, heroin, inhalants, or nonmedical use of prescription pain relievers, sedatives, or stimulants) based on assessments of individual diagnostic criteria from the DSM-IV. Nicotine dependence among cigarette smokers was assessed using the nicotine dependence syndrome scale.

Sociodemographic characteristics from NSDUH data included age, sex, race/ethnicity, educational attainment, employment status, marital status, health insurance, metropolitan statistical area, census region, and year. Race/ethnicity was NSDUH respondent’s self-classification of racial and ethnic origin and identification based on the classifications developed by the US Census Bureau. This study assessed race/ethnicity because prior research indicates racial/ethnic differences in prescription opioid-related mortality.

Statistical Analyses
All analyses were conducted for persons aged 18 through 64 years. Between 2003 and 2013 for each examined year, descriptive analyses were conducted to estimate the 12-month prevalence of nonmedical use of prescription opioids and prescription opioid use disorders, the proportion of 12-month nonmedical opioid use initiates, the prevalence of frequent users and highly frequent users, and the mean number of days of nonmedical use among adults and among nonmedical users. Similarly, we estimated trends in the rates of overdose deaths involving prescription opioids between 2003 and 2013. For percentage estimates, bivariable logistic regression models were applied to assess the unadjusted annual prevalence, to test for differences between the 2003 estimate and the estimate in each year in 2004-2013 (using PREDMARG and PRED_EFF statements in SUDAAN, }.
2-sided t test with a significance level of .05), and to test P values of β coefficients of the year variable. For mean numbers of days of nonmedical use, linear regression models were applied to examine differences between the 2003 estimate and the estimate in each year spanning 2004 through 2013 (using the REFLEVEL statement in SUDAAN,20 2-sided t test with a significance level of .05) and to test P values of β coefficients of the year variable. For drug overdose death rates, 2-tailed z tests (with a significance level of .05)21 were used to test differences between the 2003 rate and the rate in each year spanning 2004 through 2013. A Bonferroni correction was used to reduce chances of type I errors of testing overall trends. For each outcome, if the overall trend did not meet the statistical significance threshold after the Bonferroni correction, differences between the 2003 estimate and the estimates in other years were not reported.

Bivariate and multivariable logistic regression modeling were applied to assess unadjusted and model-adjusted relative risk (using PREDMARG and PRED_EFF statements in SUDAAN20,21) for prescription opioid use disorders among nonmedical opioid users. Because major depressive episodes were unavailable in the 2003 NSDUH and because the source of opioids was unavailable in 2003 and 2004 NSDUHs, separate multivariable models were calculated for 2005-2013 with these additional variables included and for 2003-2013 without them. This study used SUDAAN software to account for the complex sample design and sampling weights of NSDUH data. Moreover, bivariate and multivariable zero-truncated negative binomial regression models were applied to examine factors associated with the number of days of nonmedical use of prescription opioids among nonmedical users. Stata statistical software22,23 was used for a zero-inflated Poisson regression analysis to examine factors associated with having prescription opioid use disorders in each year during the 2010-2013 years (P = .006) had lower prevalence of prescription opioid use disorders. The prevalence was lower among users with a college degree or beyond than among users without a high school diploma (P < .001). Compared with users with full-time employment, users who were disabled for work had higher prevalence of the disorders (P < .001). The prevalence was higher among users without health insurance (P = .008) and among users with Medicaid (P < .001) than among users with private health insurance only. Nonmedical users with nicotine dependence had higher prevalence of prescription opioid use disorders than users without (P < .001). The prevalence among those with alcohol, marijuana, cocaine, hallucinogen, heroin, stimulant, and sedative use disorders were higher than users without the corresponding disorders (with each subgroup comparison tested separately for interaction, P < .001). With data from 2005-2013 NSDUHs, users with ma-
12-Month Prevalence, %a

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<th>Eligible adultsb</th>
<th>Usersc</th>
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<th>Prescription opioid use disorders</th>
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Table 1. Twelve-Month Prevalence Trends of Nonmedical Use of Prescription Opioids, Prescription Opioid Use Disorders, and Drug Overdose Deaths Involving Prescription Opioids, United States, 2003-2013

As shown in Table 1, the prevalence of nonmedical use of prescription opioids, prescription opioid use disorders, and drug overdose deaths involving prescription opioids has increased significantly from 2003 to 2013. The table highlights the trends in these metrics for the 12-month period ending in each year from 2003 to 2013. The prevalence of nonmedical use of prescription opioids has increased from 5.4% in 2003 to 5.6% in 2013, while the prevalence of prescription opioid use disorders has increased from 0.9% in 2003 to 0.9% in 2013. Similarly, the prevalence of drug overdose deaths involving prescription opioids has increased from 0.7% in 2003 to 0.7% in 2013.

(continued)
the percentage of nonmedical use of prescription opioids decreased. However, we found several measures of high-risk nonmedical prescription opioid use that either increased or persisted through 2013. Specifically, we found significant increases in high-intensity prescription opioid use (measured by both prevalence of prescription opioid use disorders and high frequency of use) among nonmedical prescription opioid users in each year from 2010 through 2013 compared with those in 2003, even after controlling for potential confounding factors. Furthermore, when compared with those in 2010, additional analyses at bivariable and multivariable levels consistently showed that both intensity outcomes did not decrease in any year from 2011 through 2013. These national increases also paralleled the increases in prescription opioid-related overdose death rates in the United States identified in our study using a separate national data set. These results are consistent with persistent high-risk nonmedical use among adults through at least 2013. The significant increases in high-intensity (and therefore especially high-risk) prescription opioid use contrast a slight downward trend in the overall percentage of nonmedical use.

A recent study, using indicators from the Researched Abuse, Diversion, and Addiction-Related Surveillance (RADARS) System, found that the abuse and diversion of prescription opioids increased between 2002 and 2010 and plateaued or decreased between 2011 and 2013.24 RADARS provides proprietary, nonnationwide representative data but does not aim to estimate prevalence.24,25 For example, not all parts of the United States have prescription drug diversion agencies, and operational details and emphases of diversion agencies vary according to the needs of the community and local drug activity.24,25 Since the completeness

### Table 1. Twelve-Month Prevalence Trends of Nonmedical Use of Prescription Opioids, Prescription Opioid Use Disorders, and Drug Overdose Deaths Involving Prescription Opioids, United States, 2003-2013* (continued)

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<td>46.1 (41.79-50.49)</td>
<td>47.3 (42.97-51.59)*</td>
<td>50.7 (46.13-55.19)*</td>
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<td>Northeast(^b)</td>
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<td>South(^b)</td>
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<tr>
<td>West</td>
<td>13.8 (12.66-15.01)</td>
<td>1 [Reference]</td>
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</table>
and accuracy of RADARS is difficult to ascertain, the nationally representative results in our study may be especially important in providing an accurate picture of the current status of the epidemic.

The epidemic has evolved over time. The increases in the prevalence of adults with prescription opioid use disorders and high-frequency use identified in our study are a major public health concern. Furthermore, the increases in high-intensity prescription opioid use occurred in the context of increased prescribing of prescription opioids. Previous studies have shown a strong relationship between inappropriate opioid prescribing and negative health outcomes. The percentage of prescription opioid users who used an opioid stronger than morphine or morphine-equivalent increased from 57.6% in the

<table>
<thead>
<tr>
<th>Factors</th>
<th>2003-2013 National Surveys on Drug Use and Health (n = 38 000)*a</th>
<th>Model-Adjusted Prevalence, % (95% CI)</th>
<th>Adjusted Relative Risk (95% CI)</th>
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<td>Nicotine dependence</td>
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<td>17.8 (16.76-18.93)</td>
<td>1.4 (1.33-1.57)</td>
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<td>No</td>
<td>12.3 (11.62-13.08)</td>
<td>1 [Reference]</td>
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<td>Alcohol use disorders</td>
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<td>1.3 (1.22-1.43)</td>
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<td>Marijuana use disorders</td>
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<td>1.4 (1.28-1.51)</td>
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<td>13.8 (13.14-14.40)</td>
<td>1 [Reference]</td>
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<td>Cocaine use disorders</td>
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<td>Hallucinogen use disorders</td>
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<td>Heroin use disorders</td>
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<td>13.9 (13.32-14.54)</td>
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<td>Sedative use disorders</td>
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<td>Stimulant use disorder</td>
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<td>2.4 (2.00-2.87)</td>
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<td>14.0 (13.42-14.62)</td>
<td>1 [Reference]</td>
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<td>Age at first nonmedical use of prescription opioids, y</td>
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<td>&lt;18b</td>
<td>15.8 (14.75-16.98)</td>
<td>1.4 (1.19-1.62)</td>
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<td>18-29b</td>
<td>14.7 (13.84-15.56)</td>
<td>1.3 (1.11-1.49)</td>
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<td>≥30</td>
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<td>Source of prescription opioids*</td>
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<td>Free from a friend or a relative</td>
<td>10.3 (9.60-11.12)</td>
<td>1 [Reference]</td>
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<td>Prescribedb</td>
<td>19.2 (17.58-20.93)</td>
<td>1.9 (1.66-2.08)</td>
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<td>Stolen from a friend/relativeb</td>
<td>18.0 (15.24-21.15)</td>
<td>1.7 (1.45-2.09)</td>
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<td>Bought from a friend/relativeb</td>
<td>21.6 (19.67-23.75)</td>
<td>2.1 (1.87-2.35)</td>
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<td>Bought from a drug dealer/strangerb</td>
<td>30.8 (27.41-34.43)</td>
<td>3.0 (2.61-3.40)</td>
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<td>Major depressive episode*</td>
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<td>20.8 (19.19-22.40)</td>
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<td>No</td>
<td>13.7 (12.93-14.42)</td>
<td>1 [Reference]</td>
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</table>

* The 2003 National Survey on Drug Use and Health (NSDUH) did not measure major depressive episode; the 2003-2004 NSDUHs did not measure source of prescription opioids. The presented results for Source of Prescription Opioids and Major Depressive Episode are based on a model using just the 2005-2013 NSDUH data (sample size = 30 800) after controlling for other covariates showing in Table 2. The rest of the results are from the 2003-2013 sample. The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files has to be rounded to the nearest 100, which intends to minimize potential disclosure risk.

b Within each factor, a model-adjusted prevalence that significantly differs from the model-adjusted prevalence of the reference group. The multivariable model adjusted simultaneously for year of the survey, age, sex, race/ethnicity, education, employment status, health insurance, region, nicotine dependence, alcohol use disorders, marijuana use disorders, cocaine use disorders, hallucinogen use disorders, heroin use disorders, sedative use disorders, stimulant use disorder, age at first nonmedical use of prescription opioids, source of prescription opioids, and major depressive episode.
Table 3. Modeled Number of Days of Nonmedical Use of Prescription Opioids in the Past 12 Months Among Prescription Opioid Nonmedical Adult Users in the United States

<table>
<thead>
<tr>
<th>Factors</th>
<th>2003-2013 National Surveys on Drug Use and Health (n = 38 000)a</th>
<th>Weighted Mean No. of Days of Nonmedical Use of Prescription Opioids (95% CI)</th>
<th>Adjusted Incidence Rate Ratio (95% CI)b</th>
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<tr>
<td>Year</td>
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<tr>
<td>2003</td>
<td></td>
<td>40.0 (35.43-44.57)</td>
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<td>2004</td>
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<td>42.1 (37.83-46.29)</td>
<td>1.06 (0.88-1.27)</td>
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<td>2005</td>
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<td>43.3 (38.65-45.95)</td>
<td>1.04 (0.88-1.22)</td>
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<tr>
<td>2006</td>
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<td>44.7 (40.47-48.97)</td>
<td>1.06 (0.90-1.25)</td>
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<td>2007</td>
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<td>46.1 (41.79-50.49)</td>
<td>1.16 (0.97-1.37)</td>
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<td>2008c</td>
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<td>47.3 (42.97-51.59)</td>
<td>1.22 (1.02-1.46)</td>
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<td>2009c</td>
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<td>50.7 (46.13-55.19)</td>
<td>1.19 (1.01-1.41)</td>
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<td>2010c</td>
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<td>49.1 (44.73-53.51)</td>
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<td>2011c</td>
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<td>50.8 (45.89-55.65)</td>
<td>1.23 (1.02-1.47)</td>
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<td>2012c</td>
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<td>52.6 (48.23-56.89)</td>
<td>1.26 (1.06-1.50)</td>
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<tr>
<td>2013c</td>
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<td>54.2 (48.97-59.43)</td>
<td>1.29 (1.09-1.54)</td>
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<tr>
<td>Age, y</td>
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<td>18-29c</td>
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<td>45.8 (44.36-47.27)</td>
<td>0.69 (0.59-0.80)</td>
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<td>30-49</td>
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<td>48.3 (45.83-50.72)</td>
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<td>50-64</td>
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<td>1.14 (1.07-1.23)</td>
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<td>Women</td>
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<td>43.0 (41.22-44.80)</td>
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<td>Hispanic</td>
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<td>68.7 (64.90-72.39)</td>
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<td>0.80 (0.73-0.87)</td>
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<tr>
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<td>43.2 (40.75-45.61)</td>
<td>0.72 (0.66-0.80)</td>
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<td>Full-time employed</td>
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<td>43.0 (41.22-44.68)</td>
<td>1 [Reference]</td>
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<td>Part-time employed</td>
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<td>41.2 (38.33-44.11)</td>
<td>0.93 (0.84-1.03)</td>
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<td>84.3 (75.23-93.37)</td>
<td>1.33 (1.14-1.55)</td>
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<td>Unemployed</td>
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<td>64.2 (59.49-68.91)</td>
<td>1.09 (0.97-1.21)</td>
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<td>Health insurance</td>
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<td>36.2 (34.62-37.80)</td>
<td>1 [Reference]</td>
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<td>1.26 (1.17-1.35)</td>
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<td>1.36 (1.22-1.51)</td>
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<td>1.16 (1.00-1.35)</td>
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<td>Nicotine dependence</td>
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<td>67.9 (65.11-70.61)</td>
<td>1.54 (1.43-1.65)</td>
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<td>37.0 (35.49-38.43)</td>
<td>1 [Reference]</td>
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<td>1.46 (1.27-1.67)</td>
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<tr>
<td>No</td>
<td></td>
<td>45.2 (43.81-46.57)</td>
<td>1 [Reference]</td>
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</table>

(continued)
years 1999 through 2002 to 80.0% in the years 2011 through 2012.27 Also, usage of higher amounts of prescription opioids is a significant risk factor for overdose death.28

We identified characteristics associated with 2 intensity outcomes that may help clinicians detect problematic prescription opioid use and use disorders and eventually reduce morbidity and mortality involving prescription opioids alone or in combinations with other drugs. For example, users with sedative use disorders were at the highest risk of both intensity outcomes, which may help explain the increasing morbidity and mortality due to prescription opioid and benzodiazepine use.29 Users who were disabled for work and users with Medicaid health insurance coverage were at higher risk of both intensity outcomes, which were consistent with previous studies showing that these populations were more likely to be prescribed and to use prescription opioids in higher-risk ways and were at increased risk of opioid-related mortality.30 These results can be incorporated into clinician training programs to facilitate effective identification and interventions for high-risk nonmedical users of prescription opioids. Moreover, clinicians can use prescription drug-monitoring programs31,32 to identify patterns of inappropriate receipt of prescription opioids and screen and treat patients with prescription opioid use disorders as well as other associated specific substance use disorders, nicotine dependence, and depression.

Receiving treatment for substance use disorders is particularly critical. Most adults with prescription opioid use disorders or other substance use disorders neither receive treatment nor perceive a need for treatment.33 In 2013, more than three-fourths of adults aged 18 through 64 years who had prescription opioid use disorders did not receive any substance use treatment.6 Particularly, policy and societal barriers prevent broad dissemination, access, and adoption of highly effective medication-assisted therapies for people with prescription opioid use disorders.7,10,33

This study has several limitations. First, the cross-sectional nature of NSDUH data precludes drawing causal

<table>
<thead>
<tr>
<th>Factors</th>
<th>2003-2013 National Surveys on Drug Use and Health (n = 38 000)</th>
<th>Weighted Mean No. of Days of Nonmedical Use of Prescription Opioids (95% CI)</th>
<th>Adjusted Incidence Rate Ratio (95% CI)</th>
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<td>Heroin use disorders</td>
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<td>Yes</td>
<td>119.8 (107.94-131.74)</td>
<td>1.91 (1.65-2.22)</td>
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<tr>
<td>No</td>
<td>45.7 (44.36-47.10)</td>
<td>1 [Reference]</td>
<td></td>
</tr>
<tr>
<td>Sedative use disorders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>110.6 (100.66-120.56)</td>
<td>1.96 (1.69-2.29)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>45.1 (43.77-46.47)</td>
<td>1 [Reference]</td>
<td></td>
</tr>
<tr>
<td>Stimulant use disorder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>101.2 (89.49-112.99)</td>
<td>1.49 (1.21-1.84)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>46.1 (44.71-47.49)</td>
<td>1 [Reference]</td>
<td></td>
</tr>
<tr>
<td>Age at first nonmedical use of prescription opioids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18</td>
<td>59.6 (57.30-61.94)</td>
<td>1.55 (1.36-1.77)</td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>42.7 (40.91-44.55)</td>
<td>1.20 (1.06-1.36)</td>
<td></td>
</tr>
<tr>
<td>≥30</td>
<td>39.1 (35.69-42.47)</td>
<td>1 [Reference]</td>
<td></td>
</tr>
<tr>
<td>Source of prescription opioids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free from a friend or a relative</td>
<td>32.4 (30.88-33.92)</td>
<td>1 [Reference]</td>
<td></td>
</tr>
<tr>
<td>Prescribed</td>
<td>62.9 (58.59-67.21)</td>
<td>1.97 (1.79-2.17)</td>
<td></td>
</tr>
<tr>
<td>Stolen from a friend or a relative</td>
<td>41.3 (35.26-47.36)</td>
<td>1.28 (1.10-1.48)</td>
<td></td>
</tr>
<tr>
<td>Bought from a friend/relative</td>
<td>76.4 (71.01-81.73)</td>
<td>2.24 (2.04-2.46)</td>
<td></td>
</tr>
<tr>
<td>Bought from a drug dealer/stranger</td>
<td>110.0 (100.85-119.23)</td>
<td>2.81 (2.54-3.10)</td>
<td></td>
</tr>
</tbody>
</table>

*The 2003-2004 National Surveys on Drug Use and Health (NSDUH) did not measure the source of prescription opioids. However, this variable is significantly associated with the number of days of nonmedical use of prescription opioids in the past 12 months. The presented results for Source of Prescription Opioids are based on a model using just the 2005-2013 NSDUH data after controlling for other covariates showing in Table 3. The rest of the results are from the 2003-2013 sample (sample size = 38 000). The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files has to be rounded to the nearest 100, which intends to minimize potential disclosure risk.

*bEach day of use is considered a separate occurrence and was counted once in calculating the adjusted incidence rate ratio.23

*Within each factor, a model-predicted number of days of nonmedical use of prescription opioids that significantly differs from the model-predicted number of days of the reference group. The variables in the Methods section but not presented in Table 3 (eg, marital status and metropolitan statistical area) were not significantly associated with the outcome at the multivariable level. However, final models were adjusted for age, sex, race/ethnicity, and education regardless of statistical significance.
inferences from reported associations. Second, except for the results on drug overdose deaths involving prescription opioids, our results only applied to the civilian, noninstitutionalized population because NSDUH does not cover institutionalized populations, homeless people not living in shelters, and active-duty military personnel. Third, although methods to assess nonresponse bias vary and each has its limitations, the SAMHSA compared NSDUH estimates with other population surveys such as the Monitoring the Future, the Youth Risk Behavior Survey, the Behavioral Risk Factor Surveillance System, the National Health and Nutrition Examination Survey, and the National Health Interview Survey. The SAMHSA found comparable trends even though the estimates themselves differ in magnitude (mostly due to differences in survey designs). For example, NSDUH and Monitoring the Future trends in nonmedical use of prescription opioids, cigarette use, and alcohol use between 2003 and 2013 showed consistent patterns. Fourth, NSDUH is a self-report survey and is subject to recall bias. Fifth, approximately 25% of drug overdose death certificates did not specify the type of drugs involved in the death on the death certificate. The death rates reported in this study may be underestimated.

Despite these limitations, we found a significant decrease in the percentage of nonmedical use of prescription opioids, as well as significant increases in the prevalence of prescription opioid use disorders, high-frequency use, and related mortality among adults aged 18 through 64 years in the United States over the past decade. Furthermore, the increases identified in this study occurred in the context of increasing heroin use and heroin-related overdose deaths in the United States, supporting a need to address nonmedical use of prescription opioid and heroin abuse in a coordinated and comprehensive manner.

Conclusions

During the 2003-2013 years, among adults aged 18 through 64 years, the percentage of nonmedical use of prescription opioids decreased. In contrast, the prevalence of prescription opioid use disorders, frequency of use, and related mortality increased.


