to receive prescription opioids, and to die from opioid overdose. Jobs prone to injury and illness have higher proportions of workers with substance misuse and overdose death. Nationally representative data and other large datasets on prescribed opioid medications can provide useful information to discuss the use and expense of prescription opioids among U.S. workers.

Objective: The papers in this session include analyses of two datasets, the Medical Expenditure Panel Survey (MEPS) and the Truven Healthcare MarketScan Research Database. The MEPS is a set of large-scale surveys of families and individuals, their medical providers, and employers across the United States. MEPS is a panel survey that contains data on the expense and use of health care and health insurance coverage. The MarketScan® Research Databases are a family of research data sets that fully integrate de-identified patient-level health data which consist of data contributed by large employers, managed care organizations, hospital, electronic medical record providers, and Medicare and Medicaid.

Together these papers examined:

- Sociodemographic factors, employment characteristics and occupation, along with the expense of obtaining opioids in U.S. workers for 10 years of MEPS data (2007-2016) (Alterman)
- Opioid prescribing patterns for work-related and non-work-related injuries in 5 years of MEPS data (2010-2014) (Quay)
- The impact of workplace injury on opioid use from MarketScan group health insurance data using a quasi-experimental framework (Asfaw).

Analyses. Weighted prevalence estimates, multivariate logistic regression, and difference-in-differences methods were used.

Results. Prevalence and expenses for outpatient prescription opioids varied by sociodemographic factors, type of health insurance, and occupation in a nationally representative sample of U.S. workers. Work-related injuries were more likely to result in at least one opioid prescription, more opioid prescription days and higher expenses than non-work-related injuries. Most data on work-related injury has relied on workers compensation data, which limits the scope of analysis because injured workers might use other sources of payment to obtain opioid prescriptions. By using the Difference-in-Differences method, researchers demonstrated the utility of using group health insurance data using a quasi-experimental framework for examining the impact of workplace injury on opioid use.

Implications and Conclusion. These studies provide information on opioid prescription use and expense in nationally representative samples of U.S. workers and in a large group insurance database. Prevention and intervention activities should be targeted to worker groups with higher prevalences of opioid use, and those at higher risk of work-related injuries. These results make a strong case for investing in worker safety and health.

Prevalence and expense of outpatient prescription opioid use among workers

Toni Alterman (NIOSH)

Introduction: Although a growing literature addresses the incidence of drug overdose, particularly opioid overdose, little is known about the prevalence of prescription opioid use among the working population. Information on the prevalence of opioid use among U.S. workers, along with factors associated with their use, is critically needed. The issue of opioid use among workers is both a health issue and a safety issue. Prescription opioids may be both a personal risk factor for work-related injury and a consequence of work exposures. 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. 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 impact opioid use or misuse. Opioid use may affect the performance of safety-sensitive tasks and increase the risk of workplace injuries by decreasing muscle strength and reaction time, as well as affecting judgment, coordination, attention, and memory. 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. Objective: Our objective was to examine the prevalence and expense of outpatient prescription opioid use, along with associated sociodemographic, economic, and work characteristics, in a national sample of U.S. workers. Method: We used the 2007–2016 Medical Expenditure Panel Survey (MEPS) data to estimate prevalence, expenses, and associations of outpatient prescription opioid use among the U.S. working population. MEPS is the most complete nationally representative longitudinal survey that collects information on health service use and expenses in the United States. We pooled ten years of MEPS data to reduce standard errors of estimates. We used the prescription drug and yearly consolidated files of MEPS for this study. The MEPS prescribed medicine file has information on all types of prescription drugs purchased or 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 purchased or obtained in an outpatient setting; it does not include drugs administered within an inpatient setting. We used more than 13,000 National Drug Code (NDC) codes. We linked the prescription files to the yearly consolidated files to get detailed information on MEPS respondents. We identified two main outcomes of interest for this study: prevalence of opioid use and total opioid expenses. Prevalence of opioid use was defined as the percentage of workers who purchased or obtained one or more outpatient prescription opioids within a given survey year. Total opioid expenses were defined as the sum of payments for opioid prescriptions within a year. Using multivariable analysis, we examined associations of opioid use with sociodemographic, economic, and work characteristics. We included 170,009 respondents between 2007 and 2016, aged 16 years and older, who reported working in at least one of the three rounds of interviews within a year. We excluded respondents with military occupations (722 respondents). Our sample represented a population of 167.2 million workers per year. Results. An estimated 21 million workers (12.6% of workers) aged 16 years or older used one or more outpatient prescription opioid medications, at an expense of $2.81 billion per year, during the study period. Private health insurance covered half of the total opioid expenses for workers. The prevalence of opioid use was higher for women than for men, but men spent more money on opioids. In addition, the prevalence of opioid use was higher for older; non-Hispanic white; divorced, separated, or widowed; and non-college-educated workers. There is an inverse relationship between family income and the likelihood of a worker using opioids. Compared to workers with private insurance, workers with public health insurance were more likely to use and spend more on opioid prescriptions. During the study period, both the prevalence

and expense of opioid prescriptions were the lowest in 2016. Finally, workers in construction and extraction; farming, fishing, and forestry; service; and production, transportation, and material moving occupations had the highest prevalence of using opioids. Conclusion. We present national prevalence estimates and expenses for prescription opioid use in a national sample of U.S. workers over a 10-year period. We identified sociodemographic, economic, and work characteristics associated with prescription opioid use. Attention to these risk factors may help identify industries and occupations to focus on, as well as groups of workers toward whom opioid misuse prevention and intervention activities should be targeted.

The impact of occupational injuries on the incidence and cost of opioids

Brian Quay (NIOSH)

Background. The United States is currently experiencing an opioid overdose epidemic. Assessing opioid prescribing patterns continues to be important to help understand risk for potential harm, such as misuse or overdose. Although there is literature describing prescription opioid use within the general population as well as within workers' compensation systems, little research has been done to compare opioid prescribing patterns between occupational and non-occupational Injuries. It is possible that occupational injuries lead to more pain and more opioid prescriptions, if post-injury avoidance of activities that led to the injuries is sometimes more difficult because they are work activities.

Objectives. We compared opioid prescribing patterns for occupational and non-occupational injuries, comparing the percentage of injuries followed by an opioid prescription within the survey year of the injury, the number of days of supply, and the total medication cost. We hypothesized that occupational injuries were more likely to result in opioid prescription, more days of prescribed opioids, and higher total opioid costs than non-occupational injuries. Data: We used data from the Medical Expenditure Panel Survey (MEPS), a nationally representative survey designed to collect information on healthcare use and expenditure. We used the medical condition (including injury), prescribed medicine, and full year consolidated data files of MEPS . In the medical condition files, 24,893 injuries were reported from 2010 to 2014. Respondents aged 16 and older who reported an injury or accident (terms presented as defined in MEPS) were asked a follow up question on whether the injury or accident occurred at work. We used this information to classify injuries as occupational and non-occupational. We linked the injuries from the medical condition files with information from the prescribed medicine and full year consolidated files. The prescribed medicine files include information on national drug code (NDC), number of days prescribed, dates filled and payments made by different sources for each medicine. The full year consolidated files contain demographic, health insurance coverage, and economic data. Measurement of variables: We identified opioids using the NDC of each prescribed medicine as a result of a reported injury condition. We used more than 13,000 NDCs provided by the Centers for Disease Control and Prevention to identify opioids. Then, we created three dependent variables: presence vs. absence of filled opioid prescription, number of days of supply, and cost of prescribed opioids (paid by patients, insurers, and other third parties). Our main explanatory variable was whether the injury was occupational or non-occupational. Our covariates included sex, age (4 categories), race (5 categories), education (4 categories), access to any health insurance, poverty status (4 categories), and number of comorbidities (5 categories).

Method: We used logistic regression to assess whether an opioid was prescribed following the incidence of injuries. We used a two-part regression model to assess the number of days for which opioids were prescribed and the associated costs. In the first part, we estimated the probability that an injury results in a non-zero number of days of prescribed opioids, and in the second part, we estimated the number of days and costs of the prescribed opioids, conditional on non-zero days of prescribed opioids.

Results. Of all injuries reported, 23.7% occurred at work. Controlling for covariates, occupational injuries were 29% [95% CI: 1.14 -1.45] more likely to result in at least one opioid prescription than non-occupational injuries. The two-part regression results showed that, controlling for covariates, occupational injuries resulted in 4.15 [95% CI: 2.58-5.73] more opioid prescription days and a $19 [95% CI: $11 - $27] higher cost of opioids per injury compared with non-occupational injuries. The study has some limitations. First, prescribed medicine are not always used by patients. Second, our follow-up period after injury may vary from a full year for injuries occurring at the beginning of the survey year to less than a month for injuries occurring at the end of the survey year.

Conclusion. We found that occupational injuries resulted in a greater likelihood of receiving an opioid prescription, a higher number of opioid prescription days, and higher opioid costs than non-occupational injuries. These results make a case for investing in worker safety and health.

Impact of workplace injury on outpatient prescription opioid use from private group health insurance

Abay Asfaw (NIOSH)

Problem. Opioid misuse has been identified as a major public health problem in the United States. Despite research on the relationship among workplace injury, workers' compensation, and opioid use, little is known about the impact of workplace injury on prescription opioid use outside the workers' compensation system. Limiting the scope of opioid use by injured workers to the workers' compensation system likely underestimates the impact of workplace injury on opioid use because injured workers might use other sources to obtain opioid prescriptions. The objective of this study was to bridge this gap by examining the impact of workplace injury on opioid use from the employer-sponsored private group health insurance (GHI) system.

Method. We used a difference-in-differences (DiD) method to examine the impact of workplace injury on the use of outpatient prescription opioids from the GHI two months before and two months after injury by injured workers compared with non-injured workers, the control group. Because dates of injury are not available for the non-injured workers, they were randomly assigned an index date or a 'pseudo injury date' (hereafter injury date) that corresponded to the date of injury of the pool of injured workers. We identified two outcome variables as proxies for outpatient prescription opioid use from the GHI: receiving one or more outpatient opioid prescriptions (hereafter opioid prescriptions) and total number of outpatient opioid prescriptions (hereafter number of opioid prescriptions). We also used logistic and negative binomial regression models for multivariate analysis. The data source for this study was the MarketScan database. We created a cohort of workers (ages 18 to 65 years) who were continuously enrolled both in the workers' compensation and GHI system from 2013 to 2015. The intervention event was incidence of a workplace injury that occurred between January 1st and December 31st 2014.

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