

Opioid Dosing Trends and Mortality in Washington State Workers' Compensation, 1996–2002

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Background *The use of opioids for chronic non-cancer pain has increased in the United States since state laws were relaxed in the late 1990s. These policy changes occurred despite scanty scientific evidence that chronic use of opioids was safe and effective.*

Methods *We examined opiate prescriptions and dosing patterns (from computerized databases, 1996 to 2002), and accidental poisoning deaths attributable to opioid use (from death certificates, 1995 to 2002), in the Washington State workers' compensation system.*

Results *Opioid prescriptions increased only modestly between 1996 and 2002. However, prescriptions for the most potent opioids (Schedule II), as a percentage of all scheduled opioid prescriptions (II, III, and IV), increased from 19.3% in 1996 to 37.2% in 2002. Among long-acting opioids, the average daily morphine equivalent dose increased by 50%, to 132 mg/day. Thirty-two deaths were definitely or probably related to accidental overdose of opioids. The majority of deaths involved men (84%) and smokers (69%).*

Conclusions *The reasons for escalating doses of the most potent opioids are unknown, but it is possible that tolerance or opioid-induced abnormal pain sensitivity may be occurring in some workers who use opioids for chronic pain. Opioid-related deaths in this population may be preventable through use of prudent guidelines regarding opioid use for chronic pain.* Am. J. Ind. Med. 48:91–99, 2005. © 2005 Wiley-Liss, Inc.

KEY WORDS: *chronic pain; mortality; opioids; workers' compensation*

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INTRODUCTION

By the end of the last decade, many state medical boards implemented dramatic liberalization of regulations regarding use of opioids for the treatment of chronic, non-cancer pain (chronic pain) [Federation of State Medical Boards of the US, 1998]. In Washington State, preliminary guidelines were published in April 1996 and final regulations, having the weight of law, were implemented in October 1999 [Washington Administrative Code, 1999]. These policies represented a 180-degree change from the nearly complete prohibition of regular opioid use for chronic pain, particularly in the ambulatory care setting, prior to that time. This policy shift was consistent with strong opinions by advocates that persons with chronic pain had been previously

undertreated [Hill, 1996], and with consensus statements from professional organizations representing pain management specialists [American Academy of Pain Medicine, 1997]. The scientific basis for this policy reversal was from limited studies suggesting that true addiction in clinical settings may be relatively rare [Portenoy, 1996], and from small, short-term controlled trials demonstrating efficacy for pain relief [Moulin et al., 1996]. The fundamental assumption here is that with prudent clinical guidelines, potentially serious problems such as tolerance, dependence, addiction, and diversion could be avoided while patients with chronic pain gained relief from pain and improved quality of life.

The effect of these policies, following rapid diffusion among treating physicians, is only now coming into focus. Between 1980 and 2000 in the United States, rates of office visit prescriptions for opioids for chronic musculoskeletal pain doubled and rates of more potent opioid prescriptions increased 4.5-fold [Caudill-Slosberg et al., 2004]. These increased prevalence rates could reflect appropriate use. However, a 2000–2001 national survey of medical examiners' reports of deaths attributable to prescription oxycodone use [US Department of Justice, 2002] and a report from Utah [Caravati et al., 2005] documenting a dramatic recent increase in accidental poisoning deaths, largely from prescription drugs, especially prescription opiates, are worrisome.

Since 1998, we have observed increased deaths associated with prescription opioid use in the Washington State workers' compensation system. Therefore, we used the Washington State workers' compensation database to examine opioid prescription patterns for injured workers between 1996 and 2002. Our objectives were to: examine the prevalence of opioid prescriptions, determine whether there was a shift towards greater use of more potent opioids during this period (from Schedule III/IV to Schedule II), determine whether the average daily dose of potent Schedule II opioids increased over this period, and describe deaths among workers attributable to use of prescription opioids.

METHODS

Setting and Data Acquisition

The Washington State Department of Labor and Industries (DLI) is the sole regulator of workers' compensation coverage in Washington State and is the direct insurer for two-thirds of the non-Federal workforce in the state, covering approximately 1.2 million eligible workers. The remaining one-third of the eligible workforce is covered by approximately 400 larger self-insured companies. The DLI receives approximately 170,000 claims for work-related injuries and illnesses annually.

We examined data obtained from the DLI administrative database, the Medical Information Payment System (MIPS), which tracks all health care services for which payment is

requested. For outpatient prescriptions, MIPS point-of-sale records information includes data such as, but not limited to, national drug code (NDC), drug class, quantity, day's supply, drug strength, prescribing practitioner, and schedules of controlled substances (II, III, IV, or V).

Opioids are scheduled by the Drug Enforcement Administration (DEA) according to their potential for abuse and dependence. Schedule II opioids have the greatest potential for abuse and dependence; this category includes formulations of fentanyl, methadone, morphine, and oxycodone. Methadone has a long half-life; fentanyl, morphine and oxycodone have shorter half-lives but are formulated in slow-release form. Typical Schedule III opioids include formulations of hydrocodone and codeine, and typical Schedule IV opioids include formulations of propoxyphene.

Temporal Trend of Opioid Prescription Use

To investigate the temporal trend of opiate use statewide in the workers' compensation system, we examined the total number of prescriptions for all opioids paid annually during 1996–2002. In addition, we investigated changes in prescription of Schedule II opioids compared to prescription of Schedules III and IV opioids.

Schedule II Dosing Trends

To examine the change in average daily dosages of Schedule II drugs, we used published equi-analgesic conversions for transdermal fentanyl (25 mcg/hr), oral levorphanol (4 mg), oral methadone (15 mg), oral morphine (45 mg), and oral oxycodone (30 mg). If the published equi-analgesic conversion was a range, we used the mid-point of that range [American Pain Society, 1999; Wolters Kluwer Health, 2004]. The daily dose for each Schedule II opioid prescription was calculated as (total quantity ÷ days supply) × (drug strength). These doses were then converted to morphine equivalent doses (mg/day).

Identification of Opiate-Related Deaths

The DLI is notified of all deaths for persons who are receiving benefits for a work-related injury claim. We requested death certificates for all such workers who had a compensable claim (i.e., a claim where wage replacement benefits were paid); died between January 1995 and December 2002; and had at least one of the following characteristics: (a) a prescription for a Schedule II or Schedule III opioid within 3 months of death, (b) at least 20 Schedule II or Schedule III opioid prescriptions for their work-related injury over the course of their claim, or (c) reported to the DLI provider review unit as an opioid-related death.

Two hundred sixty-six death certificates met these screening criteria. Of these, 60 listed cause of death as “overdose” or “intoxication” from opiates. These 60 cases were reviewed by two authors (G.M.F., J.M.) independently. Of these 60 cases, 5 were listed as suicide and 55 were listed as accidental death on the death certificate. For each of these 55 accidental deaths, the two authors obtained information on each of the following six factors from death certificates and supplementary autopsy reports (factors 1, 2, 3, 5, and 6), and from the computerized database (factor 4), in order to classify the deaths as to whether they were definitely, probably, or possibly related to prescription opiate use. Greater weight was given to information directly obtainable from the death records because as medical examiner cases, all of these cases received autopsies and most had documented toxicology. Factors 2 and 3 were added to increase the certainty that the death was related only to prescription drug use, and not to mixed prescription and non-prescription substance use.

1. Cause of death listed as “toxic overdose,” “acute intoxication,” “overdose,” or “intoxication” AND drugs listed included opioids
2. Other drugs (e.g., antidepressants) mentioned on the death certificate likely to be prescribed medications
3. Terms “medication” or “prescription” appear in the description of the underlying cause, nature, or associated cause
4. DLI records indicate worker received schedule II, III, or IV opioids within 3 months of death
5. Presence or mention of illicit drug use (e.g., methamphetamine, cocaine, heroin)
6. Presence or mention of alcohol use

We considered the death to be definitely due to prescription opiate use if the following criteria were met: both 1 and 2 or 3 were present and both 5 and 6 were absent. We considered the death to be probably due to prescription opiate use if the following criteria were met: both 1 and 4 were present and both 5 and 6 were absent. We considered the death to be possibly due to prescription opiate use if the following criteria were met: met criteria for definite or probable and either 5 or 6 was present. No disagreement between the two reviewers for definite/probable versus possible cases occurred.

Finally, we abstracted from specific fields on the death certificates information related to gender, age at death, and smoking status.

RESULTS

The total number of paid prescriptions for Schedule II–IV opioids increased only modestly during 1996–2002, from approximately 120,000 prescriptions annually in 1996 to approximately 150,000 annually in 2002 (Fig. 1). Overall, it appears that prescriptions for Schedule III opioids increased very slightly, while prescriptions for Schedule IV opioids decreased modestly. By contrast, prescriptions for Schedule II opioids increased 2.5 times, from approximately 23,000 annually in 1996 to approximately 57,000 annually in 2002. As a percent of all scheduled opioids (II–IV), Schedule II prescriptions increased from 19.3% in 1996 to 37.2% in 2002.

Oxycodone HCl controlled-release (OxyContin) accounted for nearly 30% of the Schedule II opioid prescriptions during 1996–2002 (Fig. 2). For the long-acting opioids, the mean (SD) daily morphine equivalent dose

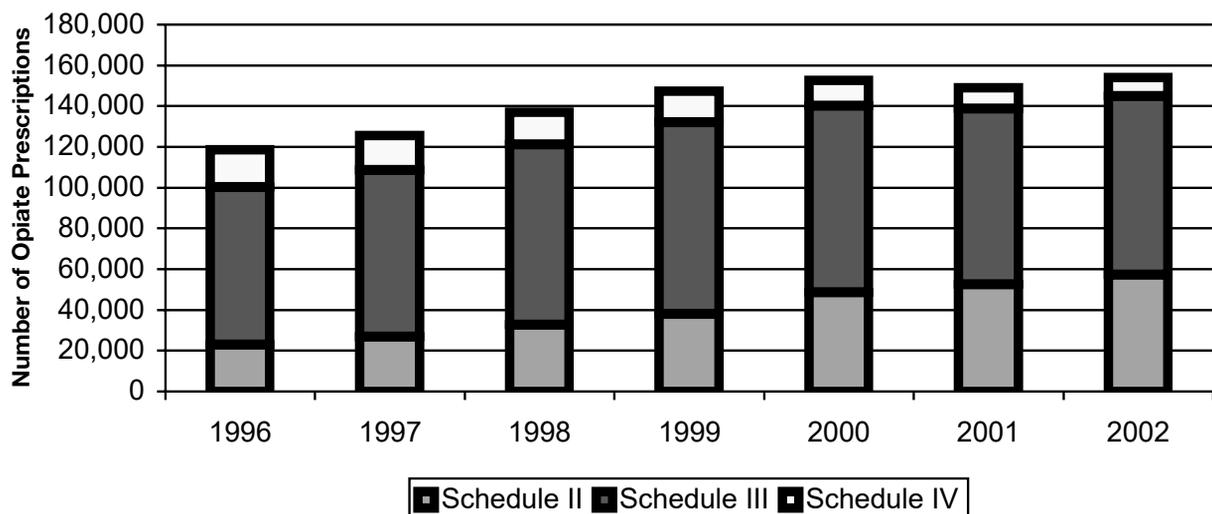


FIGURE 1. Yearly trend of scheduled opioids, Washington State, 1996–2002.

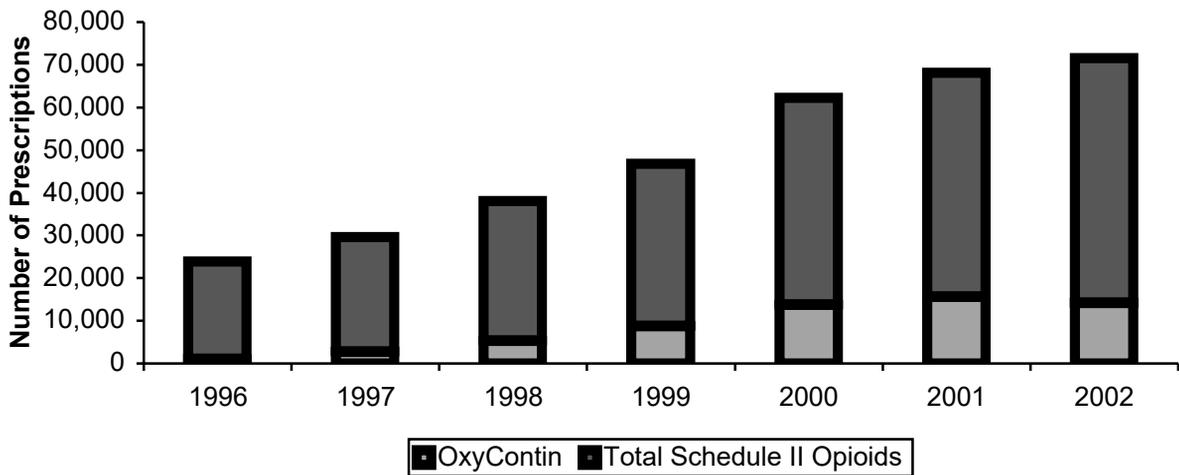


FIGURE 2. Yearly trend of schedule II opioid prescriptions, Washington State, 1996–2002.

increased from 88 (10) mg/day in the first quarter of 1996 to 132 (6) mg/day in the fourth quarter of 2002 (Fig. 3). This represents a 50% increase in average daily dose.

Of the 55 deaths potentially related to accidental prescription opioid overdose, 32 met our criteria for definitely or probably, and 12 met our criteria for possibly, related to accidental prescription opioid overdose. The total number of definite, probable, or possible deaths increased after 1997, reaching a peak in 2000 (Fig. 4). The 44 definite, probable and possible cases are enumerated in Table I in regard to year of death, age at death, smoking status, and which criteria were met regarding the case definition. Among these cases, the mean age at death was 40 years, 84% were male, and 69%

were smokers; these proportions were the same for definite/probable and possible cases.

Among the definite/probable (N = 32) cases, oxycodone was mentioned in 15 cases, and methadone was mentioned in 23 cases (some of these were overlapping). The most common treated conditions were low back pain (62.5%, 20/32) and carpal tunnel syndrome (9.4%, 2/32). Only 6.3% (2/32) of the cases would be considered catastrophic injuries (1 spinal cord injury, 1 crush injury). For the 32 definite/probable cases, 9/32 had other co-morbid conditions listed on the death certificate as possibly contributing to death, but not resulting in the underlying cause of death (accidental opioid overdose): 6 with cardiovascular disease, 2 with

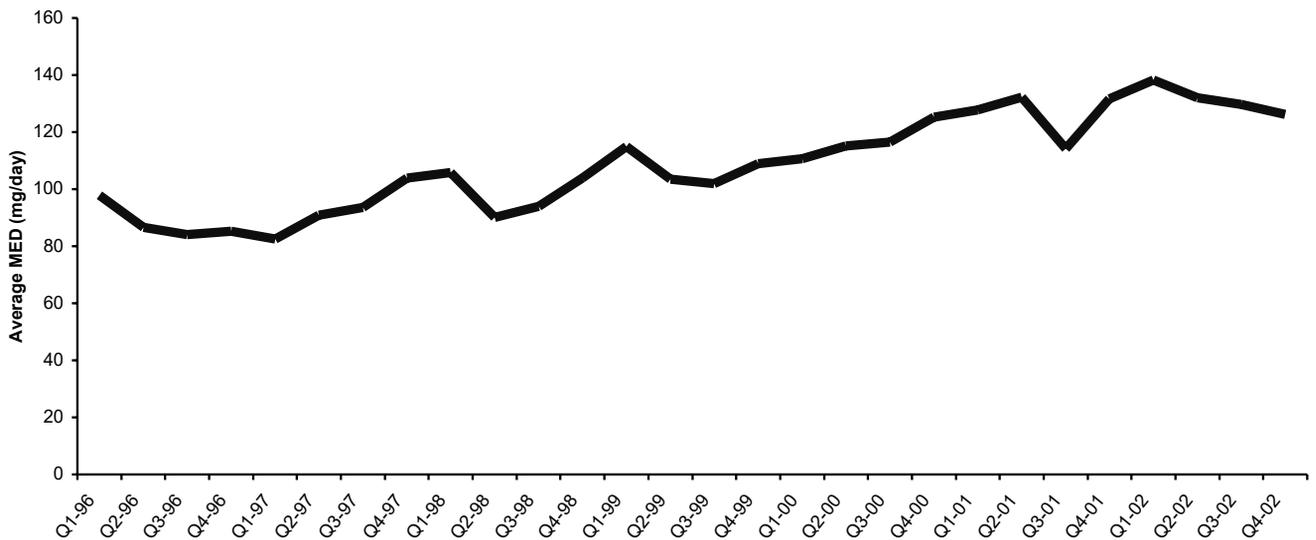


FIGURE 3. Trend of schedule II opioids, Morphine equivalent dosages, Washington State, 1996–2002.

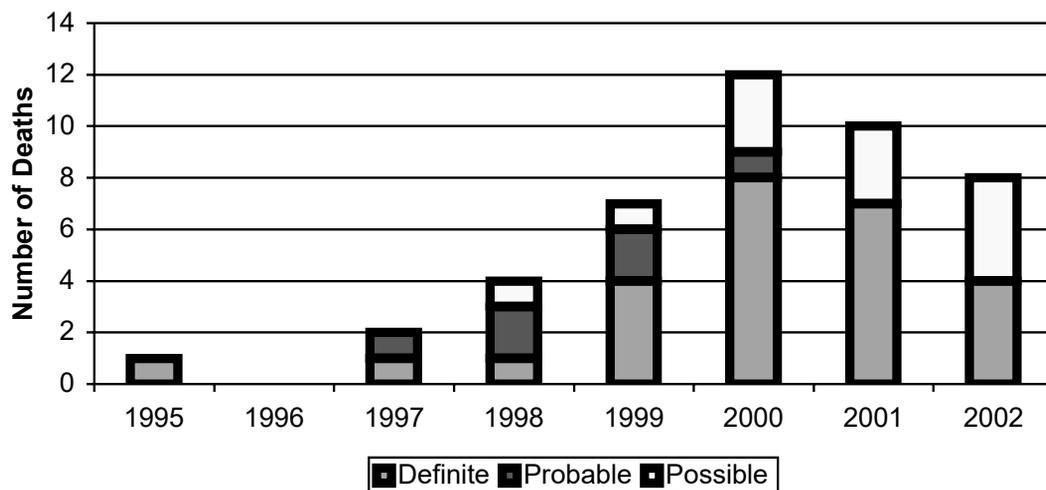


FIGURE 4. Washington workers' compensation opioid-related deaths, 1995–2002.

COPD, and 1 with early liver cirrhosis. None of these cases had known terminal illness such as cancer. Finally, the most common listed drugs on the death certificates ($N = 32$) in addition to opioids were 11 occurrences with antidepressants, 6 occurrences with benzodiazepines, and 2 occurrences with sedative-hypnotics (some of these cases were overlapping).

DISCUSSION

The dramatic shift in public policy allowing much more liberal use of opioids for chronic pain in Washington State, starting in 1996 and finalized in 1999, appears to have been associated with a number of changing patterns of opiate use among injured workers: a modest overall increase in opioid prescriptions; a dramatic shift from use of Schedule III/IV opioids to use of more potent Schedule II opioids; and among the long acting opioid prescriptions, a 50% increase in average daily morphine equivalent dose. Concomitant with these changes in opioid use, we also observed an increase in worker deaths attributable to accidental overdose of prescription opiates.

A shift to increased prescribing of potent, longer-acting opioids for chronic pain has been reported nationally [Caudill-Slosberg et al., 2004] and internationally [del Pozo, 1999], however, the clinical evidence justifying such a shift is sparse. Chou et al. [2003] in a recent systematic review, found insufficient evidence to conclude that long-acting opioids as a class are more effective or safer than short-acting opioids for chronic pain. In addition, there is no available evidence from clinical trials to demonstrate that severe adverse events, including addiction, differ for long versus short-acting opioids [Chou et al., 2003].

The slow but steady rise in dosage of Schedule II drugs has been previously reported from Australia [Bell, 1997]. In our setting, the shift from approximately 88 mg/day

morphine equivalents in 1996 to 132 mg/day morphine equivalents in 2002 for Schedule II long acting opioid prescriptions is of concern and suggests the possibility of substantial tolerance developing among patients with chronic pain who use opioid medications chronically. DLI opioid use guidelines developed in collaboration with the State medical society [Washington State Department of Labor and Industries, 2000] recommend that physicians obtain a pain management specialty consultation when daily morphine equivalent doses exceed 120 mg. In other words, the average daily dose of potent opioids prescribed for Washington State injured workers has now exceeded this “red flag” dose.

The reasons for the Schedule II opioid dosage escalation in this population of injured workers with chronic pain are not clear. However, possible explanations include pharmacologic tolerance and opioid-induced abnormal pain sensitivity resulting in the need for higher doses to achieve the same pain relief [Ballantyne and Mao, 2003]. Another unresolved question regarding chronic opioid use in the injured worker population relates to whether opioid efficacy in pain reduction also extends to improvement in function. This is a key point, since a crucial goal of the workers' compensation system is to contribute to restoration of function so that a worker may ultimately return to productivity. No direct evidence for a beneficial effect on function in the injured worker population has been published, and results regarding function in studies of other populations have been mixed [Ballantyne and Mao, 2003].

The most alarming observation is the substantial increase in accidental poisoning deaths attributable to opioids. The pattern in these death cases is not dissimilar to those reported by the DEA in a 2-year study of medical examiner death cases related to oxycodone [US Department of Justice, 2002]. In that study, 464 cases were reported to be specifically attributable to oxycodone use. Similar to our cases, the

TABLE I. Prescription Opioid-Related Deaths, Washington State Workers' Compensation, 1995–2002

Injured worker	Year of death	Age	Criteria ^a						Result	Smoking history
			1	2	3	4	5	6		
1	1995	36	X	X		X			Definite	Y
2	1997	25	X		X	X			Definite	N
3	1997	42	X			X			Probable	Y
4	1998	45	X		X	X			Definite	N
5	1998	35	X			X			Probable	Y
6	1998	34	X			X			Probable	Y
7	1998	39	X			X		X	Possible	N
8	1999	43	X			X			Probable	Y
9	1999	41	X		X	X			Definite	Y
10	1999	39	X		X	X			Definite	Y
11	1999	37	X	X				X	Possible	Y
12	1999	28	X		X	X			Definite	N
13	1999	41	X			X			Probable	Y
14	1999	55	X		X	X			Definite	Y
15	2000	44	X		X	X			Definite	Y
16	2000	49	X			X			Probable	Y
17	2000	33	X			X		X	Possible	N
18	2000	40	X	X	X				Definite	Y
19	2000	49	X	X		X			Definite	Y
20	2000	31	X	X	X	X			Definite	Y
21	2000	48	X		X				Definite	N
22	2000	32	X	X		X		X	Possible	N
23	2000	33	X	X		X			Definite	N
24	2000	40	X		X			X	Possible	Y
25	2000	36	X	X		X			Definite	Y
26	2000	45	X	X	X	X			Definite	N
27	2001	58	X	X		X			Definite	Y
28	2001	47	X	X	X	X			Definite	Y
29	2001	36	X	X		X			Definite	N
30	2001	47	X	X		X			Definite	Y
31	2001	44	X	X	X	X			Definite	Y
32	2001	37	X	X				X	Possible	N
33	2001	27	X	X					Definite	Y
34	2001	41	X	X		X		X	Possible	Y
35	2001	31	X	X		X		X	Possible	Y
36	2001	41	X	X					Definite	N
37	2002	45	X	X		X			Definite	N
38	2002	25	X	X				X	Possible	N
39	2002	38	X	X				X	Possible	Y
40	2002	48	X	X		X			Definite	Y
41	2002	50	X			X		X	Possible	N
42	2002	40	X	X					Definite	Y

(Continued)

TABLE I. (Continued)

Injured worker	Year of death	Age	Criteria ^a						Result	Smoking history
			1	2	3	4	5	6		
43	2002	48	X	X					Definite	Y
44	2002	44	X	X			X	X	Possible	Y
Average Age		40								

^aCriteria are as follows:

1. Cause of death listed as "toxic overdose," "acute intoxication," "overdose," or "intoxication" and drugs listed included opioids.
2. Other drugs (e.g., antidepressants) mentioned on the death certificate likely to be prescribed medications.
3. Terms "medication" or "prescription" appear in the description of the underlying cause, nature, or associated cause.
4. DLI records indicate worker received schedule II, III, or IV opioids within 3 months of death.
5. Presence or mention of illicit drug use (e.g., methamphetamine, cocaine, heroin).
6. Presence or mention of alcohol use.

DEA death cases also included: additional mention of other prescription drugs (particularly, benzodiazepines, another opiate, antidepressant medication, and muscle relaxants) or over-the-counter antihistamines or cold medications; and a minority of deaths attributable to alcohol-drug interactions (19%) or to cocaine use (15%). We conservatively classified persons who had any mention of ethanol or an illicit drug (e.g., cocaine, methamphetamine) as only "possible" cases, even if they met other criteria for inclusion as accidental poisoning related to prescription opioids. In our case series, oxycodone (N = 15) and methadone (N = 23) were the most common opioids mentioned on death certificates (some of these cases were overlapping).

A possible causal link between high doses of potent opioids and death from accidental overdose relates to respiratory depression. Tolerance to respiratory depression from opioids is less than complete and may be slower than tolerance to euphoric and other effects [White and Irvine, 1999]. Concomitant use of other drugs, including benzodiazepines, can markedly increase the chance of death due to potentiation of respiratory depression effects [Wolff, 2002]. In addition, these long-acting opioids may have severe adverse consequences in a delayed fashion, hours after ingestion [Wolff, 2002].

It is possible that the risk associated with respiratory depression effects of long-acting opioids may be greatest at night, when recognition of respiratory depression may be reduced. Patients in a methadone-maintenance program on stable doses of methadone were more likely than healthy controls to have substantial sleep-disordered breathing, including central sleep apnea and periodic breathing [Teichtahl et al., 2001]. Other investigators have reported observations of unique sleep-disordered breathing abnormalities during non-rapid eye movement sleep of patients on sustained-release opioids for chronic pain [Farney et al., 2003]. These abnormalities included ataxic breathing,

central apnea, and sustained hypoxemia. Further research is needed to more fully understand the respiratory depression and sleep-disordered breathing effects of various opioids when used long-term for chronic pain, and patient risk factors for respiratory depression.

Another possibility to explore in future research is whether delayed metabolism might be a contributing factor in some deaths in long-lasting opioid users. Some individuals with variant alleles of cytochrome P450 have delayed metabolism of oxycodone [Jannetto et al., 2002]. Delayed metabolism could be a factor in cases of oxycodone-associated deaths in which higher than expected (relative to therapeutic dose) blood opioid levels are found post-mortem [Drummer et al., 1994].

Among the 44 definite, probable, or possible deaths related to prescription opioid use, 84% were men and 69% were smokers. To our knowledge, no studies have directly addressed gender or smoking as risk factors related to morbidity or mortality associated with opioid use in chronic pain. Smoking as a possible risk factor is intriguing. One study found that smokers deprived of nicotine after coronary artery bypass graft required as much as one-third more opioid for postoperative analgesia than non-smokers [Creekmore et al., 2004]. Another study found smoking to be associated significantly with opioid analgesic use after open cholecystectomy [Glasson et al., 2002]. The reasons for this association are unknown; possible reasons include opiate use to avoid nicotine withdrawal symptoms, a pharmacokinetic interaction between smoking and opiates (e.g., smoking-related metabolism of opiates), and tolerance to opiates in smokers [Creekmore et al., 2004]. It is also possible that smokers might require higher doses for pain relief, and these higher doses might contribute to death by accidental overdose.

These descriptive observations from the Washington State workers' compensation system regarding opioid use can only be considered preliminary; however, the findings are

alarming and led us to send an “Opiate Warning Letter” to all prescribing providers in our system in 2004 (Appendix). The letter asks providers to more closely follow published guidelines related to opioid use for chronic pain. These guidelines include assessing pain and function at every visit, and co-signing an opioid information form after educating the patient [Washington State Department of Labor and Industries, 2000].

We were not able to report death rates relative to person-months of exposure to opioids. However, during the time frame of this study, similar to national claim trends, annual worker claims for lost time fell by approximately 15% in Washington State. Thus, it is likely that the increased deaths reported here are a conservative marker of a true increasing trend. Consistent with our observations, a recent dramatic increase in deaths since 1999 related to non-illicit opioid drug use has been reported from Utah. [Caravati et al., 2005]. Comparing two periods (1991–1998 vs. 1999–2003), deaths attributable to methadone increased from 2 to 33 per year, and deaths attributable to oxycodone and other opioids increased from 10 to 48 per year.

In their recent review, Ballantyne and Mao [Ballantyne and Mao, 2003] concluded that “. . . very large doses of opioids are prescribed for patients with chronic pain that is not associated with terminal disease, often in the absence of any real improvement in the patient’s pain or level of functioning. Whereas it was previously thought that unlimited dose escalation was at least safe, evidence now suggests that prolonged, high-dose opioid therapy may be neither safe nor effective” (page 1951). We recommend that providers be cautious about dose escalation, and consider discontinuing opioids and pursuing other management strategies if treatment goals (reduced pain, improved function) are not met. Ideally, for injured workers, opioid use should decrease pain and improve function under conditions of stable dosage. Detailed guidelines reflecting such appropriate use in workers’ compensation were disseminated statewide in 2000 and included tools for tracking pain and function [Washington State Department of Labor and Industries, 2000]. At this time, however, there is evidence that function may not improve with chronic opioid use [Moulin et al., 1996]; that substantial dose escalation of potent, Schedule II opioids has occurred over recent years; and that preventable deaths attributable to use of potent opioids have increased. We recommend that consultation with a pain management specialist be obtained if average daily morphine equivalent doses reach 120 mg. In addition, we recommend surveillance of all deaths potentially related to prescription opioid use in workers’ compensation and other health systems in order to better inform public policy and to implement prevention strategies aimed at what are almost certainly preventable deaths. Finally, longer term, prospective studies are needed to more rigorously address the important issues raised from these observations.

Two other important issues should be investigated in future studies. First, we were not able to determine the relative contributions of inappropriate prescribing versus patient misuse of opioids in the deaths reported here. Methods to accurately identify persons at risk for opioid misuse are only in development [Chabal et al., 1997; Adams et al., 2004]. Second, while we believe the trends reported here reflect more general trends [Caravati et al., 2005], it may be that persons in the workers’ compensation system and in other disability engendering systems are at even higher risk for dose escalation without functional improvement or for misuse [Chabal et al., 1997; Adams et al., 2004]. Methods to more clearly identify patients with chronic pain who may remain on effective stable doses of opioids with functional improvement from those who may die is clearly a critical research question.

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Appendix

IMPORTANT WARNING—PRESCRIPTION OPIATES

February 2004

Dear Attending Physician:

Please read this letter and think carefully about the content.

Scientific evidence does not yet provide clear guidance on which patients with chronic, non-cancer pain can safely use opiate-based pain relievers, in what dose, or for how long. The enclosed article, reprinted with permission from The New York Times, provides in layman's terms the current medical challenges in determining the most appropriate use of these powerful drugs. A review of opioid therapy in chronic pain recently published in the *New England Journal of Medicine* (2003; 349: 1943–1953) concluded that “. . . very large doses of opioids are prescribed for patients with chronic pain that is not associated with terminal disease, often in the absence of any real improvement in the patient's pain or level of functioning. Whereas it was previously thought that unlimited dose escalation was at least safe, evidence now suggests that prolonged, high dose opioid therapy may be neither safe nor effective.”

The following information is relevant to potentially serious problems that may arise from use of opioids for chronic pain:

- The Drug Enforcement Agency (DEA) has reported 464 deaths as OxyContin-verified (N = 146) or OxyContin-

likely (N = 318) from a national survey of medical examiners in 2000–2001 (www.deadiversion.usdoj.gov and access Drugs & Chemicals of Concern—oxycodone).

- The Department of Labor and Industries has also identified deaths between 1995 and 2002, associated with overdose of prescription opioids, particularly oxycodone and methadone. The majority of these deaths have occurred since 1999.
- The department has verified two patterns that may be related to these deaths:
 - A dramatic (~40%) shift from Schedule III to Schedule II opioids.
 - A dramatic increase in average daily (morphine equivalent) dose of long-acting opioids from approximately 80 mg/day in 1997 to over 130 mg/day in 2001.
- In addition to opiates, both DEA-reported and DLI opioid-related deaths also have had evidence of multiple prescription drug use, including use of benzodiazepines, tricyclic anti-depressants, and muscle relaxants.

We have included the department's opioid guideline, developed in collaboration with the Washington State Medical Association. Please use this guideline before prescribing opioids for chronic, non-cancer pain, and attend to the principles outlined in that document.

Sincerely,

Robert J. Malooly
Assistant Director for
Insurance Services

Gary Franklin, MD, MPH
Medical Director

Prescription Opioid Use, Misuse, and Use Disorders in U.S. Adults: 2015 National Survey on Drug Use and Health

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Background: Despite the continuing epidemic of opioid misuse, data on the prevalence of prescription opioid use, misuse, and use disorders are limited.

Objective: To estimate the prevalence of prescription opioid use, misuse, and use disorders and motivations for misuse among U.S. adults.

Design: Survey.

Setting: The 2015 National Survey on Drug Use and Health (NSDUH).

Participants: 72 600 eligible civilian, noninstitutionalized adults were selected for NSDUH, and 51 200 completed the survey interview.

Measurements: Prescription opioid use, misuse, and use disorders.

Results: Weighted NSDUH estimates suggested that, in 2015, 91.8 million (37.8%) U.S. civilian, noninstitutionalized adults used prescription opioids; 11.5 million (4.7%) misused them; and 1.9 million (0.8%) had a use disorder. Among adults with prescription opioid use, 12.5% reported misuse; of these, 16.7% reported a prescription opioid use disorder. The most commonly

reported motivation for misuse was to relieve physical pain (63.4%). Misuse and use disorders were most commonly reported in adults who were uninsured, were unemployed, had low income, or had behavioral health problems. Among adults with misuse, 59.9% reported using opioids without a prescription, and 40.8% obtained prescription opioids for free from friends or relatives for their most recent episode of misuse.

Limitation: Cross-sectional, self-reported data.

Conclusion: More than one third of U.S. civilian, noninstitutionalized adults reported prescription opioid use in 2015, with substantial numbers reporting misuse and use disorders. Relief from physical pain was the most commonly reported motivation for misuse. Economic disadvantage and behavioral health problems may be associated with prescription opioid misuse. The results suggest a need to improve access to evidence-based pain management and to decrease excessive prescribing that may leave unused opioids available for potential misuse.

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The United States is experiencing an epidemic of prescription opioid misuse, with prescription opioid overdose deaths more than quadrupling between 1999 and 2015 (1-4). Misuse is defined as use of a psychotropic medication without a prescription; for a reason other than as directed by a physician; or in greater amounts, more often, or longer than prescribed. The potential for misuse complicates prescription of opioids (5, 6). Several studies based on local data (7-11) or national samples of high school seniors (12, 13) have examined motivations for medication misuse. However, an examination of the prevalence of prescription opioid use, misuse, and use disorders and motivations for misuse in the U.S. adult population has been lacking. Such data could inform efforts to reduce prescription opioid misuse and related morbidity and mortality.

Based on a nationally representative sample of U.S. adults, this study examined the 12-month prevalence of prescription opioid use by sociodemographic characteristics, health conditions, and behavioral health status; the prevalence of misuse and use disorders among prescription opioid users by sociodemographic characteristics, health conditions, and behavioral health status; motivations for misuse; and sources of prescription opioids among adults with misuse and use disorders.

METHODS

Survey Methods and Study Population

The 2015 National Survey on Drug Use and Health (NSDUH) was a face-to-face household interview survey conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA). The NSDUH used a stratified, multistage area probability sample that was designed to be representative of the nation as a whole as well as each of the 50 states and the District of Columbia. Under a stratified design, with states serving as the primary strata and state sampling regions serving as the secondary strata, census tracts, census block groups, segments within census block groups, and dwelling units within segments were selected using probability-proportional-to-size sampling. After dwelling units were selected, an interviewer visited each unit to obtain a roster of all persons residing there. The roster information obtained from an eligible member of the dwelling unit was used to select 0 to 2 people for the survey.

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Data collection for NSDUH was approved by the Institutional Review Board at RTI International. Data were collected by interviewers in personal visits to households and noninstitutional group quarters. Each participant provided verbal informed consent. The interview lasted about an hour, and each respondent received \$30 in cash after completion (14).

The NSDUH collected nationally representative data on prescription opioid use, misuse, and use disorders and motivations for misuse among the U.S. civilian, noninstitutionalized population aged 12 years or older (14). Additional details about the NSDUH survey methods and questionnaire are available at SAMHSA's Web site (14). The NSDUH collected data using audio computer-assisted self-interviewing, in which respondents read or listened to the questions on headphones and then entered their answers directly into a laptop computer. This interview technique is designed for accurate reporting of information by providing respondents with a private, confidential way to record answers to sensitive questions. The NSDUH also used computer-assisted personal interviewing, in which interviewers read less sensitive questions to respondents and entered answers into the laptop computer.

In 2015, the NSDUH screening process (in which an interviewer visited each selected dwelling unit to obtain a roster of all persons residing there) was completed at 132 210 addresses, and the weighted screening response rate was 79.7%, which was not specific to age groups (14). The weighted interview response rate was 68.4% for adults, based on the definitions of the American Association for Public Opinion Research (15). A total of 72 600 eligible persons aged 18 years or older were selected for the 2015 NSDUH, and 51 200 completed the survey interview.

Measures of Main Outcomes and Patient Characteristics

The 2015 NSDUH asked about lifetime and past-year use and misuse of prescription opioids. The NSDUH defined prescription opioid misuse as "in any way that a doctor did not direct you to use them, including 1) use without a prescription of your own; 2) use in greater amounts, more often, or longer than you were told to take them; or 3) use in any other way a doctor did not direct you to use them" (16). Past-year prescription opioid use disorder was defined on the basis of the 11 diagnostic criteria for prescription opioid dependence or abuse specified in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV), including withdrawal; tolerance; use in dangerous situations; trouble with the law; and interference with major obligations at work, school, or home (17).

For respondents who reported prescription opioid misuse in the past year, NSDUH asked about the main motivation for the most recent episode with multiple-choice questions that offered the following options: to relieve physical pain, to relax or relieve tension, to experiment or see what the drug was like, to feel good

or get high, to help with sleep, to help with feelings or emotions, to increase or decrease the effects of other drugs, because the respondent was "hooked" or had to have it, or other reason (16). The source of prescription opioids for the most recent episode of misuse was assessed with a multiple-choice question that offered the following options: obtained from a friend or relative for free; prescribed by a physician; stolen from a friend or relative; bought from a friend or relative; bought from a drug dealer or stranger; or stolen from a physician's office, clinic, or pharmacy. If respondents reported that they obtained the prescription opioids from a friend or relative for free, NSDUH asked them where the friend or relative had obtained the opioids.

In addition to sociodemographic characteristics (age, sex, race/ethnicity, educational attainment, employment status, family income, marital status, health insurance, metropolitan statistical area, and census region), NSDUH asked respondents about lifetime and past-year use of tobacco, alcohol, cannabis, cocaine, heroin, hallucinogens, and inhalants as well as lifetime and past-year use and misuse of prescription sedatives, tranquilizers, and stimulants. Using survey items assessing DSM-IV diagnostic criteria, the NSDUH estimated prevalence in the past 12 months of major depressive episode and substance use disorders (alcohol, cannabis, cocaine, heroin, hallucinogens, inhalants, prescription tranquilizers or sedatives, and prescription stimulants) in addition to prescription opioid use disorders (17). Nicotine dependence among cigarette smokers was assessed using the Nicotine Dependence Syndrome Scale (18). These measures of substance use and use disorders have demonstrated good validity and reliability (19-21). For example, the 2006 NSDUH Reliability Study reported that the κ coefficient (a standard measure of test-retest agreement) was 0.73 for prescription opioid misuse and 0.62 for illicit drug use disorders, suggesting good to excellent reliability (21). Furthermore, a clinical validation study reported sensitivity of 0.85 and specificity of 0.75 for illicit drug use disorders (including prescription opioid use disorder) (20). Finally, the survey asked about medical diagnoses received from a physician or other health care professional (hypertension, heart disease, diabetes mellitus, chronic obstructive pulmonary disease, asthma, cancer, HIV/AIDS, hepatitis B or C, cirrhosis, and kidney disease), respondents' self-rated health, and the number of emergency department visits in the prior year.

Among the 2015 NSDUH adult participants, item response rates were high (for example, >99% for the prescription opioid misuse and use disorder variables). Furthermore, missing values are imputed in NSDUH using predictive mean neighborhoods (22, 23), a combination of a model-assisted imputation method and a random nearest-neighbor hot-deck procedure. For prescription opioid use, misuse, and use disorders (the main variables of this study), a modified version of

predictive mean neighborhoods was used to cycle through a group of variables being imputed as a set (23).

Statistical Analysis

We estimated the national 12-month prevalence of prescription opioid use overall and by sociodemographic, health, and behavioral health characteristics. Next, among adults with prescription opioid use in the past 12 months, we estimated the national 12-month prevalence of prescription opioid misuse and use dis-

orders overall and by sociodemographic, health, and behavioral health characteristics. Finally, we assessed the main motivations and the sources of prescription opioids for the most recent episode of misuse. We used SUDAAN software (RTI International) (24) to account for the complex sample design and sample weights of NSDUH. The NSDUH weighting procedures adjusted for nonresponse through direct adjustments as well as an indirect adjustment via poststratification (25).

Table 1. 12-Month Prevalence of Any Use of Prescription Opioids Among U.S. Adults, and Prevalence of Prescription Opioid Use Without Misuse, Misuse Without Use Disorders, and Use Disorders Among U.S. Adults With Prescription Opioid Use in the Past 12 Months, by Sociodemographic Characteristics*

Characteristic	Any Use of Prescription Opioids Among All Adults (n = 51 200)	Adults With Prescription Opioid Use (n = 19 000)		
		Prescription Opioid Use Without Misuse	Prescription Opioid Misuse Without Use Disorder	Prescription Opioid Use Disorder
Overall	37.8 (37.14-38.52)	87.5 (86.86-88.12)	10.4 (9.86-11.00)	2.1 (1.84-2.34)
Age				
18-29 y	35.7 (34.81-36.52)	76.4 (75.15-77.56)	20.1 (19.00-21.28)	3.5 (2.99-4.11)
30-49 y	37.0 (36.05-37.93)	85.4 (84.38-86.39)	11.8 (10.94-12.72)	2.8 (2.33-3.33)
≥50 y	39.5 (38.31-40.69)	93.7 (92.73-94.58)	5.3 (4.52-6.20)	1.0 (0.69-1.41)
Sex				
Male	35.3 (34.41-36.23)	84.3 (83.29-85.34)	12.8 (11.89-13.75)	2.9 (2.47-3.33)
Female	40.2 (39.22-41.12)	90.1 (89.34-90.75)	8.5 (7.87-9.16)	1.4 (1.18-1.78)
Race/ethnicity				
Non-Hispanic white	40.0 (39.14-40.82)	87.9 (87.13-88.62)	10.0 (9.31-10.65)	2.1 (1.86-2.47)
Non-Hispanic black	40.0 (38.21-41.90)	89.0 (87.01-90.73)	9.1 (7.78-10.69)	1.9 (1.20-2.87)
Hispanic	31.5 (29.89-33.04)	83.8 (81.80-85.71)	14.1 (12.29-16.08)	2.1 (1.42-3.02)
Non-Hispanic other	29.5 (27.07-32.06)	87.5 (84.68-89.90)	10.6 (8.29-13.35)	1.9 (1.27-2.90)
Education				
Less than high school	37.3 (35.37-39.17)	84.8 (82.71-86.66)	12.2 (10.55-14.17)	3.0 (2.14-4.07)
High school	38.9 (37.64-40.17)	87.3 (86.18-88.40)	10.1 (9.17-11.15)	2.6 (2.08-3.12)
Some college	42.7 (41.66-43.82)	86.6 (85.53-87.60)	11.2 (10.31-12.19)	2.2 (1.81-2.63)
College graduate	32.1 (30.91-60.99)	90.3 (89.07-91.32)	8.7 (7.72-9.80)	1.0 (0.71-2.63)
Health insurance				
Private only	34.6 (33.81-45.46)	87.3 (86.41-88.09)	11.1 (10.33-11.88)	1.6 (1.36-2.00)
Uninsured	31.6 (29.94-33.36)	73.9 (71.00-76.56)	21.1 (18.72-23.70)	5.0 (3.90-6.43)
Medicaid only	47.9 (46.24-49.57)	85.5 (83.84-86.93)	11.0 (9.82-12.35)	3.5 (2.77-4.47)
Other	41.6 (40.11-43.17)	93.8 (92.73-94.77)	5.3 (4.39-6.26)	0.9 (0.62-1.38)
Marital status				
Married	36.2 (35.20-37.12)	91.5 (90.69-92.29)	7.4 (6.62-8.12)	1.1 (0.87-1.48)
Widowed	41.0 (37.93-44.15)	92.4 (90.00-94.34)	6.0 (4.30-8.18)	1.6 (0.84-3.02)
Divorced/separated	45.5 (43.71-47.36)	88.2 (86.57-89.65)	9.3 (7.95-10.77)	2.5 (1.88-3.44)
Never married	36.4 (35.47-37.34)	78.0 (76.66-79.19)	18.3 (17.16-19.50)	3.7 (3.21-4.38)
Employment status				
Full-time	34.9 (34.03-35.72)	86.2 (85.25-87.00)	11.7 (10.93-12.54)	2.1 (1.78-2.57)
Part-time	36.5 (34.88-38.07)	85.2 (83.36-86.89)	12.7 (11.10-14.40)	2.1 (1.55-2.91)
Disabled	69.1 (66.09-71.95)	90.2 (87.83-92.14)	7.4 (5.71-9.53)	2.4 (1.57-3.69)
Unemployed	40.1 (37.60-42.65)	77.2 (73.84-80.33)	16.6 (14.12-19.40)	6.2 (4.33-8.68)
Other	37.4 (36.04-38.76)	91.7 (90.54-92.64)	7.2 (6.27-8.31)	1.1 (0.89-1.42)
Family income				
<\$20 000	41.1 (39.68-42.62)	84.2 (82.62-85.75)	12.6 (11.27-13.98)	3.2 (2.52-4.03)
\$20 000-\$49 999	39.1 (37.99-40.27)	86.4 (85.24-87.51)	11.3 (10.27-12.37)	2.3 (1.89-2.80)
\$50 000-\$74 999	36.8 (35.26-38.39)	89.2 (87.80-90.50)	8.7 (7.55-9.97)	2.1 (1.56-2.79)
≥\$75 000	35.5 (34.41-36.68)	89.5 (88.43-90.53)	9.2 (8.30-10.27)	1.3 (0.93-1.65)
Region				
Northeast	34.9 (33.48-36.36)	87.5 (85.91-88.97)	10.6 (9.25-12.07)	1.9 (1.45-2.50)
Midwest	37.1 (35.85-38.39)	88.2 (86.81-89.37)	9.9 (8.77-11.06)	2.0 (1.49-2.67)
South	39.3 (38.16-40.48)	88.0 (87.00-89.03)	9.7 (8.86-10.64)	2.2 (1.87-2.69)
West	38.4 (36.87-39.86)	86.0 (84.55-87.31)	12.0 (10.71-13.37)	2.0 (1.55-2.67)
Metropolitan statistical area				
Large	36.0 (35.10-36.90)	86.7 (95.69-87.65)	11.3 (10.44-12.22)	2.0 (1.65-2.41)
Small	40.1 (38.84-41.39)	88.2 (87.13-89.12)	9.7 (8.87-10.62)	2.1 (1.72-2.61)
Nonmetropolitan	39.9 (38.33-41.48)	88.7 (87.34-89.90)	9.0 (7.93-10.24)	2.3 (1.80-2.93)

* Values are weighted percentages (95% CIs). The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files be rounded to the nearest hundred to minimize potential disclosure risk.

Institutional Review Board Approval

The NSDUH data collection protocol was approved by the U.S. Office of Management and Budget and the Institutional Review Board at RTI International.

Role of the Funding Source

The funding sources supported the authors, who were responsible for preparation, review, and approval of the manuscript and the decision to submit the manuscript for publication. The funding sources had no role in the design and conduct of the study, analysis and interpretation of the data, preparation and review of the manuscript, or the decision to submit the manuscript for publication. The funding sources reviewed and approved the manuscript.

RESULTS

National Prevalence of Prescription Opioid Use, Misuse, and Use Disorders

On the basis of the 51 200 adult respondents to the 2015 NSDUH, we estimated that among civilian, noninstitutionalized U.S. adults aged 18 years or older, 37.8% (95% CI, 37.14% to 38.52%) or 91.8 million (CI, 89.61 to 94.08 million) used prescription opioids in the prior year, 4.7% (CI, 4.49% to 4.97%) or 11.5 million (CI, 10.88 to 12.10 million) misused them, and 0.8% (CI, 0.69% to 0.89%) or 1.9 million (CI, 1.68 to 2.15 million) had a use disorder. Among adults with prescription opioid use, the 12-month prevalence of misuse was 12.5% (CI, 11.88% to 13.14%) and the 12-month prevalence of prescription opioid use disorders was 2.1% (CI, 1.84% to 2.34%). Among adults with prescription opioid misuse, the 12-month prevalence of prescription opioid use disorders was 16.7% (CI, 14.85% to 18.49%).

Among adults reporting misuse of prescription opioids in 2015, 59.9% (CI, 57.26% to 62.56%) used them without a prescription, 22.2% (CI, 19.93% to 24.43%) used them in greater amounts than directed on their prescription, 14.6% (CI, 12.82% to 16.34%) used them more often than directed, and 13.1% (CI, 11.42% to 14.68%) used them longer than directed. These categories were not mutually exclusive.

Table 1 shows the 12-month prevalence of prescription opioid use, misuse, and use disorders by patient sociodemographic characteristics. Of note, adults aged 18 to 49 years had a lower prevalence of prescription opioid use than older adults (35.7% to 37.0% vs. 39.5%). Men had a lower prevalence of prescription opioid use than women (35.3% vs. 40.2%), and Hispanic persons had a lower prevalence than non-Hispanic white persons (31.5% vs. 40.0%). College graduates had a lower prevalence of prescription opioid use than adults with less than a high school education (32.1% vs. 37.3%), whereas those with some college education but without a degree had a higher prevalence (42.7% vs. 37.3%). Compared with adults with private health insurance only, uninsured adults had a lower prevalence of prescription opioid use

(31.6% vs. 34.6%), whereas Medicaid beneficiaries had a higher prevalence (47.9% vs. 34.6%).

Among adults with prescription opioid use, misuse without use disorders and use disorders were more commonly reported in those who had lower family incomes or were uninsured or unemployed (Table 1). Specifically, those with an annual family income less than \$50 000 had higher rates than those with an annual family income of \$75 000 or more (11.3% to 12.6% vs. 9.2% and 2.3% to 3.2% vs. 1.3%, respectively), uninsured persons had higher rates than those with private health insurance only (21.1% vs. 11.1% and 5.0% vs. 1.6%, respectively), and unemployed persons had higher rates than those with full-time employment (16.6% vs. 11.7% and 6.2% vs. 2.1%, respectively).

The prevalence of prescription opioid use among adults varied by all examined underlying health conditions (Table 2). Adults with less than excellent self-rated health, with 1 or more emergency department visits, or with each of the health or behavioral health conditions had a higher prevalence of prescription opioid use than their counterparts without the corresponding characteristic. Among adults with prescription opioid use, those with fair or poor self-rated health or 3 or more emergency department visits had a higher estimated prevalence of use disorders than their counterparts without these characteristics. Adults with cancer had a higher prevalence of prescription opioid use without misuse (93.9% vs. 87.0%) and a lower prevalence of misuse without use disorders (5.3% vs. 10.8%) and use disorders (0.8% vs. 2.2%) than those without cancer. Among adults with prescription opioid use, the prevalence of misuse and use disorders varied by each of the examined mental health and substance use conditions. For example, those with a major depressive episode had higher prevalence of prescription opioid misuse without use disorders (16.2% vs. 9.6%) and use disorders (5.0% vs. 1.7%) than those without a major depressive episode. Similarly, adults with suicidal ideation had higher prevalence of prescription opioid misuse without use disorders (21.5% vs. 9.7%) and use disorders (8.8% vs. 1.7%) than those without suicidal ideation.

Motivations for Misuse and Sources of Misused Prescription Opioids

Among U.S. adults with prescription opioid misuse overall in 2015, 63.4% (CI, 60.92% to 65.86%) reported that the motivation for their most recent misuse was to relieve physical pain. Among adults with misuse but without use disorders, the most common motivation was relief from physical pain (66.3% [CI, 63.73% to 68.95%]), followed by relaxing (11.2% [CI, 9.48% to 13.00%]) and getting high (10.8% [CI, 9.24% to 12.33%]) (Table 3). Reported main motivations among adults with prescription opioid use disorders differed from those in adults with misuse without use disorders.

Among adults with prescription opioid misuse overall in 2015, 40.8% (CI, 38.30% to 43.24%) obtained prescription opioids free from friends or relatives for their most recent misuse. Among adults with use but

Table 2. 12-Month Prevalence of Any Use of Prescription Opioids Among U.S. Adults, and Prevalence of Prescription Opioid Use Without Misuse, Misuse Without Use Disorders, and Use Disorders Among U.S. Adults With Prescription Opioid Use in the Past 12 Months, by Health Conditions and Behavioral Health Status*

Characteristic	Any Use of Prescription Opioids Among All Adults (n = 51 200)	Adults With Prescription Opioid Use (n = 19 000)		
		Prescription Opioid Use Without Misuse	Prescription Opioid Misuse Without Use Disorder	Prescription Opioid Use Disorder
Health conditions				
Self-rated health				
Excellent	26.1 (25.01-27.26)	87.1 (85.35-88.55)	11.9 (10.52-13.51)	1.0 (0.63-1.67)
Very good	34.6 (33.62-35.67)	87.4 (86.38-88.42)	11.0 (10.08-12.00)	1.6 (1.25-1.94)
Good	42.3 (41.07-43.52)	87.3 (86.15-88.36)	10.5 (9.53-11.53)	2.2 (1.83-2.68)
Fair/poor	54.8 (52.85-56.75)	88.2 (86.66-89.62)	8.3 (7.13-9.57)	3.5 (2.78-4.43)
Past-year emergency department visit				
0	31.0 (30.30-31.78)	87.7 (86.86-88.45)	10.7 (9.95-11.44)	1.6 (1.37-1.98)
1	53.6 (51.80-55.38)	88.9 (87.59-90.12)	8.7 (7.71-9.87)	2.4 (1.82-3.05)
2	56.2 (53.91-58.46)	86.2 (84.37-87.84)	11.6 (10.09-13.28)	2.2 (1.60-3.04)
≥3	72.2 (69.29-74.94)	84.7 (81.94-87.04)	10.9 (8.89-13.27)	4.4 (3.19-6.11)
Hypertension				
Yes	46.1 (44.52-47.76)	91.9 (90.70-93.04)	6.0 (5.06-7.03)	2.1 (1.55-2.81)
No	35.8 (35.08-36.50)	86.1 (85.41-86.89)	11.8 (11.09-12.45)	2.1 (1.82-2.38)
Heart disease				
Yes	49.1 (46.83-51.32)	91.9 (90.16-93.36)	5.7 (4.45-7.18)	2.4 (1.65-3.58)
No	36.5 (35.81-37.22)	86.9 (86.20-87.53)	11.1 (10.50-11.73)	2.0 (1.79-2.29)
Diabetes mellitus				
Yes	48.9 (46.55-51.26)	91.6 (89.84-93.13)	6.9 (5.54-8.52)	1.5 (0.95-2.31)
No	36.5 (35.84-37.26)	86.9 (86.25-87.57)	10.9 (10.31-11.51)	2.2 (1.92-2.47)
Cancer				
Yes	45.8 (42.88-48.78)	93.9 (91.87-95.51)	5.3 (3.84-7.27)	0.8 (0.37-1.56)
No	37.3 (36.62-38.02)	87.0 (86.38-87.68)	10.8 (10.20-11.36)	2.2 (1.93-2.48)
Asthma				
Yes	47.1 (45.08-49.14)	87.3 (85.51-88.82)	10.3 (8.94-11.91)	2.4 (1.78-3.27)
No	36.9 (36.20-37.60)	87.6 (86.92-88.27)	10.4 (9.76-10.97)	2.0 (1.78-2.33)
Chronic obstructive pulmonary disease				
Yes	61.7 (58.28-65.00)	91.3 (89.17-93.11)	6.2 (4.71-8.01)	2.5 (1.62-3.85)
No	36.8 (36.07-37.46)	87.3 (86.60-87.93)	10.7 (10.09-11.28)	2.0 (1.80-2.33)
HIV/AIDS				
Yes	51.8 (38.86-64.42)	81.6 (67.54-90.48)	13.1 (6.22-25.51)	†
No	37.8 (37.13-38.51)	87.6 (86.95-88.20)	10.3 (9.79-10.92)	2.1 (1.83-2.34)
Hepatitis B or C				
Yes	59.6 (53.08-65.87)	83.0 (76.74-87.79)	12.4 (8.32-18.19)	4.6 (2.69-7.74)
No	37.6 (36.87-38.25)	87.7 (87.03-88.29)	10.3 (9.76-10.88)	2.0 (1.79-2.30)
Cirrhosis				
Yes	71.7 (59.23-81.51)	86.1 (73.57-93.26)	†	†
No	37.8 (37.07-38.45)	87.6 (86.94-88.19)	10.3 (9.81-10.93)	2.1 (1.83-2.34)
Kidney disease				
Yes	57.4 (52.43-62.24)	93.7 (89.99-96.13)	4.0 (2.27-7.06)	2.2 (0.92-5.36)
No	37.5 (36.76-38.14)	87.4 (86.73-88.00)	10.6 (9.99-11.14)	2.1 (1.84-2.35)
Mental health problems				
Major depressive episode				
Yes	56.7 (54.48-58.97)	78.8 (76.45-80.95)	16.2 (14.32-18.37)	5.0 (3.94-6.23)
No	36.4 (35.70-37.11)	88.5 (87.87-89.13)	9.6 (9.19-10.35)	1.7 (1.49-2.01)
Suicidal ideation				
Yes	54.1 (51.26-56.85)	69.7 (66.33-72.92)	21.5 (18.77-24.46)	8.8 (6.88-11.19)
No	37.2 (36.46-37.84)	88.6 (87.94-89.17)	9.7 (9.20-10.33)	1.7 (1.46-1.92)
Substance use problems				
Tobacco use and disorder				
Past-month nicotine dependence	52.5 (50.73-54.27)	76.1 (74.23-77.94)	17.3 (15.75-19.07)	6.5 (5.58-7.61)
Past-year use	41.0 (39.74-42.24)	82.0 (80.52-83.41)	15.3 (14.05-16.64)	2.7 (2.11-3.43)
Lifetime use but no past-year use	37.9 (36.78-39.05)	91.6 (90.69-92.45)	7.4 (6.61-8.22)	1.0 (0.70-1.46)
Never-use	30.3 (29.15-31.41)	93.3 (92.14-94.22)	6.4 (5.47-7.56)	0.3 (0.18-0.52)
Alcohol use and disorder				
Past-year use disorder	50.3 (48.02-52.56)	64.3 (61.42-67.13)	28.2 (25.64-30.99)	7.4 (5.99-9.20)
Past-year use but no use disorder	38.0 (37.25-38.82)	88.0 (87.26-88.72)	10.4 (9.79-11.12)	1.6 (1.31-1.86)
Lifetime use but no past-year use	41.7 (40.08-43.43)	92.8 (91.44-93.95)	4.8 (3.87-5.96)	2.4 (1.78-3.23)
Never-use	26.5 (24.82-28.25)	94.1 (92.34-95.43)	5.5 (4.19-7.23)	0.4 (0.22-0.78)

Continued on following page

Table 2—Continued

Characteristic	Any Use of Prescription Opioids Among All Adults (n = 51 200)	Adults With Prescription Opioid Use (n = 19 000)		
		Prescription Opioid Use Without Misuse	Prescription Opioid Misuse Without Use Disorder	Prescription Opioid Use Disorder
Cannabis use and disorder				
Past-year use disorder	61.3 (57.52–64.88)	48.4 (42.98–53.81)	39.6 (34.47–44.97)	12.0 (9.15–15.64)
Past-year use but no use disorder	48.8 (47.17–50.48)	70.2 (68.18–72.18)	25.1 (23.27–26.93)	4.7 (3.99–5.59)
Lifetime use but no past-year use	43.5 (42.39–44.67)	88.6 (87.56–89.59)	9.1 (8.25–10.03)	2.3 (1.83–2.85)
Never-use	31.1 (30.21–32.03)	94.7 (93.96–95.39)	4.8 (4.19–5.57)	0.5 (0.29–0.70)
Cocaine use and disorder				
Past-year use disorder	71.7 (62.58–79.38)	31.7 (21.99–43.19)	36.8 (26.73–48.27)	31.5 (22.04–42.82)
Past-year use but no disorder	61.0 (56.85–65.01)	48.5 (42.92–54.16)	41.5 (36.23–46.97)	10.0 (7.11–13.86)
Lifetime use but no past-year use	52.2 (50.40–53.98)	77.5 (75.63–79.27)	17.3 (15.71–19.03)	5.2 (4.36–6.18)
Never-use	34.9 (34.14–35.61)	91.7 (91.14–92.28)	7.5 (6.94–8.04)	0.8 (0.64–1.00)
Heroin use and disorder				
Past-year use or disorder	90.1 (83.77–94.11)	20.3 (13.83–28.76)	37.4 (28.99–46.55)	42.3 (34.37–50.76)
Lifetime use but no past-year use	68.8 (63.95–73.32)	60.8 (54.97–66.42)	27.0 (22.17–32.42)	12.2 (9.25–15.84)
Never-use	37.1 (36.40–37.78)	88.9 (88.35–89.53)	9.7 (9.11–10.20)	1.4 (1.20–1.63)
Hallucinogen use and disorder				
Past-year use or use disorder	53.9 (50.15–57.00)	43.7 (38.86–48.75)	46.5 (41.66–51.31)	9.8 (7.50–12.72)
Lifetime use but no past-year use	52.1 (50.38–53.77)	74.3 (72.34–76.08)	20.1 (18.46–21.80)	5.7 (4.82–6.65)
Never-use	35.0 (34.23–35.73)	92.4 (91.78–92.91)	6.7 (6.22–7.29)	0.9 (0.71–1.13)
Inhalant use and disorder				
Past-year use or use disorder	51.0 (43.63–58.25)	49.6 (39.04–60.14)	37.1 (28.21–46.88)	13.3 (8.12–21.20)
Lifetime use but no past-year use	53.2 (51.28–55.20)	69.4 (66.83–71.76)	24.2 (21.99–26.59)	6.4 (5.37–7.70)
Never-use	36.2 (35.47–36.19)	90.5 (89.88–91.05)	8.2 (7.64–8.73)	1.3 (1.14–1.61)
Prescription sedative/tranquilizer misuse and use disorder				
Past-year misuse or use disorder	71.6 (68.27–74.64)	34.2 (30.69–37.91)	46.9 (43.42–50.48)	18.9 (16.06–22.00)
Past-year use and lifetime misuse	75.3 (69.44–80.29)	63.1 (55.63–69.93)	26.3 (20.49–33.06)	10.6 (6.71–16.47)
Past-year use but no lifetime misuse	64.5 (62.81–66.16)	92.4 (91.43–93.27)	6.3 (5.51–7.16)	1.3 (0.94–1.84)
Lifetime use but no past-year use	39.4 (37.49–41.34)	90.0 (88.04–91.06)	9.3 (7.71–11.15)	0.7 (0.38–1.49)
Never-use	29.8 (29.09–30.51)	90.3 (89.53–91.05)	8.8 (8.08–9.54)	0.9 (0.71–1.14)
Prescription stimulant misuse and use disorder				
Past-year misuse or use disorder	59.0 (55.76–62.14)	37.5 (33.41–41.77)	47.2 (43.26–51.27)	15.3 (12.31–18.76)
Past-year use and lifetime misuse	65.3 (56.87–72.92)	52.8 (42.86–62.56)	36.0 (27.65–45.38)	11.2 (6.22–19.16)
Past-year use but no lifetime misuse	61.3 (58.31–64.22)	85.4 (82.84–87.60)	11.5 (9.63–13.81)	3.1 (2.01–4.63)
Lifetime use but no past-year use	48.1 (45.00–51.18)	84.9 (81.81–87.49)	11.9 (9.69–14.55)	3.2 (1.98–5.22)
Never-use	35.7 (34.96–36.41)	89.9 (89.28–90.56)	8.7 (8.11–9.30)	1.4 (1.16–1.64)

* Values are weighted percentages (95% CIs). The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files be rounded to the nearest hundred to minimize potential disclosure risk.

† Estimate suppressed because of low statistical precision.

without use disorders, the most commonly reported sources were friends or relatives for free (44.6% [CI, 41.79% to 47.39%]) or a physician (33.8% [CI, 30.95% to 36.55%]) (Table 4). Among those who obtained prescription opioids from friends or relatives for free, 86.5% (CI, 83.81% to 89.11%) reported that the friend or relative received the opioids from a physician. Compared with adults with misuse but without use disorders, those with use disorders were less likely to report that they obtained prescription opioids for the most recent episode of misuse from friends or relatives for free (21.8% vs. 44.6%) and were more likely to report that they bought them from friends or relatives (14.1% vs. 8.5%) or from drug dealers or strangers (13.8% vs. 3.1%).

DISCUSSION

The 2015 NSDUH indicates a high prevalence of prescription opioid use among adults in the United States, with roughly 1 in 3 adults (91.8 million) using them in the prior year. We also found that approximately 11.5 million adults reported misusing a pre-

scription opioid at least once in the past year, and nearly 2 million had a use disorder. Among adults with prescription opioid misuse, 63.4% reported that the motivation for their most recent episode of misuse was relief from physical pain. Even among adults with prescription opioid use disorders, 48.7% reported relief from physical pain as the motivation for their most recent episode of misuse. Our results not only are consistent with previous estimates of high prevalence of pain in the United States (12, 26–30) but also show that physical pain is a common reason for prescription opioid use, even among adults with misuse and use disorders. Recent studies found a lack of data supporting the long-term effectiveness of opioids for chronic pain treatment and showed the well-documented increases in harms associated with increased opioid prescribing in the United States (31–34). Thus, our findings underscore the urgent need for more effective approaches to pain treatment, including increased access to high-quality evidence-based care, development of high-potency nonaddictive analgesics, and multimodal treatment of pain.

Table 3. Main Motivation for Misuse of Prescription Opioids Among Adults With Misuse and Use Disorder in Past 12 Months*

Main Motivation	Adults Reporting Misuse Without Use Disorder (n = 2500)	Adults Reporting Use Disorder (n = 500)
Relieve physical pain	66.3 (63.73-68.95)	48.7 (42.11-55.33)
Relax or relieve tension	11.2 (9.48-13.00)	8.9 (5.14-12.70)
Experiment	2.2 (1.63-2.73)	1.1 (0.36-1.74)
Get high or feel good	10.8 (9.24-12.33)	16.2 (11.90-20.40)
Help with sleep	4.6 (3.48-5.76)	3.7 (0.77-6.61)
Help with emotions or feelings	2.4 (1.64-3.12)	7.0 (6.11-7.92)
Increase/decrease effects of other drugs	0.9 (0.35-1.41)	†
Hooked or have to misuse	0.6 (0.22-0.96)	12.0 (8.66-15.24)
Other	1.0 (0.49-1.47)	†

* Values are weighted percentages (95% CIs). The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files be rounded to the nearest hundred to minimize potential disclosure risk. † Estimate suppressed because of low statistical precision.

Our results are consistent with findings that pain is a poorly addressed clinical and public health problem in the United States and that it may be a key part of the pathway to misuse or addiction (26-30). Because pain is a symptom of many pathologic processes (26-29), better prevention and treatment of the underlying disorders are necessary to decrease pain and the morbidity and mortality associated with opioid misuse. Simply restricting access to opioids without offering alternative pain treatments may have limited efficacy in reducing prescription opioid misuse and could lead people to seek prescription opioids outside the health system or to use nonprescription opioids, such as heroin or illicitly made fentanyl, which could increase health, misuse, and overdose risks.

Among adults with misuse of prescription opioids, 59.9% used them without a prescription at least once in 2015, and 40.8% obtained them from friends or relatives for free for their most recent episode of misuse. Such widespread social availability of prescription opioids suggests that they are commonly dispensed in amounts not fully consumed by the patients to whom they are prescribed. Diversion is especially common when opioids are prescribed in greater quantities than needed or for conditions for which they have no benefit (26-29). Based on a widely used source of prescription activity data in the U.S. outpatient retail setting, a recent study found that only approximately 7.7% of persons with an opioid prescription were long-term patients (those with prescriptions for ≥90 days), whereas the majority received short-term prescriptions (35). Thus, it is likely that prescribing too many opioids for an acute pain episode leads to a surplus that can then be used at a later date or given to others. Diversion of prescription opioids also involves criminal activities, especially for those with use disorders (36). Consistent with a finding from a previous study (31), we found that 13.8% of adults with use disorders obtained their most recently

misused prescription opioids from drug dealers or strangers.

Our findings highlight the importance of interventions targeting medication sharing, selling, and diversion (26, 37-39) and underscore the need to follow prescribing guidelines to minimize environmental availability of opioids due to excessively large numbers of leftover medications (for example, due to prescribing in larger amounts than required to address acute pain conditions [40, 41] and prescribing for conditions for which opioids have no benefit [26-29]). Recent federal legislation (32) allowing pharmacies to partially fill prescriptions may help alleviate the desire to prescribe larger quantities due to concerns about repeated clinical visits for pain that lasts longer than expected.

Consistent with prior findings (42), our study shows that adults with prescription opioid misuse and, even more strongly, prescription opioid use disorder had higher prevalence of a broad range of psychopathologic conditions, including other substance use disorders (such as heroin; cocaine; prescription sedatives, tranquilizers, or stimulants; and cannabis), depression, and suicidal ideation. Persons with these characteristics need to be prioritized for prevention, more intense monitoring, and screening for opioid use disorders when opioids are prescribed. Persons identified with prescription opioid misuse and use disorder should be queried about co-occurring behavioral health conditions and should be referred for treatment if these conditions are present. Key steps clinicians can take to identify misuse include routine use of prescription drug-monitoring programs to identify patients with prescription patterns suggesting misuse, screening patients for increased misuse risk before prescribing opioids, and inquiring about specific motivations for prescription opioid misuse (26-28, 32, 34, 42-44).

In addition, we found that uninsured adults, unemployed adults, and low-income adults had a higher prevalence of prescription opioid misuse and use dis-

Table 4. Source of Prescription Opioids Obtained for Most Recent Episode of Misuse Among Adults With Misuse and Use Disorder in Past 12 Months*

Source	Adults Reporting Misuse Without Use Disorder (n = 2500)	Adults Reporting Use Disorder (n = 500)
Obtained for free from friend/relative	44.6 (41.79-47.39)	21.8 (16.86-26.78)
Obtained from 1 physician	33.8 (30.95-36.55)	40.4 (34.08-46.62)
Obtained from >1 physician	1.3 (0.60-1.98)	3.9 (0.50-7.24)
Bought from friend/relative	8.5 (6.98-10.00)	14.1 (10.47-17.65)
Bought from drug dealer/stranger	3.1 (2.32-3.88)	13.8 (10.25-17.27)
Stolen from friend/relative	3.6 (2.53-4.61)	†
Stolen from physician's office, clinic, or pharmacy	0.5 (0.20-0.86)	†
Other	4.7 (3.41-5.95)	3.1 (1.22-5.06)

* Values are weighted percentages (95% CIs). The Substance Abuse and Mental Health Services Administration requires that any description of overall sample sizes based on the restricted-use data files be rounded to the nearest hundred to minimize potential disclosure risk. † Estimate suppressed because of low statistical precision.

orders. This suggests that financial disadvantage may be associated with risk for misuse, especially in response to poor control of pain.

This study has several limitations. First, the NSDUH did not cover homeless persons not living in shelters, active-duty military personnel, or residents of institutions (for example, incarcerated adults). Our estimates of the national prevalence of prescription opioid misuse and use disorders may be underestimates because homeless adults not living in shelters and adults in the criminal justice system usually have higher prevalence of substance use and use disorders than general civilian, noninstitutionalized adults (45–47). Second, the 2015 NSDUH had a lower response rate compared with prior years, which increases the potential for nonresponse bias. Third, because of the cross-sectional nature of NSDUH, this study could not establish temporal or causal relationships. Fourth, NSDUH did not specify relief from withdrawal symptoms as a motivation for prescription opioid misuse. Fifth, research is needed to examine the validity of self-reported data on prescription opioid source and motivation for misuse. Finally, NSDUH data are subject to recall and social-desirability biases.

In 2015, more than a third of the U.S. adult population used prescription opioids, 11.5 million adults misused them, and 1.9 million had use disorders. Actions should be taken to expand safe, evidence-based pain treatment and decrease excessive prescribing that may leave unused opioids available for potential misuse.

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Note: Dr. Han had full access to all of the data in this study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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Reproducible Research Statement: *Study protocol and statistical code:* Available from Dr. Han (e-mail, Beth.Han@samhsa.hhs.gov). *Data set:* Available through application for data portal for restrictive NSDUH data (www.datafiles.samhsa.gov/info/data-portal-nid5).

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