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Prevalence and Expenses of Outpatient Opioid Prescriptions, With Associated Sociodemographic, Economic, and Work Characteristics

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Abstract

Information on opioids obtained by workers is important for both health and safety. We examined the prevalence and total expenses of obtaining outpatient opioid prescriptions, along with associated sociodemographic, economic, and work characteristics, in national samples of U.S. workers. We used Medical Expenditure Panel Survey data (2007–2016) along with descriptive and multiple logistic regression. During the study period, an estimated 21 million workers (12.6%) aged 16 years or older obtained one or more outpatient opioid prescriptions, at an expense of $2.81 billion per year. Private health insurance covered half of the total opioid expenses for workers. The prevalence of obtaining opioid prescriptions was higher for women than for men, but men had higher opioid expenses. In addition, the prevalence of obtaining opioid prescriptions was higher for workers who were older; non-Hispanic white; divorced, separated, or widowed; and non-college-educated. There is an inverse relationship between family income and the likelihood of obtaining opioids. Compared to workers with private insurance, workers with public health insurance had higher expenses for opioid prescriptions. Finally, workers in occupations at higher risk for injury and illness – including construction and extraction; farming; service; and production, transportation, and material moving occupations – were more likely to obtain opioid prescriptions.

Keywords

opioid prescriptions; opioid expenses; work; MEPS; occupation

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Authors' Note

The findings and conclusions in this paper are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention.

Declaration of Conflicting Interests

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Prescription opioids may improve quality of life if properly used for the treatment of acute and chronic pain. However, extended use or misuse of opioids can lead to serious health problems, including death. Deaths related to drug overdose are reaching epidemic proportions in the United States, and in October 2017, the president declared the opioid crisis a national public health emergency.[1] In 2017, 17,029 deaths were due to prescription opioids, with a rate of 5.2 per 100,000 population.[2] In addition, there are economic consequences of this epidemic. Florence et al.[3] estimated that the overall economic burden of prescription opioid overdose – including treatment, productivity loss, and costs related to criminal justice – was $78.5 billion in 2013. According to a 2018 Centers for Disease Control and Prevention (CDC) Surveillance report, the rate at which opioids were prescribed increased annually by 3.0% from 2006 to 2010, decreased 1.6% annually from 2010 to 2014, and continued to decrease annually by 8.2% until 2017.[4] Studies have examined the prevalence of drug overdose – particularly opioid overdose – in the general U.S. adult population,[5] college students,[6] patients with chronic and non-chronic pain,[7–11] veterans,[12,13] and pregnant women.[14,15] Data sources have included clinical data such as hospital discharge data,[16] health insurance data,[17] national population-based surveys,[18] and vital statistics.[2] However, little is known about the prevalence of prescription opioid use among the working population.

Information on opioids obtained by workers is important for both health and safety, and is critically needed. Prescription opioids may be both a personal risk factor for work-related injuries and a consequence of work exposures.[19] Several studies have found that workers employed in industries in which the rate of occupational injury is high, such as mining and construction, were more likely than other workers to receive prescription opioids and to die from opioid overdose.[20,21] Jobs prone to injury and illness have higher proportions of workers with substance misuse and overdose death. Workplace ergonomic challenges, occupational injury, musculoskeletal conditions, and disability have been shown to affect opioid use.[21,22] As a safety issue, opioid use may increase the risk of occupational injuries by decreasing muscle strength and reaction time, as well as affecting judgment, coordination, attention, and memory.[23,24] Understanding factors that are associated with opioid use by workers may help identify potential work- and non-work-related risk factors for prevention of opioid-related health issues. The current study examined the prevalence of obtaining and expenses of outpatient opioid prescriptions, along with associated sociodemographic, economic, and work characteristics in national samples of U.S. workers.

Data and Methods

We used the 2007–2016 Medical Expenditure Panel Survey (MEPS) data. MEPS is the most complete survey that collects information on health service use and expenses in the United States.[25] MEPS has 2 broad components: the household and the insurance component. In this study, we used the household component that collects data from a nationally representative sample of U.S. civilian non-institutionalized populations that participated in the prior year's National Health Interview Survey. The panel data of MEPS include 5 rounds of interviews covering 2 full calendar years. In this study, however, we used the annual consolidated files, which have 3 rounds. During household interviews, MEPS collects detailed information for each person in the household on the following: demographic

characteristics, health conditions, health status, use of medical services, charges and source of payments, access to care, satisfaction with care, health insurance coverage, income, and employment. See Cohen[25] and Ezzati-Rice et al.[26] for sample design and a detailed description of MEPS. We pooled 10 years of MEPS data to reduce standard errors of estimates. See Machlin and Gorrell[27] for the advantage of pooling multiple years of MEPS data. Though the MEPS data include information on respondents not currently working, we considered those who worked in at least one of the 3 rounds per year.

The household component of MEPS has several files. In this study, we used the prescribed medicine and yearly consolidated files. The MEPS prescribed medicine file has information on all types of prescription drugs purchased or obtained (hereafter *obtained*) during each year of the survey. This information was collected directly from the respondents, during a recall period of 3–6 months. Then, for each medication reported by the respondent, MEPS contacted the dispensing pharmacy to collect detailed information. MEPS collects data only on prescriptions obtained in an outpatient setting; it does not include drugs administered within an inpatient setting. Therefore, all results presented in this study refer to outpatient opioid prescriptions and expenses. We used more than 13,000 National Drug Code (NDC) listed by CDC and Cerner Multum, Inc. (Multum's April 2018 content) to identify opioids obtained by MEPS respondents. We linked the prescription medicine files to the yearly consolidated files to get detailed information on MEPS respondents.

We identified 2 main outcomes of interest for this study: prevalence of obtaining opioid prescriptions and total opioid expenses. Prevalence of obtaining opioid prescriptions was defined as the percentage of workers who obtained one or more opioid prescriptions within a given survey year. We defined total opioid expenses as the sum of payments for opioid prescriptions, including copays, private insurance, public insurance (Medicaid, Medicare, and other public), workers compensation, and other sources within a year. In addition to total opioid expense, we computed conditional and unconditional mean opioid expenses. Conditional mean expenses were computed by dividing the total opioid expenses by the number of workers who obtained opioid prescriptions. Unconditional mean opioid expenses were computed by dividing the total opioid expenses by the total working population. Although unconditional expenses are included in Table 1, we focus on conditional mean expenses. All expenses during the study period were converted to 2017 dollars with use of the medical care price index available at https://fred.stlouisfed.org/series/CPIMEDSL.

We selected a number of sociodemographic, economic, and work-related variables as covariates. Sociodemographic variables included sex, age group, race or ethnicity, marital status, college education, and access to health insurance (uninsured, any private including TRICARE/CHAMPVA, and any public). Economic and work-related variables included family income as percentage of the poverty line (see MEPS Technical Notes for explanation of income categories at https://meps.ahrq.gov/survey_comp/hc_technical_notes.shtml), self-employment, number of employees at the establishment of the person's main job, average hours worked at main job, union status, and occupation. Although the MEPS codes occupation to a 4-digit census level, the public use data file contains only 8 broad categories and one category for unclassifiable. We also included region and year of the survey as potential covariates. See Table 1 for details.

We considered 170,009 respondents between 2007 and 2016, aged 16 years and older, who reported working in at least one of the 3 rounds of interviews within a year. We excluded respondents with military occupation (722 respondents). Our sample represented a population of 167.2 million workers per year (Online Appendix 1). We calculated chi-square tests for overall difference in sociodemographic and other characteristics. In addition to a descriptive analysis, we estimated a logistic regression model to examine associations between obtaining opioid prescriptions and sociodemographic, economic, and work-related factors. We used STATA® to generate nationally representative results by taking into account the complex sampling procedure of MEPS. We adjusted the MEPS weight variable in the combined data by dividing the sample weight by 10, the number of years of data that we combined.

Results

Prevalence of Obtaining Opioid Prescriptions

Descriptive results.—Online Appendix 2 presents the weighted prevalence of sociodemographic, economic, and work characteristics of the U.S. working population aged 16 years or older represented by the MEPS between 2007 and 2016.

The second column of Table 1 presents the prevalence of obtaining opioid prescriptions by sociodemographic, economic, and work-related factors during the study period. On average, the yearly prevalence of obtaining opioid prescriptions for U.S. workers was 12.6% per year during the study period. There was a statistically significant difference in the prevalence of obtaining opioid prescriptions by sex. On average, the prevalence of obtaining opioid prescriptions was 14.7% for women and 10.6% for men (Pearson F=300; P<.001). The prevalence of obtaining opioid prescriptions was highest for those aged 65 and older (16.0%), followed by ages 45 to 64 (14.1%). Workers in the youngest age group had the lowest prevalence (9.6%).

Differences in obtaining opioid prescriptions by race or ethnicity were significant (Pearson F=136; P<.001). The prevalence of obtaining opioid prescriptions was 14.0% for non-Hispanic white workers and 12.6% for non-Hispanic black workers, compared with less than 9% for both Hispanic and non-Hispanic workers of other race or ethnic groups. The prevalence of obtaining opioid prescriptions was highest for divorced, separated, or widowed workers (16.6%) and lowest for never-married workers (8.2%) (Pearson F=149; P<.001).

The mean prevalence of obtaining opioid prescriptions was 13.0% for workers without a college education and 12.3% for workers with a college education (P<.10). The prevalence of obtaining opioid prescriptions was lowest for those without any health insurance (7.8%) and highest for those with public health insurance (18.8%) (Pearson F=185; P<.001). The prevalence of obtaining opioid prescriptions for those with private health insurance was 13.1%.

We also examined the association of obtaining opioid prescriptions with economic and work-related factors. Workers from poor families had the highest prevalence of obtaining opioid prescriptions (14.8%), followed by workers from near-poor or low-income families

(13.2%). The prevalence of obtaining opioid prescriptions was 12.2% for those from middle- or high-income families. The prevalence of obtaining opioid prescriptions was significantly higher for employees (12.7%) than for self-employed workers (11.3%) (Pearson F=11; P<.001).

The prevalence of obtaining opioid prescriptions was significantly higher for workers in establishments with more than 100 employees (14.2%) than for workers in establishments with 10–99 employees (12.6%) and fewer than 10 employees (12.2%) (Pearson F=24; P<.001). However, the prevalence of opioid prescriptions by number of hours worked per week was not significant. Unionized workers had higher prevalence of obtaining prescription opioids than non-unionized workers (14.0% vs 12.4%).

We observed statistically significant differences in the prevalence of obtaining opioid prescriptions by occupation. The highest prevalence for obtaining opioid prescriptions was among workers in office and administrative support (13.5%), service (12.8%), sales and related (12.7%), and production and transportation (12.5%) occupations. Finally, workers in the Midwest had the highest opioid prescription prevalence (14.1%), followed by workers in the South (12.9%). Workers in the Northeast had the lowest opioid prescription prevalence (10.7%) during the study period.

There was statistically significant annual variability in the prevalence of obtaining opioid prescriptions over the study period (Figure 1). The highest prevalence was observed in 2014 (13.3%), and the lowest in 2016 (10.8%).

Multivariable results.—Table 2 presents the adjusted odds ratios (AORs) and 95% confidence intervals (CIs). Consistent with the univariate analysis, controlling for other covariates, men were less likely than women to obtain opioid prescriptions (AOR: 0.69; 95% CI: 0.65–0.72). When controlling for other covariates, age was significantly and positively associated with obtaining opioid prescriptions. AORs ranged from 1.24 (95% CI: 1.13–1.36) for workers ages 25–44, to 1.51 (95% CI: 1.33–1.74) for ages 65 and above. Among the 4 race or ethnicity groups considered in this study, non-Hispanic white workers (the reference category) had the highest adjusted odds of obtaining opioid prescriptions. Non-Hispanic black workers had the second highest adjusted odds of obtaining opioid prescriptions (AOR: 0.84; 95% CI: 0.79–0.88). The adjusted odds of divorced, separated, or widowed adult workers obtaining opioid prescriptions were 37% higher than for never-married workers (AOR: 1.37; 95% CI: 1.27–1.48). The adjusted odds of workers with a college education obtaining opioid prescriptions were 11% less than for workers without a college education (AOR: 0.89; 95% CI: 0.85–0.93).

Most of the economic and work-related variables were significantly associated with obtaining opioid prescriptions. The adjusted odds of workers from poor and near-poor or low-income families obtaining opioid prescriptions were 40% (AOR: 1.40; 95% CI: 130–1.52) and 20% (AOR: 1.20; 95% CI: 1.13–1.27) higher than for workers from middle- or high-income families, respectively. The adjusted odds of uninsured workers and workers with public health insurance obtaining opioid prescriptions were 37% lower (AOR: 0.63; 95% CI: 0.58–0.67) and 32% higher (AOR: 1.32; 95% CI: 1.23–1.43), respectively, than for

workers with private health insurance. The adjusted odds of workers in establishments with more than 100 employees obtaining opioid prescriptions were 16% higher (AOR: 1.16; 95% CI: 1.08–1.23) than for workers in establishments with fewer than 10 employees. Those who worked more than 40 h per week were also more likely (AOR: 1.06; 95% CI: 1.01–1.12) to obtain opioid prescriptions than those who worked 35 to 40 h per week. Self-employed workers were less likely (AOR: 0.90; 95% CI: 0.82–1.00) and unionized workers more likely (AOR: 1.09; 95% CI: 1.02–1.17) to obtain opioid prescriptions.

Compared with workers in management, business, and financial operations (the reference occupations), workers in construction and extraction (AOR: 1.27; 95% CI: 1.15–1.41); farming, fishing, and forestry (AOR: 1.27; 95% CI: 1.00–1.61); service (AOR: 1.14; 95% CI: 1.05–1.23); and production, transportation, and material moving (AOR: 1.12; 95% CI: 1.03–1.22) were more likely to obtain opioid prescriptions. The adjusted odds of workers in the Midwest (AOR: 1.33; 95% CI: 1.21–1.46), South (AOR: 1.32; 95% CI: 1.20–1.45), and West (AOR: 1.31; 95% CI: 1.19–1.44) obtaining opioid prescriptions were higher than for workers in the Northeast region. The year variable (not shown) indicated an increase in obtaining opioid prescriptions in the years 2009, 2011, and 2013–2015 compared with 2007, but none of these increases were statistically significant. Compared with the reference year, 2007, there was a statistically significant decline in 2016.

Expenses for Outpatient Opioid Prescriptions

On average, in 2017 dollars, the total yearly opioid expenses for workers were $2.81 billion during the study period. The last 2 columns in Table 1 present the mean conditional and unconditional opioid expenses (denominator is all workers) in 2017 dollars. Our discussion will focus on conditional expenses based on workers who obtained opioid prescriptions. Overall, the mean conditional opioid expense was $134. There was a statistically significant difference in opioid expenses by sex. The conditional mean expenses were higher for men ($141) than for women ($128). The mean conditional opioid expenses were also highest for those aged 45 to 64 ($164 per year) and 65 and above ($158).

There was a statistically significant difference in opioid expenses by race or ethnicity. The mean annual opioid expenses were highest for non-Hispanic white workers, followed by non-Hispanic black workers. The conditional mean opioid expenses were $149 per year for non-Hispanic white workers and $112 per year for non-Hispanic black workers, compared to $75 per year for Hispanic and $76 per year for non-Hispanic other. The mean conditional expenses were highest for divorced, separated, or widowed workers. Mean opioid expenses were lowest for those without any health insurance and highest for those with public health insurance. The mean conditional opioid expenses were $155, $133, and $116 per year for those with public health insurance, private health insurance, and no insurance, respectively.

We also examined the mean opioid expenses by economic and work-related factors. No significant differences were observed in mean opioid expenses by family poverty status. The mean conditional opioid expenses were $110, $153, and $133 per year for workers from poor, near poor or low-income, and middle- or high-income families, respectively. The mean conditional opioid expenses were much higher for self-employed workers ($247) than for employees ($120). There was no statistically significant difference in mean expenses for

opioid prescriptions expenses among workers in different sized establishments and number of hours worked per week. Unionized workers ($185) had higher mean conditional opioid expenses than that of non-unionized workers ($127). Workers in management and finance ($181), construction and extraction ($160), and sales and related ($159) occupations had the highest mean conditional opioid expenses per year.

There was statistically significant variation in opioid expenses for workers through time (Figure 2). The annual opioid expenses were $2.97 billion in 2007 and $3.71 billion in 2011 but decreased to $2.05 billion in 2016.

We also examined financing sources for opioid expenses (Figure 3). During the study period, private health insurance and out-of-pocket (self and family) payments financed three-fourths of opioid expenses for the working population, while those same sources of payment financed less than half of opioid expenses for the entire adult population.

Discussion

The risks related to opioid use in the working population are increasingly complex, going beyond misuse, addiction, and overdose, to concerns with occupational injury and disability. Ramchand et al.,[22] in a review of the literature on the relationship between substance use (alcohol or illegal drug use) and occupational injuries, concluded that there was a strong association between the two. Using drug test results, Price[24] showed a statistically significant association between opioid use and the incidence of occupational injuries. Opioid use may also increase the risk of occupational absenteeism and presenteeism. Van Hasselt et al.[28] showed that after adjustment for covariates, workers who reported prescription drug misuse within the past month had a 7.4% increase in probability of being absent from work one or more days during the previous month. Using workers' compensation claims in Washington State from 2012 to 2015, Nkyekyer et al.[29] showed that pre-injury opioid and benzodiazepine use may increase the risk of disability after work-related injury. Thumula et al.[30] and O'Hara et al.[31] conducted studies similar to ours, but their scope was limited to workers who used the workers' compensation system and did not have information on sociodemographic factors that may be associated with opioid use in workers. This study allows examination of these factors.

Using 10 years of MEPS data (2007–2016), we found that, on average, 21 million workers (12.6%) aged 16 and older obtained one or more opioid prescriptions and spent $2.81 billion per year. These findings may underestimate the actual prevalence and expenses of obtaining opioid medications, because MEPS does not include inpatient prescriptions.[18] Illicit and nonmedical purchase of opioids would not factor into estimating the prevalence or expenses of obtaining opioid medications.[32] Lack of inclusion of these may lead to underestimating the prevalence of illicit opioid use or nonmedical use of opioid medications. Using the same data, Lemke[33] and Stagnitti[34] reported that 34.4 million adults in 2012 and 41.6 million adults in 2015 obtained one or more opioid prescriptions. Our study estimated that 20 million workers in 2012 and almost 23 million workers in 2015 obtained opioid prescriptions. Stagnitti[34] also reported $10.7 billion spent on opioid medications in 2015 in the general population, compared with our estimate of $3.06 billion spent on opioid

prescriptions in the working population in the same year. The 2007–2016 MEPS data show that 69% of the adult population was working. Based on this share, the total opioid expenses would have been expected to be $7.38 billion ($10.7 billion × 0.69). However, our estimates are lower, likely because of the healthy worker effect. Working adults generally exhibit fewer serious health issues than nonworking adults, who may suffer from chronic health problems that exclude them from employment.[35]

Recent reports have shown a decrease in the number of opioid prescriptions.[4] Our study showed that the number of workers who obtained opioid prescriptions in 2016 decreased by 17.4% from the 2015 level. This may be due to the CDC's recently published guidelines for prescribing opioids for chronic pain outside of active cancer treatment, palliative care, and end-of-life care.[36] The guidelines recommend using non-opioid therapies for chronic pain, using opioids for chronic pain only when the benefits are likely to outweigh the risks, and prescribing the lowest effective dosage when opioids are used.[37] The sources of financing for opioid expenses were very different for workers than for the general population. As shown in Figure 3, during the study period, private health insurance covered half of opioid expenses for workers but only one-fourth of those for all adults. This result is not unexpected, as private health insurance companies insured 77% of workers (see Online Appendix 2). We also observed variation in the share of public health insurance. Whereas Medicare and Medicaid covered only 27% of the opioid expenses for workers, they covered 40% of such expenses for the adult population. One reason for this could be that Medicare and Medicaid cover adults 65 and older, a large proportion of whom may not be in the labor force. During the study period, workers' compensation covered 2% of the opioid expenses for workers and 3.8% for all adults. This may indicate that the workers' compensation system financed opioid expenses for some severely injured workers who left the labor force. Insurers have also begun to implement a number of approaches to reduce inappropriate prescribing of opioids.

Consistent with previous studies, we found statistically significant differences in the prevalence of obtaining opioid prescriptions by sex.[5,38] Controlling for other covariates, we noted that the odds of women obtaining opioid prescriptions were 31% higher than for men. Given the higher rate of occupational injury rates for men (injuries and illnesses among men were 23% higher than among women between 2011 and 2016),[39] our results may not be intuitive. Although numerous studies have shown that women tended to report more health problems than men,[40–43] working men spent more money on opioids than working women. The conditional mean opioid expense for men was 10% higher than for women. The number of days opioids were prescribed was also higher for men (by 23%) than for women (results not shown). Using employer-sponsored health insurance data from 2003 to 2013, Pensa et al. [44] found that working men were 11% more likely to receive opioids chronically than were working women.

Age was significantly and positively associated with obtaining opioid prescriptions in both univariate and multivariate analyses. Other researchers found similar results. Campbell et al. [38] showed that the incidence of long-term opioid use for non-cancer pain in 2015 increased with age for both adult men and adult women. Other researchers also reported similar findings.[31,44,45] We found a significant association between race or ethnicity and the

likelihood of obtaining opioid prescriptions. The odds of non-Hispanic white workers obtaining opioid prescriptions were higher than for other race or ethnic groups. Pensa et al.[44] found, after controlling for covariates, that the odds of white workers purchasing opioids chronically were 34% and 43% higher than for black and Hispanic workers, respectively. Our findings are also similar to those of Wang et al.[45] on nonmedical (not prescribed for the responder) use of prescription opioids, based on the National Survey on Drug Use and Health data. In the urban sample, Wang et al.[45] noted that the odds of white adults using nonmedical prescription opioids were 42% and 36% higher than for black and Hispanic adults. In the rural areas, however, they did not find any significant difference, possibly because of a lack of diversity in those areas. The share of non-Hispanic white participants in their rural sample was 95.8%, compared with 65.3% in our sample. A statistically significant difference in opioid use by race or ethnicity was also reported by Lemke,[33] Kelly et al.,[5] and Luo et al.[46] Our results showed that both the prevalence of obtaining and mean expenses for opioid prescriptions were highest among non-Hispanic white workers. As indicated by Case and Deaton,[47] this may be one of the reasons for the observed increase in all-cause mortality for middle-aged, non-Hispanic white people in the United States between 1999 and 2013.

Consistent with some previous research, we found that the odds of obtaining opioid prescriptions were highest among divorced, separated, or widowed adults. Toblin et al.,[48] using the 2007 Kansas Behavioral Risk Factor Surveillance data, showed that, for divorced, separated, or widowed adults or never married couples with chronic pain, the odds of obtaining opioid prescriptions were 1.5 times higher than for married or unmarried couples.

The literature on the relationship between socioeconomic status and opioid use is mixed. Qureshi et al.[49] found no statistically significant association between socioeconomic indicators (poverty status, annual median household income, and education) and opioid prescription drug use. Joynt et al.[50] concluded that patients of lower socioeconomic status visiting emergency departments were less likely (AOR: 0.76; 95% CI: 0.68–0.86) to receive opioids than patients of higher socioeconomic status. Similar results were reported by studies that considered only injured workers and the workers' compensation system.[30,31]

However, several researchers have identified low socioeconomic status as a potential risk factor for opioid use. Gebauer et al.[51] reported that new patients with back pain and residing in low socioeconomic neighborhoods had a higher risk of purchasing prescription opioids. Platts-Mills et al.[52] showed that the likelihood of receiving prescription opioids at emergency departments was 3 times higher for patients who did not complete high school than for patients with post-college education, after controlling for age, sex, income, and severity of pain. Our study showed similar but modest results. One possible reason for the inverse relationship between socioeconomic status and prevalence of obtaining opioid prescriptions could be differences in requesting or declining opioid prescription during a health care visit.[52]

Compared to workers with private health insurance, workers with public health insurance were more likely and workers without any health insurance less likely to obtain opioid prescriptions. Similar results were reported for the general U.S. adult population.[33,53] The AOR for the public health insurance category reported from our study (1.3) was somewhat

smaller than the one reported by Lemke[33] for 2012 MEPS data (1.5), because we did not consider nonworking adults older than 65 who were more likely to be covered by Medicare. Other studies also indicated a high risk of opioid use for respondents with public health insurance such as Medicare.[54]

Finally, workers in construction and extraction; farming, fishing, and forestry; service; production, transportation, and material moving; and sales and related occupations had higher risks of obtaining opioid prescriptions than workers in the management, business, and financial (reference) occupation category. Recently, Morano et al.[20] reported that opioid-related (heroin and methadone) overdose deaths were highest for workers in construction and others with high risk for ergonomic injury. Using workers' compensation claim data, Thumula et al.[30] reported similar results. Controlling for covariates, the likelihood of workers in mining and construction industries and occupations to receive prescription pain medication was higher than workers in other industries and occupations. Construction workers also reported a relatively high level of pain that limited their normal work, compared with workers in the reference occupation. For example, for workers in farming, fishing, and forestry and in construction and extraction, the odds of using opioids were 27% higher than for the reference occupations. During the same period, the percentage of workers in these occupations who reported that pain extremely limited their normal work was 2.5 and 1.4 times higher, respectively, than for workers in the reference occupation category. Reducing work-related risk factors associated with pain may help reduce the prevalence of opioid use.

The use of a large nationally representative sample that includes pharmacy cost data for a 10-year period is one of the strengths of this study. However, this study has some limitations. First, prevalence of obtaining opioid prescriptions was based on prescription opioids obtained during the survey year. There is a complex relationship between obtaining a prescription for opioids and use. Although opioids may be obtained, the individual may not use them. In this study, we do not know whether the drugs were used or transferred to another person. In addition to this, we examined only the prevalence of workers who purchased or obtained one or more prescribed opioids, thereby equating one purchase with multiple purchases.

The findings of this study could help employers to educate workers about the benefits and harms of opioid medications, including their potential to impair some types of work activities, and partner with health plan providers and pharmacy benefit managers to encourage use of strategies that improve prescribing guideline-concordant care. The collection and examination of data with more information on occupation and associated workplace psychosocial factors are needed. Future efforts should evaluate these same sociodemographic, economic, and work-related factors, while accounting for the number of opioid prescriptions, as well as prescription strength and length. In addition, a closer examination of data on older adult, non-Hispanic white, divorced, or widowed working women obtaining opioid prescriptions is warranted. This information will provide valuable insights into the opioid epidemic.

Conclusion

Our findings showed that on average, 21 million workers obtained one or more prescription opioids and spent $2.81 billion per year between 2007 and 2016 (in 2017 dollars). The prevalence of obtaining opioid prescriptions was 12.6% per year among U.S. workers, with a lower prevalence in 2016, which is consistent with recent surveillance data showing that the prevalence is decreasing.[4] On average, each worker who obtained prescription opioids spent $134 per year during the study period. Sex, age, marital status, education, income, health insurance type, and occupation were independently and significantly associated with obtaining opioid prescriptions. Our findings help fill the research gap with regard to prevalence and correlates of obtaining opioid prescriptions among the U.S. working population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Biography

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Toni Alterman is a senior social epidemiologist at the U.S. Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), in the Health Informatics Branch. She has graduate degrees in both psychology and epidemiology and has been at NIOSH since 1992, after leaving a faculty position at the University of Texas Health Science Center, School of Public Health. Her research interests include workplace psychosocial factors, nonstandard work arrangements, work organization, job stress, opioid use, mental health, disability, and chronic disease. She has collaborated with a number of U.S. government agencies to collect health data via large national surveys to gain a greater

understanding of relationships between work organization, workplace psychosocial factors, and worker health.

Brian Quay is an economist at the U.S. Centers for Disease Control and Prevention (CDC), National Institute for Occupational Safety and Health (NIOSH), in the Economics Research and Support Office. He joined NIOSH in 2017 after working for the U.S. Department of the Interior for 4 years. His research uses econometrics to understand the distributional impacts of workplace injury across individuals, employers, and society as a whole. His current research efforts include exploring how work impacts opioid use and misuse, the prevalence and effects of nonstandard work arrangements, and how healthy work design impacts worker well-being.

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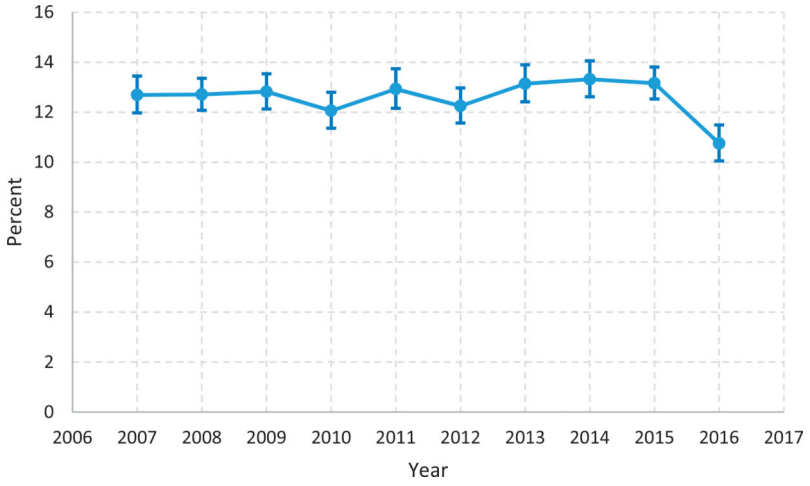

Figure 1.

Prevalence of workers who purchased one or more prescription opioids, by year (MEPS, 2007–2016). Vertical lines show 95% confidence intervals for the estimates of the mean. Workers are respondents aged 16 years and older, who reported working in at least one of the 3 rounds of interviews within a year. We excluded respondents with military occupation.

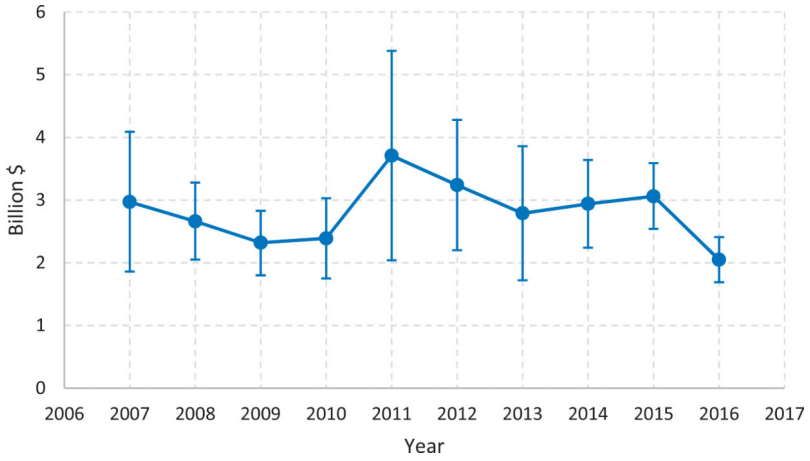

Figure 2.

Total opioid expenses for workers in 2017 dollars, by year (MEPS, 2007–2016). Vertical lines show 95% confidence intervals for the estimates of the mean.

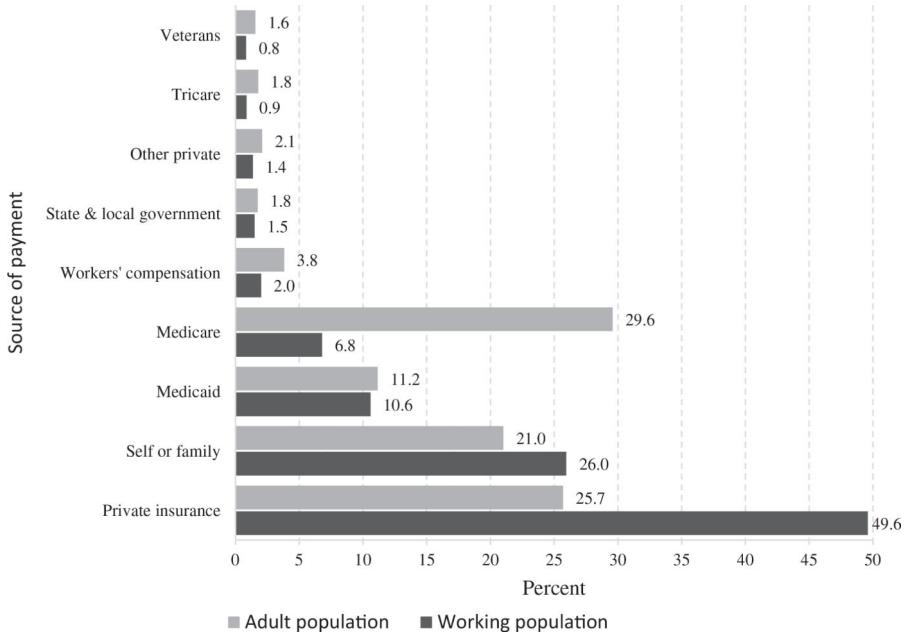

Figure 3.
Sources of payment for opioid prescription expenses (MEPS, 2007–2016).

Table 1.

Prevalence (%) of Opioid Purchases and Mean Expenses by Sociodemographic, Economic, and Work-Related Characteristics (MEPS, 2007–2016).

		Mean Expenses per Year in 2017 Dollars	
Characteristic	**Prevalence (%) (95% CI)**	**Conditional[a] (95% CI)**	**Unconditional[b] (95% CI)**
Total	12.6 (12.3–12.9)	134 (121–147)	17 (15–19)
Sex[c]			
Female	14.7 (14.3–15.2)	128 (110–146)	19 (16–22)
Male	10.6 (10.3–10.9)	141 (121–160)	14 (12–18)
Age category,[c] years			
16–24	9.6 (9.1–10.1)	55 (45–66)	5 (4–6)
25–44	11.8 (11.5–12.1)	119 (96–141)	14 (11–17)
45–64	14.1 (13.8–14.5)	164 (142–186)	23 (19–27)
65+	16.0 (15.0–17.0)	158 (119–198)	25 (18–33)
Race or ethnicity[c]			
Hispanic	8.5 (8.1–9.0)	75 (61–90)	6 (5–8)
Non-Hispanic white	14.0 (13.7–14.4)	149 (132–167)	21 (18–24)
Non-Hispanic black	12.6 (12.1–13.2)	112 (89–135)	14 (11–17)
Non-Hispanic other	8.2 (7.4–9.0)	76 (61–91)	6 (4–8)
Marital status[c]			
Married	12.8 (12.4–13.2)	141 (124–159)	18 (15–21)
Divorced, separated, or widowed	16.6 (15.9–17.3)	161 (121–200)	27 (18–35)
Never married	10.2 (9.8–10.7)	96 (77–114)	10 (8–12)
Education[d]			
No college	13.0 (12.5–13.5)	145 (124–166)	19 (16–22)
College	12.3 (12.0–12.7)	125 (108–143)	15 (13–18)
Family poverty status[c]			
Poor or negative	14.8 (14.0–15.7)	110 (92–129)	16 (13–19)
Near poor or low income	13.2 (12.6–13.9)	153 (121–184)	20 (15–25)
Middle or high income	12.2 (11.9–12.6)	133 (116–149)	16 (14–19)
Health insurance[c]			
Any private	13.1 (12.7–13.5)	133 (117–149)	17 (15–20)
Public	18.8 (17.6–20.0)	155 (128–182)	27 (22–32)
Uninsured	7.8 (7.2–8.4)	116 (98–134)	9 (7–11)
Employee vs self-employed[c]			
Employee	12.7 (12.3–13.0)	120 (108–132)	15 (13–17)
Self-employed	11.3 (10.6–12.1)	247 (170–325)	28 (17–39)
Number of employees at the main job[d]			
<10	12.2 (11.6–12.8)	154 (126–181)	18 (14–22)

Characteristic	Prevalence (%) (95% CI)	Mean Expenses per Year in 2017 Dollars	
		Conditional[a] (95% CI)	Unconditional[b] (95% CI)
10–99	12.6 (12.1–13.2)	119 (100–139)	15 (12–18)
>100	14.2 (13.5–14.8)	134 (108–161)	18 (14–23)
Average hours worked per week			
<35	12.6 (12.1–13.1)	147 (122–171)	19 (15–22)
35–40	12.8 (12.3–13.4)	130 (110–150)	16 (13–19)
>40	13.0 (12.3–13.8)	121 (94–148)	16 (11–20)
Member of a union			
No	12.4 (12.1–12.7)	127 (114–139)	16 (14–18)
Yes	14.0 (13.2–14.8)	185 (112–258)	26 (13–38)
Occupation[c]			
Management and finance	12.1 (11.5–12.8)	181 (130–233)	22 (14–30)
Professional and related	12.5 (11.9–13.1)	107 (88–127)	13 (11–16)
Service	12.8 (12.2–13.4)	111 (95–127)	14 (11–17)
Sales and related	12.7 (11.9–13.4)	159 (117–202)	20 (14–26)
Office and administrative support	13.5 (12.7–14.2)	148 (90–205)	20 (10–30)
Farming, fishing, and forestry	12.2 (9.7–15.2)	62 (40–84)	8 (4–11)
Construction and extraction	11.9 (11.0–12.9)	160 (117–202)	19 (14–25)
Production and transportation	12.5 (11.8–13.1)	105 (84–126)	13 (10–16)
Unclassifiable	7.3 (5.7–9.3)	142 (61–222)	10 (3–17)
Census region[c]			
Northeast	10.7 (9.9–11.5)	160 (116–205)	17 (11–23)
Midwest	14.1 (13.5–14.7)	135 (102–170)	19 (13–25)
South	12.9 (12.4–13.5)	134 (116–152)	17 (14–20)
West	12.1 (12.3–12.9)	112 (96–130)	14 (11–16)

Abbreviation: 95% CI, 95% confidence interval.

[a]Conditional mean expenses were computed by dividing the total opioid expenses by the number of workers who obtained opioid prescriptions.

[b]Unconditional mean opioid expenses were computed by dividing the total opioid expenses by the total working population.

[c]χ^2 test for difference (P <.01).

[d]χ^2 test for difference (P <.1).

Table 2.

Adjusted Multiple Logistic Regression Model for Sociodemographic, Economic, and Work-Related Characteristics Associated With Obtaining One or More Opioid Prescriptions (MEPS, 2007–2016).

Characteristic	AOR (95% CI)
Sex	0.69 (0.65–0.72)
Female (Ref.)	
Male	
Age category, years	
16–24 (Ref.)	
25–44	1.24 (1.13–1.36)
45–64	1.42 (1.27–1.57)
65+	1.52 (1.33–1.74)
Race or ethnicity	
Non-Hispanic white (Ref.)	
Hispanic	0.59 (0.55–0.63)
Non-Hispanic black	0.84 (0.79–0.89)
Non-Hispanic other	0.59 (0.53–0.67)
Marital status	
Never married (Ref.)	
Married	1.12 (1.05–1.19)
Divorced, separated, or widowed	1.37 (1.27–1.48)
College education	0.89 (0.84–0.93)
Family poverty status	
Middle or high income (Ref.)	
Poor	1.40 (1.30–1.52)
Near poor or low income	1.20 (1.13–1.28)
Health insurance	
Any private (Ref.)	
Public	1.32 (1.21–1.45)
Uninsured	0.63 (0.58–0.68)
Self-employed	0.90 (0.82–1.00)
Number of employees at the main job	
<10 (Ref.)	
10–99	1.03 (0.96–1.10)
>100	1.16 (1.08–1.24)
Average hours worked per week	
35–40 (Ref.)	
<35	0.97 (0.92–1.04)
>40	1.06 (1.00–1.13)
Union membership	
No (Ref.)	
Yes	1.09 (1.02–1.17)

Characteristic	AOR (95% CI)
Occupation	
Management and finance (Ref.)	
Professional and related	1.01 (0.94–1.09)
Service	1.14 (1.04–1.24)
Sales and related	1.09 (0.99–1.21)
Office and administrative support	1.04 (0.94–1.14)
Farming, fishing, and forestry	1.27 (0.96–1.67)
Construction and extraction	1.27 (1.13–1.44)
Production and transportation	1.12 (1.02–1.22)
Unclassifiable	0.70 (0.45–1.08)
Census region	
Northeast (Ref.)	
Midwest	1.33 (1.21–1.46)
South	1.32 (1.20–1.45)
West	1.31 (1.19–1.44)

Abbreviations: AOR, adjusted odds ratio; 95% CI, 95% confidence interval.