

# Prescribing of Controlled Medications to Adolescents and Young Adults in the United States



**WHAT'S KNOWN ON THIS SUBJECT:** The nonmedical use of prescription drugs by adolescents and young adults has surpassed all illicit drugs except marijuana and has become an increasing public health concern. Adolescents and young adults are in the most likely age groups to abuse prescription medications.



**WHAT THIS STUDY ADDS:** This study's results demonstrate increasing rates of prescribing of controlled medications to adolescents and young adults across multiple settings, including ambulatory offices and emergency departments.

## abstract



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**OBJECTIVE:** The nonmedical use of prescription drugs by adolescents and young adults has surpassed all illicit drugs except marijuana, yet little is known about prescribing patterns. We examined the prescribing of controlled medications to adolescents aged 15 to 19 and young adults aged 20 to 29.

**METHODS:** We used cross-sectional data from the National Ambulatory Medical Care Survey ( $N = 4304$  physicians) and the National Hospital Ambulatory Medical Care Survey ( $N = 2805$  clinics;  $N = 1051$  emergency departments) between 2005 and 2007. We also used consecutive data from 1994 to describe trends.

**RESULTS:** A controlled medication was prescribed at 2.3 million visits by adolescents and 7.8 million visits by young adults in 2007. Between 1994 and 2007, controlled medications were prescribed at an increasing proportion of visits from adolescents (6.4%–11.2%) and young adults (8.3%–16.1%) ( $P < .001$  for trend). This increase was seen among males and females, in ambulatory offices and emergency departments, and for injury-related and non-injury-related visits (all  $P < .001$ ). A controlled medication was prescribed during 9.6% of all adolescent visits and 13.8% of young-adult visits for non-injury-related indications and at 14.5% of adolescent visits and 27.0% of young-adult visits for injury-related reasons. Controlled medications were prescribed at a substantial proportion of visits for common conditions, such as back pain, to both adolescents (23.4%) and young adults (36.9%).

**CONCLUSIONS:** Controlled medications are prescribed at a considerable proportion of visits from adolescents and young adults, and prescribing rates have nearly doubled since 1994. This trend and its relationship to misuse of medications warrants further study. *Pediatrics* 2010;126:1108–1116

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### KEY WORDS

adolescent, teen, young adult, prescribing, controlled medication, opioid, sedative, hypnotic, stimulant

### ABBREVIATIONS

NSDUH—National Survey on Drug Use and Health  
NAMCS—National Ambulatory Medical Care Survey  
NHAMCS—National Hospital Ambulatory Medical Care Survey  
NCHS—National Center for Health Statistics

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The nonmedical use of prescription medications has increased by 162% in the past decade and has surpassed all illicit drugs except marijuana in the United States.<sup>1</sup> Adolescents and young adults are in the age groups most likely to abuse prescription medications.<sup>1–3</sup> In the National Survey on Drug Use and Health (NSDUH), 12.6% of adolescents between the ages of 12 and 17 years and 31.4% of young adults reported nonmedical use of prescription medications at some point in their lifetime.<sup>4</sup>

An inherent tension exists between adequately treating individual patient's symptoms while remaining cognizant of the growing nonmedical use of prescription medications. Numerous patient advocacy groups, state medical boards, and the Joint Commission on the Accreditation of Hospitals have focused physician efforts on adequately treating pain,<sup>5,6</sup> which has led, in part, to an increase in national opioid consumption. Between 1997 and 2006, the sale of oxycodone increased by 732%, hydrocodone by 244%, and methadone by 1177%.<sup>1</sup> At the same time, sedative-hypnotic medications became among the mostly widely advertised medications to patients, and sales have increased substantially.<sup>7,8</sup>

Concurrently, there has been an increase in the abuse of prescription medications.<sup>1,3,6</sup> Motivations for misuse of prescription medications are broad and range from self-treatment of various conditions (ie, pain, insomnia, difficulty concentrating) to recreational use.<sup>9,10</sup> Although the motivations for misuse vary, the use of prescriptions medications without physician supervision imposes considerable risk. Similar to illicit street drugs, the nonmedical use of prescription medications is associated with unintentional overdoses, trauma, and high-risk behavior.<sup>3,11–15</sup> In fact, emergency department visits that involve

the nonmedical use of narcotic pain relievers have more than doubled in recent years.<sup>15</sup> In addition, the nonmedical use of prescription medications is associated with other forms of substance and alcohol abuse.<sup>11,12</sup>

Prescription medications reportedly are easier to obtain than illicit street drugs<sup>16</sup> and are most commonly obtained from friends and relatives.<sup>17</sup> Overall, reports of diversion of prescription medications range from 24% among adolescents to 35.8% among college students.<sup>18,19</sup> Although adolescents and young adults are in the age groups most likely to abuse prescription medications,<sup>1</sup> few data exist about the prescribing of controlled medications to adolescents and young adults.

Our goals were to describe the frequency of prescriptions for controlled medications (opioids, sedative-hypnotics, stimulants) provided to adolescents and young adults between 2005 and 2007, determine trends in prescribing, identify factors associated with prescribing, and describe indications for prescribing controlled medications to adolescents and young adults.

## METHODS

### Data Source

We used cross-sectional data from the National Ambulatory Medical Care Survey (NAMCS) and the National Hospital Ambulatory Care Survey (NHAMCS) to examine the prescribing of controlled medications to adolescents and young adults. The NAMCS and NHAMCS are both conducted yearly by the National Center for Health Statistics (NCHS) and the Centers for Disease Control and Prevention; US Census Bureau employees act as the field agents for data collection. The surveys use a multistage probability design to select a stratified systematic sample of visits to physician practices, outpatient departments, and emergency departments.<sup>20,21</sup> The data are weighted to

produce national estimates of utilization of ambulatory and emergency medical care in the United States.<sup>20,21</sup> A comprehensive description of the methods used for sampling, data collection, and weighting are available online at [www.cdc.gov/nchs/ahcd.htm](http://www.cdc.gov/nchs/ahcd.htm).

### Study Time Period and Age Groups

Our primary analyses were focused on the most recent data available from 2005 to 2007. To assess trends in utilization, we used data from 1994 to 2007. We evaluated adolescents between 15 and 19 years of age and defined young adults as those between 20 and 29 years of age on the basis of previous studies.<sup>22,23</sup>

### Classification of Controlled Medications

We defined a controlled medication as any scheduled medication regulated by the Drug Enforcement Agency and used classifications provided by the NAMCS and NHAMCS to categorize controlled medications as pain medications/opioids, sedative-hypnotics, stimulant medications, or other medications. Between 1994 and 2005, the NAMCS and NHAMCS classified medications on the basis of the National Drug Code Directory.<sup>20,21,24</sup> Beginning in 2006, the NAMCS and NHAMCS assigned drug codes and classifications on the basis of Multum's Lexicon Drug Database.<sup>20,21</sup>

Table 1 lists the classification codes used to define subtypes of controlled medications. We classified miscellaneous controlled medications including scheduled antitussive medications, medications containing butalbital (eg, Fiorinal), sibutramine (Meridia), anabolic steroids, antidiarrheal medications (eg, Lomotil), certain anesthetics, and antimigraine medications as "other" medications. Nonscheduled medications, such as Nubain, butor-

**TABLE 1** Classification of Controlled Medications on the Basis of National Drug Codes and Multum's Lexicon Drug Codes

Medication Class	National Drug Code	Multum's Lexicon Drug Codes
Pain	1720, 1721, or 1722	060, 063, or 191
Sedative-hypnotic	0626, 0627, 0634, 1374, or 1373	201, 203, 068, 069, 070, 178, of 179
Stimulant	0631	071 or 253

phanol, and tramadol, were not included in these analyses.

### Reason for Visits

To describe the principle reason for visits during which a controlled medication was prescribed, we used the "most important" reason for the visit as identified by the patient. We grouped visits into general categories (eg, injury, back pain, chest pain) based on the primary reason for visit-classifications codes provided by the NAMCS/NHAMCS and report the specific codes for each category in Supplemental Table 6. For the majority of visits, only a single reason for the visit was listed. When applicable, we also report the 2 most common secondary reasons for visits in Supplemental Table 7.

### Statistical Analysis

We performed all statistical analyses by using SAS 9.1 (SAS Institute Inc, Cary, NC) and SAS-callable SUDAAN (Research Triangle Institute, Research Triangle Park, NC) to appropriately weight visits and account for the complex sampling design. We used  $\chi^2$  test statistics, accounting for the complex sampling design, to compare all proportions. We stratified our analyses on the basis of injury status and defined an injury-related visit as any visit related to a traumatic injury, poisoning, or adverse effect of medical treatment on the basis of established variables in the NAMCS and NHAMCS.<sup>20,21</sup>

We compared the characteristics of patient visits during which a controlled medication was prescribed for both adolescent and young adults, stratified according to injury status.

We subsequently developed logistic regression models to evaluate for racial and regional differences in prescribing while controlling for potential confounders. On the basis of previous literature and clinical significance, we included age, site of care (outpatient office or emergency department), gender, race, ethnicity, insurance, region of the country, and metropolitan status in the model. To account for clinical and statistical evidence of effect modification according to injury status, we developed separate logistic regression models for each level of injury status (injury related or non-injury related) for adolescents and young adults. To account for sickle cell- and cancer-related pain, we reran key analyses excluding any visits for sickle cell or cancer. To enhance our identification of visits related to sickle cell disease, we used both diagnosis and probable diagnosis ICD9 codes including 28260, 28262, 28264, 28269, 51730, 28952, 28241, and 28242.

Last, we used logistic regression to assess for trends in the prescribing of controlled medications between 1994 and 2007 for adolescents and young adults. We combined the data into 2-year increments to increase sample size and for ease of interpretation. We modeled whether a controlled medication was prescribed at a visit (yes/no) against year, similar to previous studies.<sup>25</sup> We reported *P* values associated with the trend in prescribing on the logit scale over the years studied.

To ensure reliability of national estimates, the NCHS has established strict release standards for data based on the relative SE of the point estimate

(>30% considered unreliable) and the absolute number of visits (<30 considered unreliable).<sup>12,13</sup> All values reported meet the established release criteria for national estimates, unless otherwise noted. This study was approved by the University of Rochester Research Subjects Review Board, and the protocols used by the NAMCS were approved by the NCHS institutional review board.<sup>19</sup>

### RESULTS

Between 2005 and 2007, 4304 physicians participated in the NAMCS (65.1% participation), and 2805 hospital-based outpatient clinics (85.0% participation) and 1051 emergency departments (88.8% participation) participated in the NHAMCS. Table 2 lists unweighted and weighted characteristics of the data between 2005 and 2007.

### Trends

A controlled medication was prescribed at 2.3 million visits by adolescents (aged 15–19 years) and at 7.8 million visits by young adults (aged 20–29 years) in 1994, and that number increased to 5.7 million visits by adolescents and 18.6 million visits by young adults in 2007. Figure 1 shows the rates of prescribing of controlled medications between 1994 and 2007. Over this time period, controlled medications were prescribed at an increasing proportion of adolescent visits (6.4–11.2%; *P* < .001 for trend) (Fig 1A) and young-adult visits (8.3–16.1%; *P* < .001 for trend) (Fig 1B). For young adults, the trend for opioids was modest before 2001 (Fig 1B; *P* = .14 for trend) and increased considerably after 2001 (*P* < .001 for trend), which corresponds with the introduction of the Joint Commission on the Accreditation of Hospitals initiative to improve pain control. These increasing rates of prescribing were seen across multiple settings and for both injury-related and non-injury-related visits (Table 3).

**TABLE 2** Visits Recorded in the NAMCS and the NHAMCS Between 2005 and 2007

	Unweighted Visits, <i>n</i>	Weighted Visits, <i>n</i> (%)
Total	55 189	486.344 million (100)
Site		
Ambulatory <sup>a</sup>	29 785	400.546 million (82.4)
Emergency department <sup>b</sup>	25 404	85.799 million (17.6)
Age		
Adolescent (15–19 y)	17 130	160.776 million (33.1)
Young adult (20–29 y)	38 059	325.568 million (66.9)
Gender		
Female	35 956	322.755 million (66.4)
Male	19 233	163.588 million (33.6)
Race		
White	39 087	387.719 million (79.7)
Black	13 055	74.796 million (15.4)
Other <sup>c</sup>	3047	23.830 million (4.9)
Ethnicity		
Hispanic <sup>d</sup>	10 140	70.222 million (14.4)
Region		
Northeast	14 683	94.695 million (19.5)
Midwest	12 962	115.270 million (23.7)
South	17 220	185.105 million (38.1)
West	10 324	91.276 million (18.7)
Insurance		
Private	20 359	269.926 million (56.7)
Public	18 634	108.748 million (22.9)
Uninsured	10 110	54.849 million (11.5)
Other <sup>e</sup>	4776	42.543 million (8.9)

<sup>a</sup> Ambulatory data are from the NAMCS and the outpatient portion of the NHAMCS.

<sup>b</sup> Emergency department data are from the NHAMCS.

<sup>c</sup> Includes Asian, Native Hawaiian, American Indian, Alaskan Native, and more than 1 race.

<sup>d</sup> Hispanic ethnicity, any race.

<sup>e</sup> Includes worker's compensation, other forms of payment, and unknown source of expected payment.

Prescriptions for multiple controlled medications similarly increased over this time period. Between 1994–1995 and 2006–2007, more than 1 controlled medication was prescribed at an increasing proportion of visits by adolescents (0.4–1.7%;  $P < .001$ ) and young adults (0.5–3.2%;  $P < .001$ ).

### Visit Characteristics

Table 4 lists the characteristics of visits during which a controlled medication was prescribed between 2005 and 2007. Overall, a controlled medication was prescribed to adolescents at 9.6% of non–injury-related and 14.5% of injury-related visits. Similarly, a controlled medication was prescribed to young adults at 13.8% of non–injury-related and 27.0% of injury-related visits. Controlled medications were more commonly prescribed at visits from young adults compared with adoles-

cents for both injury-related and non–injury-related indications ( $P < .001$  for both).

Controlled medications were more commonly prescribed in the emergency department than in ambulatory offices and in the South and West compared with the Northeast. Controlled medications were consistently prescribed at higher rates to patients without insurance compared with those with private insurance. Modest gender and racial differences were found among young adults at non–injury-related visits.

### Indications

Figure 2 lists the primary reason for visits during which a controlled medication was prescribed to adolescents and young adults. Musculoskeletal complaints and back pain (19%) were

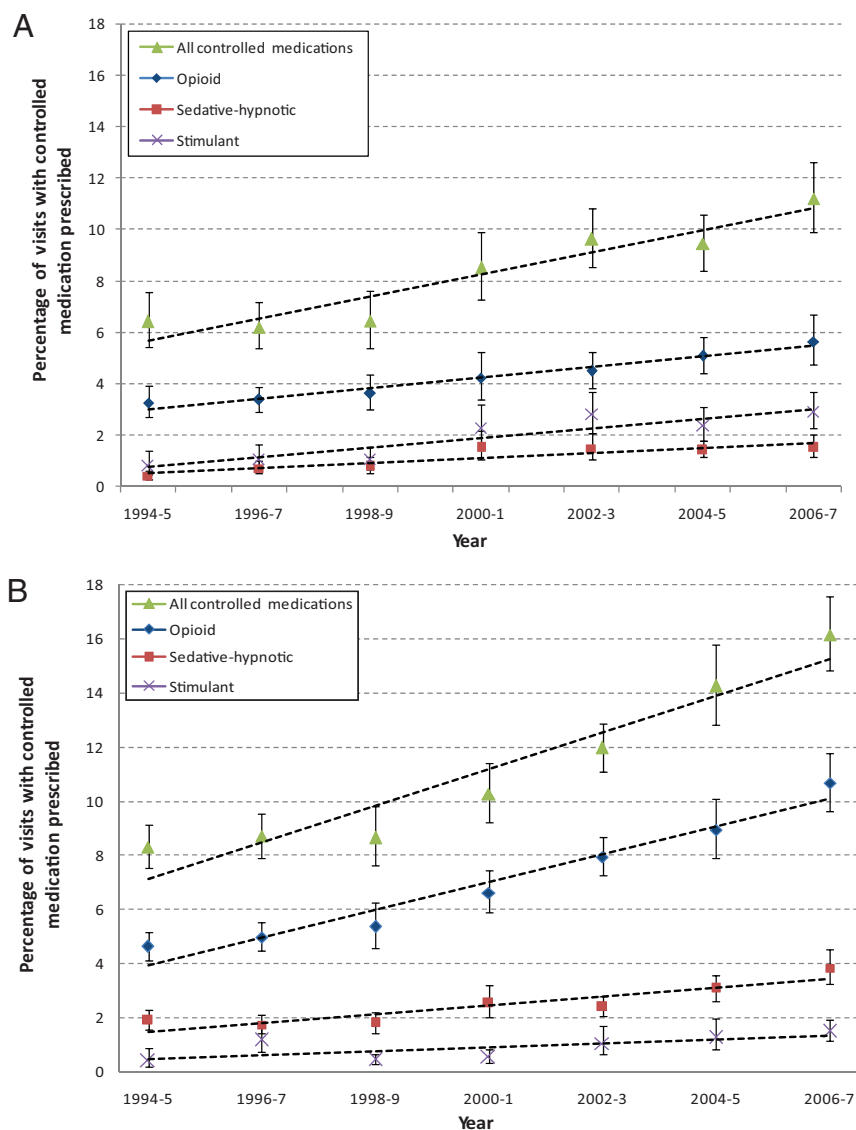
the most common principle reason for visits, followed by injury (12%) and psychiatric illness/insomnia (11%).

Table 5 lists prescribing rates of controlled medications for specific indications in both the outpatient and emergency department settings. These indications are the principle reasons for visits during which a controlled medication was prescribed. A controlled medication was prescribed at 23.4% of visits by adolescents and 36.9% of visits by young adults in which back pain was listed as the principle reason for the visit. Similarly, a controlled medication was prescribed at 13.0% of all visits by adolescents and at 24.0% of all visits by young adults for headaches. Controlled medications were more commonly prescribed at visits by young adults than by adolescents for most of the indications evaluated.

Visits for a diagnosis related to sickle cell disease, tumors, masses, or malignancy accounted for 0.2% of all adolescent and 0.7% of all young-adult visits during which a controlled medication was prescribed. Exclusion of these visits from the analyses did not change any key findings.

### DISCUSSION

The nonmedical use of prescription drugs by adolescents and young adults has surpassed all illicit drugs except marijuana and has become an increasing public health concern.<sup>1,3</sup> The results of this study demonstrate increasing rates of prescribing of controlled medications to adolescents and young adults across multiple settings, including ambulatory offices and emergency departments. Overall, a controlled medication was prescribed at ~1 of every 6 visits by young adults and ~1 of every 9 visits by adolescents. Although the increased prescribing of controlled medications does not necessarily foster misuse or



**FIGURE 1**

Percentage of visits during which controlled medications were prescribed to adolescents (A) and young adults (B) from 1994 to 2007 in the NAMCS and the NHAMCS. For the data shown in A,  $P < .001$  for trend for all; for the data shown in B,  $P < .001$  for trend for all controlled medications, opioids, and sedative-hypnotics, and  $P = .09$  for trend for stimulants.

**TABLE 3** Percentage of Visits During Which a Controlled Medication Was Prescribed

	Adolescents, Ages 15–19 y			Young Adults, Ages 20–29 y		
	1994–1996	2005–2007	<i>P</i>	1994–1996	2005–2007	<i>P</i>
All	6.2	10.6	<.001	8.3	15.9	<.001
Site of care						
Ambulatory office	4.6	8.1	<.001	6.2	11.7	<.001
Emergency department	13.5	23.9	<.001	18.7	34.3	<.001
Injury <sup>a</sup>						
Injury related	8.4	14.5	<.001	12.1	27.0	<.001
Non-injury related	5.2	9.6	<.001	7.0	13.8	<.001
Gender						
Female	4.9	9.7	<.001	7.3	14.1	<.001
Male	8.0	11.9	.002	10.7	20.1	<.001

<sup>a</sup> Injury includes traumatic injuries, poisonings, or adverse effects of medical treatment.

diversion, the current trends warrant vigilance.

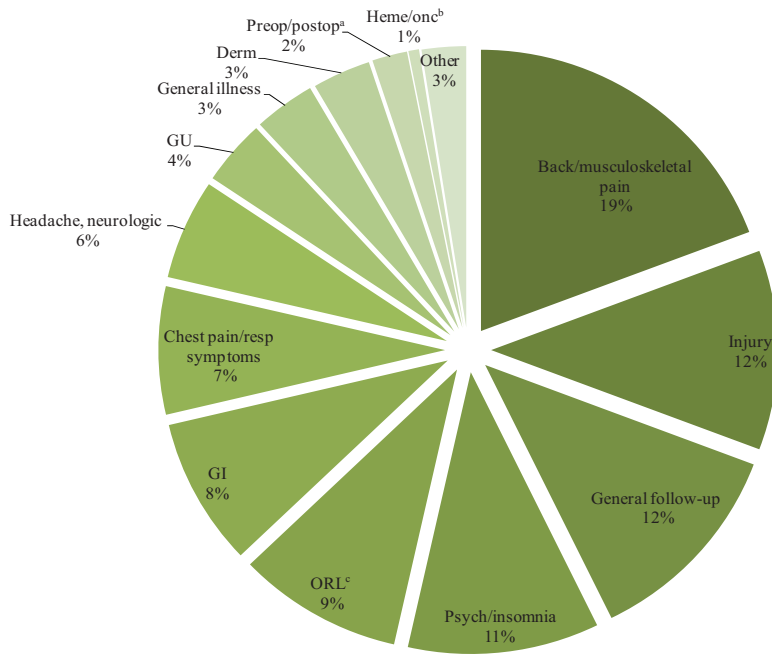
We found that prescriptions for controlled medications, including opioids, sedative-hypnotics, and stimulants, increased over the study period (1994–2007) among adolescents and young adults, consistent with trends previously observed in other age groups.<sup>25,26</sup> This increase in prescribing of controlled medications was observed for both males and females and across multiple settings (ambulatory offices and emergency departments) and for injury-related and non-injury-related visits.

This rising trend in prescribing of controlled medications was most pronounced for opioids prescribed to young adults, particularly after 2001, which corresponds with the Joint Commission on the Accreditation of Hospitals initiative to treat pain as a fifth vital sign. We found a similar increase, although less pronounced, in the prescribing of opioids to adolescents. These increases are possibly attributable, in part, to evolving federal and state regulations, increased advocacy, and increased physician comfort with opioids. Although increased prescribing augments the potential availability of opioids, it does not necessarily lead to diversion or abuse. The NSDUH recently reported that the nonmedical use of prescription opioids continues to increase among young adults but is beginning to decline slightly for adolescents.<sup>27</sup> Although nonmedical use among adolescents is beginning to decline, the Drug Abuse Warning Network recently found that emergency department visits that involve the nonmedical use of narcotic pain relievers has more than doubled between 2004 and 2008.<sup>15</sup> Overall, potential associations between population-level prescribing patterns of opioids and misuse or diversion is complex and warrants further study to further elucidate the relationship.

TABLE 4 Characteristics of Patient Visits During Which a Controlled Medication Was Prescribed Between 2005 and 2007

Characteristic	Adolescents, Ages 15–19 y				Young Adults, Ages 20–29 y						
	Non-Injury-Related Visit	Injury-Related Visit	Non-Injury-Related Visit	Injury-Related Visit	Non-Injury-Related Visit	Injury-Related Visit	Non-Injury-Related Visit	Injury-Related Visit			
	Percent of Visits	Adjusted Odds Ratio (95% Confidence Interval) <sup>a</sup>	Percentage of Visits	P	Adjusted Odds Ratio (95% Confidence Interval) <sup>a</sup>	Percentage of Visits	P	Adjusted Odds Ratio (95% Confidence Interval) <sup>a</sup>	Percentage of Visits	P	Adjusted Odds Ratio (95% Confidence Interval) <sup>a</sup>
Total	9.6		14.5			13.8			27.0		
Site of care											
Ambulatory office	8.3	<.001	7.2	<.001	1.0	10.7	<.001	1.0	19.5	<.001	1.0
Emergency department	21.0		27.4		4.5 (2.8–7.4)	32.6		4.2 (3.6–4.9)	37.2		2.2 (1.6–2.9)
Gender											
Female	9.0	.06	14.0	.67	1.0	12.5	<.001	1.0	28.0	.41	1.0
Male	10.8		14.9		1.1 (0.8–1.7)	17.6		1.4 (1.2–1.6)	26.2		0.9 (0.8–1.2)
Race											
White	9.7	.35	14.2	.69	1.0	14.4	.009	1.0	26.5	.42	1.0
Black	10.3		16.6		0.7 (0.5–1.1)	12.5		0.6 (0.5–0.8)	29.8		0.9 (0.7–1.1)
Other <sup>b</sup>	6.6		13.0		0.7 (0.3–1.6)	9.5		0.6 (0.4–0.9)	24.5		0.9 (0.5–1.6)
Ethnicity <sup>c</sup>											
Non-Hispanic	10.0	.04	14.6	.71	1.0	14.3	.02	1.0	27.2	.52	1.0
Hispanic	7.1		13.6		0.8 (0.5–1.3)	11.3		0.7 (0.6–0.9)	25.4		0.9 (0.6–1.2)
Insurance											
Private	8.3	<.001	11.3	<.001	1.0	13.1	<.001	1.0	21.7	<.001	1.0
Public	10.7		16.8		1.3 (0.8–2.0)	14.4		1.1 (0.9–1.3)	35.3		1.8 (1.4–2.5)
Uninsured	19.4		28.0		1.6 (1.0–2.6)	19.2		1.0 (0.8–1.2)	38.1		1.6 (1.2–2.2)
Other <sup>d</sup>	87.3		19.5		1.5 (0.8–2.7)	10.0		0.6 (0.4–0.9)	20.1		1.0 (0.8–1.4)
Region											
Northeast	6.7	<.001	8.0	.001	1.0	10.4	.001	1.0	20.8	.006	1.0
Midwest	7.6		11.5		1.5 (1.0–2.5)	12.7		1.3 (1.0–1.6)	23.2		1.2 (0.9–1.7)
South	12.1		18.7		2.6 (1.5–4.5)	15.6		1.6 (1.3–2.1)	32.2		1.9 (1.4–2.6)
West	10.5		18.5		2.6 (1.5–4.6)	14.8		1.7 (1.3–2.2)	26.9		1.6 (1.0–2.4)
Metropolitan <sup>e</sup>											
Metropolitan	9.3	.09	14.7	.67	1.0	13.7	.59	1.0	27.4	.33	1.0
Rural	11.8		13.4		0.8 (0.5–1.2)	14.8		1.0 (0.7–1.4)	24.5		0.8 (0.6–1.1)

<sup>a</sup> Adjusted for all covariates listed.<sup>b</sup> Other includes Asian, Native Hawaiian/other Pacific Islander, American Indian/Alaska Native, and patients with more than 1 race reported.<sup>c</sup> Any race.<sup>d</sup> Other insurance includes worker's compensation, other forms of payment, and unknown source of expected payment.<sup>e</sup> Metropolitan indicates a metropolitan sampling area. Rural includes nonmetropolitan sampling areas, including rural areas and micropolitan areas.



**FIGURE 2**

Primary reason for visits during which an opioid was prescribed to adolescents and young adults from 2005 to 2007 in the NAMCS and the NHAMCS. Descriptions of visit codes, including outpatient and emergency department settings, are available in Supplemental Table 6. <sup>a</sup> Preoperative/postoperative (preop/postop) includes procedures; <sup>b</sup> includes sickle cell disease; <sup>c</sup> otolaryngology (ORL) includes tooth, mouth, and ear pain in addition to other symptoms referable to the ears, nose, and throat. Derm indicates dermatologic; GU, genitourinary; Resp, respiratory; GI, gastrointestinal; Heme/onc, hematologic/oncologic.

**TABLE 5** Percentage of Visits for Specific Indication During Which a Controlled Medication Was Prescribed Between 2005 and 2007 in the NAMCS and NHAMCS

Primary Reason for Visit <sup>a</sup>	Adolescent, Ages 15–19 y	Young Adult, Ages 20–29 y	P
Headache			
Any	13.0	24.0	.01
Opioid	12.7	16.4	.33
Back pain			
Any	23.4	36.9	.008
Opioid	21.5	33.4	.01
Musculoskeletal			
Any	12.9	26.2	<.001
Opioid	11.3	24.8	<.001
Injury			
Any	16.6	26.3	<.001
Opioid	15.0	24.3	<.001
Psychiatric <sup>b</sup>			
Any	31.2	32.1	.84
Sedative-hypnotic	8.9	21.0	<.001
Stimulant	22.7	7.1	<.001
Abdominal pain <sup>c</sup>			
Any	15.9	28.2	<.001
Opioid	13.0	26.8	<.001

<sup>a</sup> Descriptions of visit codes are listed in Supplemental Table 6; includes outpatient and emergency department settings.

<sup>b</sup> Psychiatric includes depression, anxiety, and symptoms referable to psychological and mental disorders; excludes primary insomnia.

<sup>c</sup> Excludes appendicitis or hernia.

Sedative-hypnotic medications also were prescribed at an increasing rate to both adolescents and young adults.

Increasing awareness of insomnia and anxiety, the availability of new pharmaceuticals, and widespread direct-to-

consumer marketing likely fueled the increased prescribing of sedative-hypnotics.<sup>7,8</sup> Over a similar time period, sedative misuse among 12th-graders increased through the 1990s, peaked in the mid-2000s, and is now slowly declining.<sup>2,28</sup> The nonmedical use of sedative-hypnotic medications among young adults, however, has continued to slowly rise.<sup>28</sup>

We found that stimulant medications were prescribed to adolescents at an increasing rate over the study period, similar to previously observed trends.<sup>29–31</sup> Over a similar time period between 2002 and 2008, however, the misuse of methylphenidate (Ritalin) and other prescription-like stimulant medications decreased among adolescents and young adults.<sup>2,3,28</sup> Despite the decline in reported misuse, a recent study<sup>29</sup> revealed an increase in poison-center calls related to intentional misuse of stimulant medications, possibly related to increasing intensity of misuse. In addition, reports of lifetime rates of diversion of stimulant medications have ranged from 16% to 29%,<sup>32</sup> which emphasizes the need to adequately address potential diversion.

Overall, prescribing of controlled medications varied according to several factors. Controlled medications were more commonly prescribed to young adults than adolescents for both injury-related and non-injury-related indications, possibly related to prescribing differences between pediatric and adult-focused providers or differences in presenting complaints. Similarly, rates of misuse of prescription medications are highest among young adults.<sup>3</sup>

Prescribing patterns also varied according to geographic region. Controlled medications were prescribed at higher rates in the South and West compared with the Northeast in the United States, possibly because of regional practice differences and state

regulations that vary considerably.<sup>26,33</sup> Regional variations in misuse of prescription medications have also been reported. The NSDUH<sup>34</sup> reported the highest rates of misuse in the South and West among people aged 12 years and older. However, the Monitoring the Future Survey<sup>2</sup> revealed less regional variability in misuse among 12th-graders, and an NSDUH follow-up analysis of substate regions revealed substantial heterogeneity of nonmedical prescription use within substate regions.<sup>35</sup> Potential associations between regional prescribing patterns and rates of misuse are complex and difficult to observe when using broad geographic regions.

We found that controlled medications, most commonly opioids, were prescribed at a considerable proportion of encounters for common indications. A controlled medication was prescribed at nearly one-quarter of adolescent visits and 37% of visits by young adults with back pain listed as the primary reason for the visit. Similarly, a controlled medication was prescribed at 13% of adolescent visits and nearly one-quarter of visits by young adults for headaches.

Controlled medications are an important treatment modality for a variety of conditions, and, in some instances, symptoms are inadequately con-

trolled.<sup>5,36</sup> Physicians, therefore, must balance the fundamental need to adequately treat conditions that require controlled medications while remaining cognizant of the potential misuse and diversion of these medications. Although clinical guidelines are available to support treatment of pain and other conditions,<sup>37,38</sup> physicians often feel ill equipped.<sup>59</sup> In addition, many of them do not routinely ask about prescription drug abuse and frequently do not obtain records from previous physicians before prescribing controlled medications.<sup>17,40</sup> In the setting of a hurried and often fragmented health care delivery system, increased awareness, improved education, and enhanced communication are needed.

This study has several limitations. Most notably, we were unable to distinguish whether a prescription for a controlled medication was ultimately used for legitimate medical indications or diverted for nonmedical use. Second, we were unable to determine how many pills or refills were given with each prescription. Third, the NAMCS and NHAMCS provide encounter-level rather than individual-level data, which precludes any longitudinal analysis. Last, we reported the primary reason for visits during which a controlled medication was prescribed, recorded as the “most important” patient-identified reason for the visit.

Because several conditions may be addressed at any 1 visit, the primary reason for a visit may not necessarily be the indication for the controlled medication. Secondary reasons, however, were listed for fewer than half of the visits during which a controlled medication was prescribed and were mostly all supportive of the primary indication (Supplemental Table 7).

## CONCLUSIONS

Controlled medications are prescribed at a considerable proportion of all visits by adolescents and young adults, and rates have nearly doubled since 1994. Although the increased prescribing of controlled medications does not necessarily foster abuse or diversion, these increasing trends do warrant vigilance. Potential associations between prescribing patterns and misuse or diversion are complex and merit further study. In the setting of rising prescribing trends, increased awareness and improved strategies are needed to ensure adequate treatment for patients and mitigate the potential for nonmedical use of controlled medications.

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