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Prevalence of Self-Reported Prescription Opioid Use and Illicit Drug Use Among U.S. Adults:

NHANES 2005–2016

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Clinical significance: Our study found that prevalence of prescription opioid use was 6.5% (adults) and 4.1% (adult workers) and the prevalence of illicit drug use was 9.5% (adults) and 10.2% (adult workers) during 2005 to 2016. Among occupational groups, prevalence of prescription opioid use ranged from 1.7% (farming/fishing/forestry) to 6.5% (personal care) and for illicit drug, 4.1% (education/training/library) to 18.0% (construction/extraction).

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Abstract

Objective: To estimate the self-reported prevalence of prescription opioid use and illicit drug use in the United States.

Methods: Self-reported prescription opioid use and illicit drug use (mostly nonopioid) were obtained for adults and adult workers (NHANES 2005–2016).

Results: Prevalence (95% CI) of prescription opioid use was 6.5% (6.0–7.0) (adults) and 4.1% (3.7–4.5) (workers). Prevalence of illicit drug use was 9.5% (8.8–10.1) (adults) and 10.2% (9.4–11.1) (workers). Among occupations, prevalence of prescription opioid use was highest in personal care (6.5%; 4.1–10.4) and healthcare practitioners (5.9%; 3.8–9.0); for illicit drug use, construction/extraction (18.0%; 15.1–21.3) and food preparation (15.8%; 12.5–19.7).

Conclusion: The prevalence of prescription opioid use was elevated among some occupations. Judicious prescription strategies and targeted interventions are both needed. The prevalence of illicit drug use among certain occupational groups suggests the need to ensure access to therapy.

Keywords

illicit drug use; industry; NHANES; occupation; prescription opioid use

For the past two decades, increasing overdoses involving opioids have adversely affected the United States (U.S.) population, resulting in an opioid overdose epidemic that was declared a National Public Health Emergency in the fall of 2017.[1,2] Although the epidemic began with the over-prescribing of prescription opioids, overdose deaths from illicit drugs such as illicitly manufactured fentanyl, heroin, and cocaine has become epidemic as states have mandated the requirements of the prescription drug monitoring programs (PDMPs).[1,3,4] The rate of opioid-involved overdose deaths increased five-fold, from 2.9 per 100,000 population in 1999 to 14.6 per 100,000 in 2018.[5]

Since work is an important aspect of life for the majority of U.S. adults, occupational factors could potentially influence opioid use. For example, a work-related injury or illness could be the proximate cause for an opioid prescription that eventually leads to opioid misuse, use disorder, other illicit drug use, and overdose. This suggests that occupations or industries with high injury or illness rates might have high rates of opioid use or misuse. A recent study conducted by the National Institute for Occupational Safety and Health (NIOSH) found that workers in construction, extraction, and health care practitioner occupations had the highest prevalence of opioid-involved deaths.[6]

Workers' compensation studies have shown that 44% of all claims had at least one opioid prescribed; 45% of the claimants received an opioid prescription two or more years after the initial injury date.[7] Long-term use of opioids and illicit drugs may increase the opportunity for the development of opioid use disorders.[8] Moreover, other workers' compensation studies have suggested that, among all occupational groups, construction workers have one of the highest rates of opioid dispensing.[9–11] However, not all U.S. employers are covered by workers' compensation programs and some occupational groups are more likely than others to experience events resulting in workers' compensation claims. Therefore, studies of workers' compensation data do not provide a comprehensive view of opioid use disorder among U.S. workers, although they offer a valuable viewpoint of opioid prescribing.

Researchers studying prescription opioid use also use nationally representative datasets such as the Medical Expenditure Panel Survey (MEPS) to provide a broader view of the opioid crisis, by examining the prescription opioid use among the U.S. working population. Such examination may be helpful in identifying and understanding the potential occupational antecedents of prescription opioid prescribing and associated risk factors. According to a study using MEPS data by Asfaw et al, there was a high prevalence of prescription opioid use (regardless of payer) among construction workers, which was consistent with worker overdose mortality and workers' compensation studies.[11,12]

In this study, we look to broaden the scope of our understanding of the opioid crisis as it manifests among the working population by addressing gaps in our knowledge. We describe the prevalence of both legal prescription opioid use and illicit drug use, mostly drugs other than opioids, among U.S. workers by demographic and lifestyle characteristics, industry, and occupation, and provide prevalence estimates with specific industry and occupation groups according to the most recent data available from the National Health and Nutrition Examination Survey (NHANES).

METHODS

Data Source and Study Population

Prescription opioid use and illicit drug use was assessed using data from the NHANES, which is developed and administered by the National Center for Health Statistics (NCHS) of the U.S. Centers for Disease Control and Prevention (CDC). The NHANES was created to assess the health and nutritional status of the U.S. population. Since 1999, the NHANES has been designed as a nationally representative cross-sectional survey conducted in 2-year cycles. Data are collected through in-person household interviews and physical examinations in specially designed and equipped mobile centers. As a multistage, stratified, complex, probability sample, NHANES oversamples persons of racial/ethnic minority subgroups (eg, non-Hispanic blacks, Hispanics, and non-Hispanic Asians), low-income persons, and older adults. Individuals therefore are assigned weights to account for their unequal sampling probability and nonresponse. Extensive details about the questionnaire, methodology, data, and documentation are available on the NHANES website https://wwwn.cdc.gov/nchs/nhanes/AnalyticGuidelines.aspx.

Analyses for this study are based on data collected from those aged 18 years or older during the six NHANES survey cycles during 2005 to 2016. The selection of cycles was determined by data availability. The data for prescription medication, illicit drug use, and characteristics are available in the 2005 to 2016 survey data, while coded industry and occupation data are only available from 2005 to 2014.

The total pooled NHANES sample size for 2005 to 2016 was 60,936, with varying response rate from 61% in 2015 to 2016 to 80% in 2005 to 2006. The sample for analysis of U.S. adults (aged 18 years or older) was 36,287. The sample for analysis of U.S. adult workers (aged 18 years and older who were "working at a job or business" or "with a job or business but not at work" during the week prior to their interview) was 19,858, after excluding 16,429 persons who did not have a job in the past week (eg, those who were unemployed, retired, or students). The sample for analysis of U.S. adult workers by industry and occupation groups was 16,421 in 2005 to 2014. Supplement Figure 1, http://links.lww.com/JOM/A971, shows the flowchart of inclusion and exclusion criteria of this study.

Prescription Opioid Use

Participants were asked by trained interviewers if they had taken any prescription medication during the month prior to the survey date. Those who responded "yes" were asked to show the interviewer the medication containers of all the products used. If no container was available, participants were asked to report the name of the medication.

All drug names entered by the interviewer were compared to the Multum Lexicon Drug Database, which is a comprehensive database of all prescription and some nonprescription drug products available in the U.S. drug market. The medications were coded using the Multum Lexicon Therapeutic Classification Scheme, a 3-level nested category system that assigns a therapeutic classification to each drug and each ingredient of the drug. Detailed information about the Multum Lexicon Drug Database is available at https://wwwn.cdc.gov/Nchs/Nhanes/1999-2000/RXQ_DRUG.htm. Codes used to identify prescription opioid use were: Level 1: 57 = central nervous system agents; Level 2: 58 = Analgesics; Level 3: 60 = narcotic analgesics, or 191 = narcotic analgesics combinations. Medications containing buprenorphine were excluded because they are used to treat use disorder.[13]

The duration of use was recorded for each prescription medication. Long-term opioid therapy was defined as medication taken for more than 90 days. To calculate the proportion of long-term use among those reporting any prescription opioid use, the following formula was used: the weighted number of persons who reported long-term opioid therapy over the weighted number of persons who reported prescription opioid use.

Illicit Drug Use

Adults were asked about use of drugs not prescribed by a doctor. Illicit drug use was defined as any use of marijuana or hashish, cocaine, heroin, or methamphetamine during the past 30 days or injection use of nonprescription drugs during the past 30 days. Participants aged 18 to 59 years were asked if they used marijuana, cocaine, heroin, methamphetamine, and needle injection drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs) during the past 30 days. Participants aged 18 to 69 years were asked if they injected

any nonprescription drugs during the past 30 days. This measure of nonprescription drug use does not include opioids specifically, and therefore cannot evaluate illicit opioid use, although a small amount of illicit opioid use may be captured as part of the “other” response to IV drug use in the past 30 days. The interview questions were self-administered using the Audio Computer-Assisted Self-Interviewing system at the Mobile Examination Center (MEC). No proxy respondents or translators were used in situations when the respondents could not self-report. Individuals with mental impairments or those with language barriers were not asked these questions.

Demographic, Lifestyle, and Job Characteristics

We obtained data from the NHANES questionnaire on age (18 to 29, 30 to 44, 45 to 59, 60+ years), gender (male, female), race and Hispanic origin (non-Hispanic white, non-Hispanic black, other race, and Hispanic), education (< high school, high school or equivalent, some college, and college degree or higher), smoking status (never, former, and current), type of employment (private companies, government, self-employed, unemployed, retired, and nonemployed), and work hours per week (<40 hours, 40 hours, and >40 hours). Alcohol consumption was categorized into three groups (none, moderate, and heavy) as defined by CDC (https://www.cdc.gov/alcohol/fact-sheets/alcohol-use.htm). Moderate drinking was defined as consuming up to 7 drinks of alcohol per week for women and up to 14 drinks for men. Consumption beyond these amounts was considered heavy drinking.

At the time of these analyses, the most recent data available from the NHANES occupational questionnaire was for 2005 to 2014. It was coded into occupation and industry groups based on 4-digit U.S. Census Bureau codes that are consistent with the Standard Occupational Classification (SOC) system and the North American Industry Classification System (NAICS). The public use data files provided 22 broad industry groups and 23 broad occupational groups. This study includes all groups, except for "Armed Forces."

Statistical Analysis

The NHANES data in the current analyses were combined into six 2-year cycles during 2005 to 2016 and were analyzed according to NHANES Analytic Guidelines 1999 to 2010 (https://www.cdc.gov/nchs/data/series/sr_02/sr02_161.pdf) and 2011–2016 (https://wwwn.cdc.gov/nchs/data/nhanes/2011-2012/analyticgui-delines/analytic_guidelines_11_16.pdf). To attain unbiased estimates, all analyses were weighted to account for the complex survey design and survey nonresponse using SAS-callable SUDAAN v11.0 software (Research Triangle Institute, Research Triangle Park, NC). In order to accurately represent the population of the U.S., all analyses were performed using the interview weight variable, which was divided by 6 to take into consideration the six 2-year cycles during 2005 to 2016. Standard errors were estimated using Taylor series linearization methods.

We assessed the prevalence of prescription opioid use and illicit drug use by demographic factors (age, gender, race/ethnicity, and education level), lifestyle habits (alcohol consumption and smoking status), and employment characteristics (type of employment and work hours per week) in 2005 to 2016 (Tables 1 and 2) and by industry and occupation

groups in 2005 to 2014 (Tables 3 and 4). Differences in prevalence between categories within these groups were not tested for statistical significance. The prevalence estimates (%) were weighted and age-adjusted to the 2010 U.S. adult standard population for age groups: 18 to 29, 30 to 44, 45 to 59, 60+ years. The relative standard error (RSE) is defined by the standard error of the estimate divided by the estimate and then multiplied by 100. The point estimates of prevalence with the relative standard error larger than 30% were considered unreliable and were identified by a symbol (#) in the tables.

RESULTS

Prescription Opioid Use and Illicit Drug Use Among U.S. Adults by Type of Employment, 2005–2016

During the period 2005 to 2016, the prevalence of recent prescription opioid use (past 30 days) among all U.S. adults was 6.5% (6.0 to 7.0) (Table 1). The prevalence of recent use ranged from 3.4% (2.5 to 4.7) for the self-employed to 4.9% for the unemployed (3.3 to 7.1) and for retirees (3.5 to 7.0), while the prevalence for those not in the labor force was 14.4% (13.1 to 15.8). Among all adults taking prescription opioids, 63.4% (61.1 to 65.6) reported long-term use (>90 days). The highest proportion with long-term use was reported by the unemployed (76.8%; 67.4 to 84.0). The prevalence of illicit drug use in U.S. adults was 9.5% (8.8 to 10.1) overall, with a prevalence of 16.2% (14.2 to 18.5) among unemployed adults.

Prescription Opioid Use and Illicit Drug Use Among all U.S. Workers, 2005 to 2016

During 2005 to 2016, the prevalence of prescription opioid use among U.S. workers was 4.1% (3.7 to 4.5) overall (Table 2). Some groups of workers with high prevalence were current (6.3%; 5.4 to 7.3) or former (5.4%; 4.3 to 6.8) smokers and those with some college education (5.0%; 4.3 to 5.7). Among workers taking prescription opioids, 54.3% (50.5 to 58.1) reported long-term use. Workers with a high proportion of long-term use included those aged 45 to 59 (70.1%; 62.1 to 77.0), those who reported no alcohol consumption (62.9%; 55.2 to 70.0), and current smokers (62.2%; 53.1 to 70.6).

The prevalence of illicit drug use in workers was 10.2% (9.4 to 11.1). Groups with high prevalence were heavy drinkers (26.5%; 23.4 to 29.9), current smokers (22.6%; 20.7 to 24.5), and those aged 18 to 29 (19.0%; 9.4 to 11.1).

Prescription Opioid Use and Illicit Drug Use Among U.S. Workers by Industry, 2005 to 2014

Among the 21 NAICS industry groups included in this study, the prevalence of prescription opioid use during 2005 to 2014 was 4.4% (3.9 to 4.9) overall and ranged from 2.2% (1.5 to 3.2) in educational services to 7.4% (2.9 to 17.8) in mining (although the estimate for mining should be interpreted with caution due to a large RSE) (Table 3). Other industries with high prevalence of prescription opioid use were accommodation and food services (6.4%; 4.1 to 9.7), health care and social assistance (5.8%; 4.6 to 7.3), construction (5.4%; 3.8 to 7.6), and real estate and rental and leasing (5.4%; 2.8 to 10.3). The prevalence of illicit drug use was 9.7% (9.0 to 10.4) overall and ranged from 3.8% (1.6 to 8.4) in agriculture, forestry, fishing, and hunting to 20.1% (13.2 to 29.4) in mining. Other industries with high

prevalence of illicit drug use were real estate and rental and leasing (17.7%; 12.0 to 25.2), arts, entertainment, and recreation (17.2%; 11.7 to 24.6), and accommodation and food services (15.5%; 12.2 to 19.5).

Prescription Opioid Use and Illicit Drug Use Among Workers by Occupation, 2005 to 2014

Across the 22 SOC occupational groups included in this study, the prevalence of prescription opioid use was 4.4% (3.9 to 4.9) and ranged from 1.7% (0.4 to 6.7) in farming, fishing, and forestry (estimate should be interpreted with caution due to a large RSE) to 6.5% (4.1 to 10.4) in personal care and service (Table 4). Other occupations with high prevalence of prescription opioid use were health care practitioners and technicians (5.9%; 3.8 to 9.0), legal (5.8%; 2.3 to 13.6, although this estimate should be interpreted with caution due to a large RSE), food preparation and serving related (5.7%; 3.6 to 8.9), protective service (5.5%; 2.9 to 10.3), and community and social service (5.5%; 2.7 to 10.8, although this estimate should be interpreted with caution due to a large RSE). The prevalence of illicit drug use was 9.7% (9.0 to 10.4) and ranged from 4.1% (2.6 to 6.3) in education, training, and library to 18.0% (15.1 to 21.3) in construction and extraction. Other occupations with high prevalence of illicit drug use were food preparation and serving related (15.8%; 12.5 to 19.7), arts, design, entertainment, sports, and media (14.3%; 9.1 to 21.6), and installation, maintenance, and repair (14.0%; 11.0 to 17.6).

DISCUSSION

This study examined prescription opioid use and illicit use of other drugs by worker characteristics, industry, and occupation using National Health and Nutrition Examination Survey (NHANES) data, 2005 to 2016. The prevalence of prescription opioid use was higher among those not working (unemployed, retired, not in the labor force) than among workers (private companies, government, self-employed). The prevalence of illicit drug use was higher among the unemployed than among workers. A variety of demographic, lifestyle, and socioeconomic characteristics were observed with higher prevalence of prescription opioid use and illicit drug use among workers. The prevalence of prescription opioid use ranged from 2.2% to 7.4% across 21 industries and from 1.7% to 6.4% across 22 occupational groups. The prevalence of illicit drug use ranged from 3.8% to 20.1% across the same industries and from 4.1% to 18.0% across occupational groups.

In the present study, the prevalence of recent prescription opioid use was highest among those not in the labor force (14.4%); unemployed workers had the highest proportion of long-term use of prescription opioids. In a previous study that focused specifically on past-year nonmedical use of prescription opioids (not prescribed for the respondent or use only for the experience or feeling) using data from the National Survey on Drug Use and Health (NSDUH), 2011 to 2013, the highest prevalence for nonmedical use of prescription opioids was among the unemployed, three times greater than for those not in the labor force.[14] Unemployment has also been associated with current opioid use disorder (a DSM-5 diagnosis that excludes those under appropriate medical supervision) in the 2012 to 2013 National Epidemiological Survey on Alcohol and Related Conditions III (NESARC III).[15] In the present study, the highest prevalence of illicit drug use (16.2%) was among the

unemployed, similar to the prevalence of 18.2% for past-month illicit drug use among the unemployed in the 2013 NSDUH.[16]

Our findings are consistent with findings in the study by Asfaw et al using the Medical Expenditure Panel Survey, that showed the prevalence of prescription opioid purchases was highest among ages 45 years and older.[12] There are relatively few other published papers that look at the prevalence of current prescription opioid use or illicit drug use among U.S. workers. This demonstrates the need for additional research in this area.

Long-term use of prescription opioids for chronic pain has been shown to be associated with opioid use disorder and overdose deaths.[8,17–19] The epidemic of opioid overdose began with deaths due to use of prescription opioids for chronic pain (in the 1990s), followed by a predominance of heroin overdoses (in 2010), then synthetic opioids such as fentanyl (in 2013).[20] Wilson and colleagues reported that during 2017 to 2018, 68% of drug overdose deaths in the U.S. involved an opioid,[21] and a quarter of patients who received long-term opioid therapy in a primary care setting struggled with opioid use disorder.[22,23] Our finding of the proportion of long-term use of prescription opioids may indicate increasing risk for substance use disorder, especially in workers who were 45 or more years of age, those who took heavy alcohol, or current smokers.

In previous studies, the prevalence of prescription opioid use and opioid-related overdose deaths were highest among workers in construction and agriculture and fishing industries.[3,7–9] However, in the current study, workers in accommodation and food services had the highest prevalence of prescription opioid use (6.4%), followed by those in health care and social assistance (5.8%) and construction (5.4%). Prescription opioid use in these three industry sectors represents a third of opioid use across the 21 industry sectors. In a recent study, the Montana Department of Labor and Industry showed that workers in restaurants had the most opioid claims for their injuries.[24]

Workers who may more easily access prescription opioids, such as healthcare practitioners and technicians (5.9%), had higher prevalence of prescription opioid use than the overall prevalence of all occupations (4.4%). These workers may benefit from public health programs with a focus on treating prescription opioid use disorder, but that also include essential response strategies such as medication-assisted treatment and increased availability of naloxone to treat opioid overdose.[25] NIOSH recently released a workplace solutions document “Medication-Assisted Treatment for Opioid Use Disorder,” which provides information for workers and employers on preventing opioid use disorder and facilitating support treatment if it does occur.[26]

Among industry groups, workers in mining had the highest prevalence of illicit drug use which is two times higher than the average prevalence for all industry groups (20.1% and 9.7%, respectively). A 2015 report from the Substance Abuse and Mental Health Service Administration revealed that 5% of mining workers reported illicit drug use within the past month.[25] Workers in Arts, entertainment, and recreation (17.2%) and accommodation and food services (15.5%) had high prevalence of illicit drug use. A report using 2008 to 2012 data from NSDUH had similar results for fulltime workers in these two industry areas

(19.1% and 13.7%, respectively).[25] Among occupational groups, workers in construction and extraction had the highest prevalence of illicit drug use. No other studies on the prevalence of illicit drug use by occupations were identified.

Limitations and Strengths

There are a few limitations that must be taken into consideration. First, the estimated prevalence of prescription opioid use and illicit drug use in this study was based entirely on self-reported survey responses. Although the self-reported prescription opioid use was verified by an interviewer, illicit drug use was collected through an Audio Computer-Assisted Self-Interview system and might have been subject to recall and response bias. Second, although information on illicit drug use was collected among participants who were 12 years and older, the data on illicit drug use that was made available to the public during 2005 to 2008 consisted only of participants ages 20 years and older. However, we did not restrict our analyses to this group (20+ years) but also included persons 18 years and older. Therefore, lack of information on illicit drug use among those who were 18 to 19 years old during the survey cycles of 2005 to 2006 and 2007 to 2008 might have resulted in an underestimation of the prevalence of illicit drug use, particularly among industries or occupations that have a larger percentage of young workers. In addition, the data did not have diagnostic information, therefore, prescription opioid misuse could not be estimated. Another limitation is that the prevalence of prescription opioid use by specific type of drug could not be estimated due to the small subsample size among U.S. workers. The illicit drug use variable is based on questions that did not specifically ask about opioids, and it is unclear how much of the reported illicit drug use is opioid-related. Cautions need to be taken when interpreting the results. Although NHANES includes detailed information on occupation and drug use, the sample sizes for some specific occupation and industry groups were small which resulted in unreliable estimates with large variance.

However, there are also a few strengths to this study. The data are based on a nationally representative sample and provide the opportunity to estimate the prevalence of prescription opioid use and illicit drug use by industry and occupation among all workers. In addition, the data collected include a variety of work characteristics and sociodemographic variables which allowed us to evaluate how these factors are associated with prescription opioid use and illicit drug use among the working population.

CONCLUSION

The results of our study show that the prevalence of prescription opioid use in the past 30 days was 6.5% among all U.S. adults. Unemployed persons reported the highest prevalence of long-term prescription opioid use and the highest prevalence of illicit drug use.

Among employed workers, those employed in the mining industry reported the highest prevalence of both prescription opioid use and illicit drug use. Workers in personal care and service occupations reported the highest prevalence of prescription opioid use, while those in construction and extraction occupations reported the highest prevalence of illicit drug use.

Our findings underscore the need for education and intervention among all workers but especially those in the industries and occupations most affected by prescription opioid use and illicit drug use. The prevalence of prescription opioid use among some occupational groups compared to the overall prevalence suggests that these groups may be experiencing more injuries and pain. For these groups, it is important to prescribe opioids only when the benefits exceed the risks. However, prescriptions are only short-term solutions and studies should be conducted to identify the most effective interventions that can be implemented to decrease the prevalence of the injuries or other sources of pain. The prevalence of illicit drug use among certain occupational groups suggests the need to ensure access to substance use treatment provision when needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Temporal trends in the age-adjusted prevalence[1] of prescription opioid and illicit drug use by characteristics among all US adults 2005–2016

		Rx Opioid Use				Chronic Rx Opioid Use[2]				Illicit Drug Use[3]			
	N	n	Overall Prev. (95%CI)	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)[2]	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)	Slope[4] (SE)	p for trend[4]
US adults	36,287	2,345	6.5 (6.0, 7.0)	−0.19 (0.11)	0.1608	1,668	63.9 (61.7, 66.1)	2.80 (0.83)	0.0280	3,088	9.5 (8.8, 10.1)	0.76 (0.14)	0.0056
Age													
18–29	8,037	231	3.6 (3.0, 4.2)	−0.57 (0.07)	0.0011	64	29.3 (22.5, 37.3)	5.47 (2.95)#	0.1377#	1,421	19.0 (17.6, 20.5)	1.76 (0.38)	0.0096
30–44	8,802	457	5.3 (4.6, 6.1)	−0.40 (0.17)	0.0732	278	60.7 (56.4, 64.8)	3.87 (1.13)	0.0265	1,006	11.4 (10.3, 12.7)	0.38 (0.29)	0.2673
45–59	8,118	661	8.2 (7.2, 9.2)	−0.14 (0.22)	0.5608	514	78.8 (74.4, 82.7)	1.40 (0.92)	0.2045	656	8.3 (7.3, 9.4)	1.03 (0.28)	0.0220
60+	11,330	996	8.6 (7.8, 9.4)	0.12 (0.33)	0.7361	812	81.9 (78.3, 85.0)	1.87 (0.84)	0.0895	5	0.0 (0.1, 0.1)#	n/a	n/a
Gender													
Male	17,618	1,006	5.7 (5.1, 6.4)	−0.21 (0.21)	0.3869	722	63.6 (59.4, 67.6)	1.68 (2.00)	0.4461	1,967	12.2 (11.4, 13.0)	0.69 (0.18)	0.0196
Female	18,669	1,339	7.3 (6.7, 7.8)	−0.09 (0.10)	0.4197	946	64.2 (60.7, 67.6)	3.61 (0.47)	0.0015	1,121	6.8 (6.2, 7.5)	0.72 (0.13)	0.0047
Race/Ethnicity													
White (NH)	15,162	1,266	7.1 (6.5, 7.8)	−0.28 (0.13)	0.0901	939	65.1 (62.2, 67.8)	3.15 (1.14)	0.0502	1,357	10.0 (9.1, 10.9)	0.81 (0.29)	0.0490
Black (NH)	7,910	499	6.5 (5.9, 7.2)	0.07 (0.27)	0.8070	346	60.9 (54.7, 66.8)	1.06 (0.68)	0.1888	929	12.7 (12.0, 13.5)	0.83 (0.32)	0.0622
Hispanic	9,508	448	5.0 (4.4, 5.6)	0.11 (0.08)	0.2458	287	54.9 (49.9, 59.8)	3.00 (1.54)	0.1230	562	6.4 (5.7, 7.2)	0.63 (0.18)	0.0264
Others (NH)	3,707	132	4.4 (3.4, 5.7)	−0.07 (0.58)#	0.9138#	96	72.9 (63.4, 80.6)	2.53 (4.11)	0.5717	240	6.4 (5.3, 7.6)	0.67 (0.21)	0.0331#
Education level													
< High school	8,973	714	8.1 (7.1, 9.3)	−0.24 (0.24)	0.3674	526	61.2 (57.4, 64.9)	1.94 (0.96)	0.1142	679	11.8 (10.6, 13.0)	0.70 (0.24)	0.0427
High / GED	7,777	593	7.9 (7.0, 8.8)	0.08 (0.10)	0.4474	439	68.8 (62.9, 74.1)	5.44 (2.33)	0.0803	770	11.3 (10.2, 12.6)	0.79 (0.27)	0.0438
Some college	9,783	705	7.5 (6.9, 8.2)	0.01 (0.14)	0.9294	504	65.2 (60.9, 69.2)	3.28 (0.74)	0.0115	989	10.6 (9.8, 11.5)	0.55 (0.22)	0.0672

		Rx Opioid Use				Chronic Rx Opioid Use[2]				Illicit Drug Use[3]			
	N	n	Overall Prev. (95%CI)	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)[2]	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)	Slope[4] (SE)	p for trend[4]
College degree	7,599	290	3.6 (3.1, 4.2)	−0.49 (0.16)	0.0382	190	57.5 (51.1, 63.7)	0.14 (1.67)	0.9395	363	5.9 (4.8, 7.3)	0.64 (0.12)	0.0058
Alcohol consumption[5]													
None	12,290	841	6.6 (5.9, 7.4)	−0.02 (0.14)	0.8732	631	69.5 (64.9, 73.8)	3.06 (1.39)	0.0932	468	4.6 (4.0, 5.2)	0.03 (0.13)	0.8454
Moderate	10,343	522	5.0 (4.4, 5.6)	−0.15 (0.17)#	0.4199#	307	52.9 (47.9, 57.9)	4.01 (0.93)	0.0127	1,585	13.5 (12.5, 14.5)	0.77 (0.45)	0.1646
Heavy	2,381	133	5.4 (4.2, 6.9)	−0.26 (0.34)	0.4858	98	68.5 (59.6, 76.5)	7.52 (1.47)#	0.0088#	637	24.3 (22.1, 26.6)	1.61 (0.36)	0.0113
Smoking status													
Never	19,379	870	4.5 (4.1, 5.0)	−0.25 (0.12)	0.1000	583	58.7 (54.6, 62.6)	1.14 (1.04)	0.3355	859	4.4 (4.0, 4.9)	0.33 (0.07)	0.0109
Former	8,192	685	7.7 (6.7, 8.8)	−0.20 (0.18)	0.3231	527	64.0 (57.8, 69.8)	4.43 (1.18)	0.0200	449	11.0 (9.5, 12.8)	0.71 (0.72)	0.3811
Current	7,194	752	10.7 (9.7, 11.9)	0.38 (0.36)	0.3581	550	69.8 (65.5, 73.8)	4.32 (0.81)	0.0060	1,627	21.1 (19.5, 22.7)	1.5 (0.25)	0.0037
Types of employment													
Private companies	14,915	520	4.2 (3.7, 4.8)	−0.39 (0.18)	0.0936	256	52.3 (47.2, 57.3)	4.5 (1.0)	0.0115	1,588	9.2 (8.5, 10.0)	0.41 (0.17)	0.0728
Government	2,848	121	4.6 (3.7, 5.8)	0.38 (0.14)#	0.0495#	79	64.3 (52.4, 74.6)	5.6 (3.1)#	0.1436#	156	5.1 (4.1, 6.4)	0.52 (0.58)	0.4231
Self-employed	1,914	64	3.4 (2.5, 4.7)	0.61 (0.24)#	0.0617#	39	66.0 (51.5, 77.9)	0.6 (3.8)#	0.8711	186	11.6 (9.7, 13.9)	0.60 (0.74)	0.4619
Unemployed	1,676	63	4.9 (3.3, 7.1)	−0.94 (0.58)#	0.1789#	40	76.8 (67.4, 84.0)	6.4 (3.4)#	0.1571#	337	16.2 (14.2, 18.5)	0.95 (0.71)	0.2492
Retired	6,641	568	4.9 (3.5, 7.0)	0.13 (0.57)#	0.8316#	467	65.9 (46.4, 81.1)	12.7 (1.2)	0.0004	20	6.5 (1.5, 23.8)	3.39 (0.98)#	0.0406#
Not in the labor force[6]	8,081	1,007	14.4 (13.1, 15.8)	−0.40 (0.13)	0.0409	786	70.3 (66.0, 74.3)	0.88 (1.8)	0.6544	780	9.7 (8.7, 10.8)	0.81 (0.29)	0.0492

[1]The prevalence estimates (%) were weighted and age-adjusted to the 2010 U.S. adults standard population using six age groups: 18–29, 30–44, 45–59, 60+.

[2]Chronic Rx opioid use means taking prescription opioid mediation more than 90 days. When calculating prevalence of chronic Rx opioid use, the denominator is the weighted number of Rx opioid use and the numerator is the weighted number of chronic Rx opioid use.

[3]Illicit drugs are the non-prescription opioid drugs included Marijuana, hashish, cocaine, heroin, methamphetamine, or intravenous use of drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs). Participants aged 18–59 years only were asked if they used marijuana, cocaine, heroin, methamphetamine, and needle injections drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs) during the past 30 days. Participants aged 18–69 years were asked if they injected any non-prescription drugs during the past 30 days.

[4]Slope and p-value for trend were from weighted linear regression from 2005 to 2016.

[5]For men, moderate drinking was defined as 1–14 drinks/wk and heavy drinking 15+ drinks/wk. For women, moderate drinking was defined as 1–7 drinks/wk and heavy drinking 7+ drinks/wk.

[6]Not in the labor force includes those who did not work due to taking care of family, going to school, unable to work for health reasons, disabled, and others.

[#]The slope and p for trend are unreliable since prevalence in a survey cycle year is unreliable because the relative standard error of the estimate is larger than 30%.

Table 2.

Temporal trends in the age-adjusted prevalence[1] of prescription opioid and illicit drug use by characteristics among US adult workers 2005–2016

		Rx Opioid Use				Chronic Rx Opioid Use[2]				Illicit Drug Use[3]			
	N	n	Overall Prev. (95%CI)	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)[2]	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)	Slope[4] (SE)	p for trend[4]
US adult workers	19,858	706	4.1 (3.7, 4.5)	−0.27 (0.12)	0.0892	374	54.4 (50.5, 58.2)	4.12 (0.61)	0.0025	1,949	10.2 (9.4, 11.1)	0.53 (0.13)	0.0165
Age													
18–29	5,096	149	3.5 (2.9 4.2)	−0.68 (0.05)	0.0001	37	27.1 (18.8, 37.3)	5.27 (4.03)#	0.2611#	909	19.0 (17.3, 20.9)	1.94 (0.47)	0.0145
30–44	6,501	224	3.7 (3.1, 4.4)	−0.26 (0.13)	0.1235	115	52.8 (45.5, 59.9)	6.98 (1.09)	0.0031	671	10.8 (9.6, 12.1)	0.21 (0.36)	0.5978
45–59	5,592	217	4.7 (3.9,5.6)	−0.06 (0.26)	0.8224	142	70.1 (62.1, 77.0)	1.24 (1.99)	0.5654	368	7.1 (6.0, 8.3)	0.30 (0.29)	0.3662
60+	2,669	116	4.5 (3.6, 5.7)	−0.27 (0.42)#	0.5613#	80	67.6 (54.4, 78.4)	9.39 (1.86)#	0.0072#	1	-	-	-
Gender													
Male	10,593	328	3.6 (3.1, 4.2)	−0.43 (0.23)	0.1368	178	53.1 (46.1, 60.0)	3.78 (2.14)	0.1521	1,300	12.8 (11.7, 13.9)	0.44 (0.23)	0.1266
Female	9,265	378	4.6 (4.0, 5.2)	−0.11 (0.07)	0.1735	196	55.4 (50.2, 60.6)	5.09 (1.22)	0.0142	649	7.3 (6.5, 8.2)	0.59 (0.13)	0.0096
Race/Ethnicity													
White (NH)	7,919	398	4.7 (4.2, 5.3)	−0.37 (0.16)	0.0760	222	55.4 (50.2, 60.5)	4.66 (0.68)	0.0023	907	11.1 (10.0, 12.2)	0.40 (0.20)	0.1128
Black (NH)	4,195	141	3.4 (2.9, 4.1)	0.10 (0.11)	0.4421	74	50.3 (41.6, 59.1)	0.30 (3.83)#	0.9409#	514	12.5 (11.4, 13.6)	0.86 (0.47)	0.1373
Hispanic	5,531	117	2.3 (1.9, 2.8)	−0.10 (0.07)	0.2639	48	39.6 (30.0, 50.0)	4.49 (2.37)#	0.1307#	372	7.0 (6.1, 8.0)	0.80 (0.16)	0.0071
Others (NH)	2,213	50	3.2 (2.1, 4.7)	−0.16 (0.56)#	0.7823#	30	67.0 (54.3, 77.6)	5.61 (3.69)#	0.2263#	156	6.9 (5.5, 8.6)	1.04 (0.33)#	0.0331#
Education level													
< High school	3,745	119	4.1 (3.1, 5.4)	−0.59 (0.19)#	0.0342#	63	47.9 (37.7, 58.3)	6.36 (3.06)#	0.0348#	351	11.8 (10.4, 13.4)	0.49 (0.26)	0.1361
High / GED	4,115	175	4.7 (3.8, 5.7)	−0.14 (0.21)	0.5354	102	61.4 (52.8, 69.3)	4.89 (3.30)	0.2119	495	12.3 (10.9, 13.8)	0.57 (0.32)	0.1481

	N	Rx Opioid Use				Chronic Rx Opioid Use[2]				Illicit Drug Use[3]			
		n	Overall Prev. (95%CI)	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)[2]	Slope[4] (SE)	p for trend[4]	n	Prev. (95%CI)	Slope[4] (SE)	p for trend[4]
Some college	5,804	242	5.0 (4.3, 5.7)	−0.22 (0.25)	0.4344	130	54.7 (47.7, 61.5)	4.48 (2.52)	0.1503	659	11.6 (10.6, 12.7)	0.40 (0.35)	0.3183
College degree	5,180	147	2.9 (2.4, 3.6)	−0.50 (0.15)	0.0269	77	49.9 (41.5, 58.3)	1.36 (1.99)#	0.5304#	303	7.0 (5.5, 8.8)	0.59 (0.21)	0.0519
Alcohol consumption[5]													
None	5,903	198	3.8 (3.2, 4.6)	−0.17 (0.19)	0.4082	119	62.8 (55.8, 69.4)	2.42 (2.20)	0.3324	252	4.6 (3.9, 5.5)	0.02 (0.13)	0.9111
Moderate	6,885	239	3.9 (3.2, 4.7)	−0.08 (0.19)	0.7140	107	45.0 (37.1, 53.1)	5.29 (2.16)	0.0707	1,071	14.2 (12.9, 15.5)	0.49 (0.54)	0.4154
Heavy	1,453	49	3.8 (2.6, 5.6)	−0.23 (0.27)#	0.4425#	31	65.0 (49.6, 77.9)	6.26 (2.61)#	0.1386#	412	26.6 (23.5, 29.9)	1.18 (0.29)	0.0148
Smoking status													
Never	11,386	288	2.8 (2.4, 3.3)	−0.32 (0.08)	0.0151	143	48.9 (42.3, 55.5)	0.51 (2.48)	0.8480	601	5.0 (4.5, 5.6)	0.32 (0.18)	0.1533
Former	3,804	178	5.4 (4.3, 6.8)	−0.52 (0.20)	0.0635	97	53.9 (45.7, 61.9)	6.17 (2.99)	0.1083	327	12.9 (10.8, 15.4)	0.77 (0.93)	0.4526
Current	3,943	221	6.3 (5.4, 7.3)	−0.05 (0.29)	0.8729	133	62.4 (53.3, 70.8)	6.95 (2.46)	0.0474	951	22.6 (20.7, 24.5)	1.13 (0.30)	0.0198
Work hours													
<40 hours	6,376	244	4.2 (3.5, 5.0)	−0.45 (0.18)	0.0661	129	54.5 (47.4, 61.5)	0.71 (2.95)	0.8225	752	11.5 (10.6, 12.5)	0.69 (0.53)	0.2619
=40 hours	6,005	173	3.8 (3.1, 4.6)	0.45 (0.13)#	0.1287#	104	61.5 (53.0, 69.2)	6.29 (1.31)#	0.0086#	538	10.2 (8.9, 11.7)	0.40 (0.28)	0.2302
>40 hours	6,747	225	3.7 (3.1, 44)	−0.28 (0.14)	0.1144	118	53.6 (45.8, 61.3)	4.22 (1.82)	0.0818	590	9.1 (8.1, 10.2)	0.53 (0.16)	0.0293

[1]The prevalence estimates (%) were weighted and Prevalence estimates were age adjusted to the 2010 U.S. adult workers standard population by Bureau of Labor Statistics, using five age groups: 18–34, 35–44, 45–54, 55–64, 65+ years.

[2]Chronic Rx opioid use means taking prescription opioid mediation more than 90 days. When calculating prevalence of chronic Rx opioid use, the denominator is the weighted number of Rx opioid use and the numerator is the weighted number of chronic Rx opioid use.

[3]Illicit drugs are the non-prescription opioid drugs included Marijuana, hashish, cocaine, heroin, methamphetamine, or intravenous use of drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs). Participants aged 18–59 years only were asked if they used marijuana, cocaine, heroin, methamphetamine, and needle injections drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs) during the past 30 days. Participants aged 18–69 years were asked if they injected any non-prescription drugs during the past 30 days.

[4] Slope and p-value for trend were from weighted linear regression.

[5] For men, moderate drinking was defined as 1–14 drinks/wk and heavy drinking 15+ drinks/wk. For women, moderate drinking was defined as 1–7 drinks/wk and heavy drinking 7+ drinks/wk.

[#] The slope and p for trend are unreliable since prevalence in a survey cycle year is unreliable because the sample in the denominator in each is less than 30 or the relative standard error of the estimate is larger than 30%.

Table 3.

Age-adjusted prevalence[1] of prescription opioids and illicit drug use among US adult workers, by industry groups: 2005–2014

		Rx opioid use		Illicit drug use	
	Sample	No. of Rx opioid	Prev.[1] (95%CI)	No. of illicit drug	Prev.[1] (95%CI)
All	16,421	615	4.4 (3.9, 4.9)	1,550	9.7 (9.0, 10.4)
Agriculture, forestry, fishing, and hunting	252	5	2.5 (0.9, 6.8)#	9	3.8 (1.6, 8.4)#
Mining	92	4	7.4 (2.9, 17.8) #	17	20.1 (13.2, 29.4)
Utilities	125	5	4.6 (1.4, 14.5) #	5	4.2 (1.5, 11.2)#
Construction	1,235	52	5.4 (3.8, 7.6)	180	14.6 (12.2, 17.4)
Manufacturing: durable goods	1,063	29	3.5 (2.1, 5.7)	82	8.1 (6.1, 10.7)
Manufacturing: non-durable goods	750	23	3.7 (2.3, 5.9)	56	9.8 (7.2, 13.2)
Wholesale trade	461	17	4.6 (2.5, 8.1)	51	11.8 (8.7, 15.8)
Retail trade	1,733	68	5.1 (3.7, 7.1)	187	9.2 (7.5, 11.2)
Transportation and warehousing	688	36	4.9 (3.0, 7.9)	57	10.0 (7.4, 13.3)
Information	384	14	3.3 (1.6, 6.7) #	49	13.0 (9.4, 17.6)
Finance and insurance	610	18	3.2 (1.8, 5.5)	47	8.3 (5.6, 12.2)
Real estate and rental & leasing	347	16	5.4 (2.8, 10.3)	51	17.7 (12.0, 25.2)
Professional, scientific, and technical services	878	21	2.9 (1.7, 4.7)	62	7.9 (6.0, 10.2)
Administrative, waste management services	853	29	3.1 (2.0, 4.8)	107	13.2 (10.5, 16.5)
Educational services	1,294	36	2.2 (1.5, 3.2)	71	5.5 (4.0, 7.6)
Health care and social assistance	2,204	103	5.8 (4.6, 7.3)	121	5.4 (4.2, 6.9)
Arts, entertainment, and recreation	358	14	4.3 (2.2, 8.3)	53	17.2 (11.7, 24.6)
Accommodation and food services	1,332	54	6.4 (4.1, 9.7)	220	15.5 (12.2, 19.5)
Other services (except public administration)	800	35	4.3 (2.9, 6.5)	83	12.1 (9.1, 16.0)
Private households	200	6	4.3 (1.8, 10.2)#	6	6.1 (2.6, 13.7)
Public administration	666	27	4.0 (2.7, 5.9)	28	4.0 (2.7, 5.9) #

[1]Prevalence estimates were age adjusted to the 2010 U.S. workers standard population by Bureau of Labor Statistics, using five age groups: 18–34, 35–44, 45–54, 55–64, 65+ years.

[2]Marijuana, hashish, cocaine, heroin, methamphetamine, and needle injections drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs).

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[#]The estimate of prevalence is unreliable because the relative standard error of the estimate is larger than 30%.

Table 4.

Age-adjusted prevalence[1] of prescription opioids and illicit drug use among US adult workers, by occupational groups: 2005–2014

		Rx opioid use		Illicit drug use[2]	
	Sample	No. of Rx opioid	Prev.[1] (95%CI)	No. of illicit drug	Prev.[1] (95%CI)
All	16,421	615	4.4 (3.9, 4.9)	1,550	9.7 (9.0, 10.4)
Management	1,394	41	3.0 (2.2, 4.1)	103	7.7 (5.7, 9.8)
Business and financial operations	585	13	2.7 (1.4, 4.9)	43	8.1 (5.7, 11.5)
Computer and Mathematics	383	14	4.8 (2.5, 9.0)	27	6.4 (4.2, 9.6)
Architecture and Engineering	244	5	3.1 (1.2, 7.7) #	15	7.1 (3.8, 12.1)
Life, physical, and social science	183	6	2.9 (1.2, 6.8) #	9	5.7 (2.5, 12.1) #
Community and social services	263	12	5.5 (2.7, 10.8) #	14	5.5 (2.5, 9.9) #
Legal	149	6	5.8 (2.3, 13.6) #	7	6.4 (2.8, 14.0) #
Education, training, and library	770	148	2.5 (1.5, 4.1)	30	4.1 (2.6, 6.3)
Arts, design, entertainment, sports & media	298	11	3.3 (1.76, 6.4)	34	14.3 (9.1, 21.6)
Healthcare practitioners and technicians	701	29	5.9 (3.8, 9.0)	24	4.2 (2.8, 6.3)
Healthcare support	518	26	5.0 (2.9, 8.8)	48	8.7 (5.8, 12.8)
Protective service	369	15	5.5 (2.9, 10.3)	25	6.4 (3.9, 10.2)
Food preparation and serving related	1,075	50	5.7 (3.6, 8.9)	181	15.8 (12.5, 19.7)
Building and grounds cleaning and maintenance	1,011	29	3.8 (2.5, 5.9)	81	10.8 (8.4 13.9)
Personal care and service	654	31	6.5 (4.1, 10.4)	66	10.4 (7.3, 14.5)
Sales and related	1,649	58	3.9 (2.8, 5.2)	188	10.7 (8.9, 12.7)
Office and administrative support	1,923	93	5.4 (4.2, 7.0)	162	8.5 (7.1, 10.2)
Farming, fishing, and forestry	132	2	1.7 (0.4, 6.7) #	6	6.4 (2.3, 16.6) #
Construction and extraction	1,102	46	4.8 (3.4, 6.8)	177	18.0 (15.1, 21.3)
Installation, maintenance, and repair	509	24	5.0 (3.2, 7.6)	74	14.0 (11.0, 17.6)
Production	1,177	39	4.5 (2.7, 7.2)	95	9.8 (7.6, 12.6)
Transportation and material moving	1,242	44	4.5 (3.1, 6.4)	133	11.2 (9.6, 13.1)

[1]Prevalence estimates were age adjusted to the 2010 U.S. workers standard population by Bureau of Labor Statistics, using five age groups: 18–34, 35–44, 45–54, 55–64, 65+ years.

[2] Marijuana, hashish, cocaine, heroin, methamphetamine, and needle injections drugs (cocaine, heroin, methamphetamine, steroids, and any other drugs).

[#] The estimate of prevalence is unreliable because the relative standard error of the estimate is larger than 30%.