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Do Injured Workers Receive Opioid Prescriptions Outside the Workers' Compensation System?:

The Case of Private Group Health Insurances

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Abstract

Objectives: We explored the impact of workplace injury on receiving opioid prescriptions from employer-sponsored private group health insurances (GHI) and how long injured workers receive opioid prescriptions after injury.

Methods: We used a difference-in-differences method and Market-Scan® databases for the years 2013 to 2015.

Results: Estimated odds for injured workers relative to noninjured workers to receive opioid prescriptions from the GHI within 60 and 180 days from the index date of injury were 4.9 and 1.5, respectively. In addition, the number of opioid prescriptions received within 60 days of injury was 2.5 times higher.

Conclusion: Workplace injury could be a risk factor for both short and long-term prescription opioid use. Studies that use only workers' compensation medical claim data likely underestimate the magnitude of the impact of workplace injuries on opioid prescriptions.

Keywords

difference-in-differences; group health insurances; opioid prescriptions; workplace injury

The opioid crisis has been identified as a major public health problem in the United States.[1,2] Overdoses involving opioids killed more than 47,000 people in 2017, and more than 17,029 of those deaths involved prescription opioids.[3] According to one study, the economic burden of opioid misuse, overdose, and use disorder has been estimated to be over $53.4 billion in 2006, of which 79% was related to lost productivity.[4] Despite the growing literature on the relationships among workplace injury, workers' compensation claims, and prescription opioid use,[5–8] we know little about the impact of workplace injury on prescription opioid use outside the workers' compensation system. Limiting the scope of research to workers' compensation is likely to underestimate the impact of workplace injury on opioid prescriptions, because injured workers might be covered by other insurers such as

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private insurance companies, Medicare, or Medicaid, or pay cash for opioid prescriptions.[9,10]

Studies showed that more than half of workers with workplace injury and illness do not file workers' compensation claims, particularly those with private health insurances.[11,12] In fact, between 40% and 75% of those with workplace injuries do not file for workers' compensation benefits.[11–15] The literature mentions that factors such as fear of adverse consequences,[16,17] decline in union membership,[13] severity of injury,[12,17] and coverage and copayment differences between workers' compensation and health insurance systems[18,19] affect the probability that injured workers will file claims for workers' compensation benefits. Even if workers apply for workers' compensation benefits, claims for certain conditions such as back pain and musculoskeletal disorders might not be approved by workers' compensation insurers.[20,21]

The objectives of this study were to examine the impact of workplace injury on receiving outpatient opioid prescriptions (*opioid prescriptions*, hereafter) from employer-sponsored private group health insurances (GHI) and to evaluate how long injured workers would continue receiving opioid prescriptions. The findings help us understand the impact of workplace injury on opioid prescriptions beyond the workers' compensation system.

METHOD

We used a difference-in-differences (DiD) method to examine the impact of workplace injury on receiving opioid prescriptions from GHI. In the absence of a randomized trial in which randomly selected workers are assigned to be injured, using quasi-experiment models such as DiD is the best alternative method for examining the impact of an injury by controlling the selection bias. We included noninjured workers as a control group and several variables as covariates.

Card and Krueger,[22] Abadie,[23] and Dimick and Ryan[24] provide further details on the DiD method, but the basic method can be presented as follows:

$$Y_{it} = \beta_0 + \beta_1 t_t + \beta_2 I_i + \beta_3 I_i \times t_t + \beta_j X_{ji} + \varepsilon_{it}$$

where Y_{it} is the outcome of interest (receiving opioid prescriptions) for individual i at study period t (t takes a value of zero for study periods before injury and 1 for study periods after injury); I is a binary treatment indicator (injury), which takes a value of 1 if individual i is injured and zero otherwise; X_j is a vector of j observed characteristics of individual i; and ε is the error term. All workers in our sample were observed in a pre-injury study period (t=0) and post-injury study period (t=1). The coefficient of the study period and injury status interaction variable, β_3, measures the effect of injury on the outcome of interest in study period 1 compared to in study period 0 and compared to noninjured workers in study period 1. This approach separates the effects of time invariant differences between the injured and noninjured workers and removes common time trends across the two groups on the outcome variables, leaving only the injury effect.[25] For each outcome variable, we report the P value of β_3, indicating whether we found a significant DiD for the analyzed indicator.

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One of the most critical assumptions of the DiD method is the parallel trend assumption. Violation of this assumption will lead to biased results.[23] This assumption requires the trend in the outcome variable for both treated and control groups to be the same in the absence of the intervention. In our specific case, this assumption requires the trend of opioid prescriptions for injured and noninjured workers to remain the same in the absence of an injury. Note that the test does not require the outcome variable to be the same during the pretreatment period. The approach removes biases in the post-intervention period comparisons between the injured and noninjured workers that could be the result of permanent differences between the 2 groups. It also removes biases from comparisons over time among the injured workers that could be the result of trends due to other causes of the outcome. Researchers examine the validity of this assumption by inspecting the pretreatment period growth rate in outcome variables.[26] In this study, we extended the preinjury study period from 60 days to 120 days before injury in order to more rigorously test the parallel trend assumption. See below for additional details.

We used univariate and multivariable regression analyses. More specifically, we used logistic regression to measure the outcome as a dummy variable (receipt of one or more opioid prescriptions) and negative binomial regression to measure the outcome as a count variable (number of opioid prescriptions). In all cases, we used random-effects regression models.

DATA AND MEASUREMENT OF VARIABLES

The source of data for this study was the MarketScan® databases for the years 2013 to 2015. MarketScan® is constructed and maintained by Truven Health (formerly known as Thomson Reuters) from over 250 medium and large employers and health plans throughout the United States.[27] The data are fully compliant to the Health Insurance Portability and Accountability Act (HIPAA), and no Institutional Review Board approval was necessary because individual patients were not identifiable from the data.[28]

In this study, we used the Commercial Claims and Encounters (CCAE) and the Health and Productivity Management (HPM) databases. The CCAE database includes GHI enrolment, outpatient, inpatient, drug, and facility files. The HPM database includes eligibility, absence, short-term disability, and workers' compensation files. We used the GHI enrolment and outpatient files of the CCAE and the workers' compensation files of the HPM database. From the workers' compensation and GHI enrolment files, we created a cohort of workers who were enrolled both in workers' compensation and in the annual-enrolment GHI from 2013 to 2015 (36 months). Workers who were not enrolled for the whole study period were excluded from the study cohort. All workers represented by the workers' compensation data were between the ages of 18 and 65 years, because most workers older than 65 years are not enrolled in GHI.

The intervention event was an incidence of workplace injury between January 1 and December 31, 2014. We used the MarketScan® workers' compensation file to identify injured workers. We considered 21,280 workers who filed workers' compensation claims to be injured and without missing information on covariates. Workers with an initial injury are more likely to experience a second injury.[29] This would make it difficult to establish a

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unique follow-up period for the first injury. Therefore, workers who were injured more than once in 2014 (n = 2,048) were excluded from the cohort. Exclusion of workers injured more than once in 2014 might also help to reduce reverse causality between injuries and receiving opioid prescriptions. The baseline distribution of variables between workers injured once and more than once is provided in the Appendix. We included in the study 19,232 workers who were injured only once in 2014 and without missing information for covariates discussed below. From the total of 757,492 workers in the data who were not injured from 2013 to 2015 and without missing information for covariates, we randomly selected 96,160 noninjured workers—5 times the number of injured workers—as a control group. Overall, the study included 115,392 (injured or control) workers.

The CCAE outpatient file has information on all types of drugs prescribed to each member, the amount of money paid to all providers who submitted claims for covered services, and the national drug code (NDC) for each prescribed drug. We used 13,269 NDCs listed by the Centers for Disease Control and Prevention (CDC)[30] and 2,453 additional NDCs listed in Cerner Multum's April 2018 content[31] to identify opioid prescriptions received by each member.

We identified 2 outcome variables: receiving one or more outpatient opioid prescriptions and total number of outpatient opioid prescriptions (*number of opioid prescriptions*, hereafter) from GHI within 60 days of the index date of injury. We derived these variables from the outpatient claim level GHI data, aggregated to the individual level, based on different study periods. Regarding the DiD modeling and estimating the likelihood of receiving opioid prescriptions, the main study periods were 60 days before and 60 days after the index date of injury. However, to measure the long-term consequence of workplace injury on receiving opioid prescriptions from GHI, we extended the before-injury study period to 360 days before the index date of injury (i.e., up to January 1, 2013), and the after-injury study period to 360 days after the index date of injury (i.e., up to December 31, 2015). All time periods were analyzed in 60-day intervals (i.e., 0 to 60 days, 61 to 120, 121 to 180, 181 to 240, 241 to 300, and 301 to 360).

Because there were no dates of injury for the noninjured workers, we randomly assigned an index date or a "pseudo injury date" to each of these workers that corresponded to the date of injury of injured workers. This means that every worker in the study cohort had an injury date: an actual injury date for injured workers and a pseudo injury date for noninjured workers. We examined the sensitivity of our results to this procedure by changing the random seed number. To control for some observed differences, we included the following covariates at the baseline date, January 1, 12014: sex; age in 5 categories (18 to 29, 30 to 44, 45 to 54, and 55 to 65 years); health insurance plan type (Preferred Provider Organization [PPO], Comprehensive, Health Maintenance Organization [HMO], Point of Service [POS], Consumer Directed Health Plan [CDHP], Exclusive provider organization [EPO] or High-Deductible Health Plan [HDHP]); industry (services, manufacturing: durable Goods, manufacturing: nondurable goods, transportation, communications and utilities, and others); hourly versus salaried compensation; union membership; and four regions (Northeast, North Central, South, and West). We also controlled for preinjury overall health status of workers because an injury might aggravate preinjury health conditions thereby influence the impact

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of injury on receiving opioids from the GHI. We used the Charlson comorbidity index (excluding age) to control for preexisting health conditions. The index was computed using both outpatient and inpatient records of each worker within one year before the index date of injury. See Table 1 for details.

For all estimates, we used the national weights provided by MarketScan®. The MarketScan® weights are estimated using data from the Medical Expenditure Panel Survey and reflect the national distribution of individuals with GHI.

RESULTS

Our study sample represents 83.7 million workers between the age of 18 and 65 years with GHI (Table 1). Of the total weighted sample, 2.6% were injured and filed workers' compensation claims. Overall, 6.29% and 6.37% of workers received opioid prescriptions within 60 days before and 60 days after the index date of injury, respectively, and the average number of opioid prescriptions was 0.13 in each period.

Before examining the impact of workplace injury on receiving opioid prescriptions from GHI, we established the validity of the DiD method. First, the composition of intervention and comparison groups was stable because we followed the same cohort of injured and noninjured workers before and after the index date of injury. Second, we tested the parallel trend assumption of the DiD method by comparing the preinjury opioid prescription trends (61 to 120 days and 1 to 60 days before injury) of injured and noninjured workers. Figures 1 and 2 show the results. For the preinjury study periods of 61 to 120 and 1 to 60 days, we observed parallel trends in both outcome variables between the injured and noninjured workers. These indicated that in the absence of injury, the differences in the outcome variables between injured and noninjured workers were constant over time.

Receiving Opioid Prescriptions from the GHI

Within 60 days before the index date of injury, 6.2% and 7.8% of noninjured and injured workers, respectively, received opioid prescriptions from GHI. However, within 60 days after the index date of injury, the percentage of noninjured workers who received opioid prescriptions declined to 6.1% (F-test = 2.35; $P = 0.1253$), while the percentage of injured workers who received opioid prescriptions increased to 17.9% (F-test = 578.69; $P < 0.001$). The DiD between the 2 cohorts of workers was 10.2% points (95% CI: 9.4 to 11.4; t-test = 379.81; $P < 0.00$) (Fig. 1).

In the multivariable analysis, we included baseline covariates (age, sex, Charlson comorbidity index, health insurance type, industry, compensation type, union membership, and region) and estimated a random-effects logistic regression model. Table 2 shows the results. The coefficient of the interaction term between injury and study period (where 1 to 60 days before injury = 0 and 0 to 60 days after injury = 1) was positive and statistically significant ($P < 0.001$). Controlling for receiving opioid prescriptions within 60 days before the index date of injury and other baseline covariates, we estimated that the odds for injured workers to receive opioid prescriptions from the GHI within 60 days from injury were 5.13 (95% CI: 4.64 to 5.66) times higher than for noninjured workers.

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Some of the coefficients of the control variables took the expected signs. As age increased, the estimated odds of receiving opioid prescriptions increased. The estimated odds for male workers to receive opioid prescriptions were 38% less than for female workers, controlling for other variables. A one-unit increase in the Charlson comorbidity index within a year before the index date of injury increased the estimated odds of receiving opioid prescriptions from the GHI by 50%, controlling for other covariates. The estimated odds of receiving opioid prescriptions were 29% (95% CI: 1.11 to 1.50) and 27% (95% CI: 1.15 to 1.41) higher for workers with a comprehensive or HMO plan than for workers with a PPO plan (the reference category), respectively. Workers with CDHP, HDHP, EPO, or POS plans had lower estimated odds of receiving opioid prescriptions than workers with a PPO plan. Compared to workers in the service industry, workers in other industries had higher estimated odds of receiving opioid prescriptions. The estimated odds for hourly workers to receive opioid prescriptions was 2 times (95% CI: 1.87 to 2.16) higher than for salaried workers. Unionized workers had higher estimated odds of receiving opioid prescriptions (HR: 1.05; 95% CI: 1.00 to 1.17). Workers in the North Central, South, and West regions had higher estimated odds of receiving opioid prescriptions than workers in the Northeast, the reference region.

Number of Opioid Prescriptions Received from GHI

Within 60 days before the index date of injury, the average number of opioid prescriptions received from GHI was 0.13 for noninjured workers; it slightly declined to 0.12 within 60 days from the index date of injury (F-test=4.95; P<0.05). For injured workers, the average number of opioid prescriptions received increased from 0.17 within 60 days before injury to 0.36 within 60 days from injury (F-test=150.40; P<0.001). The DiD between the 2 cohorts of workers was 0.20 and was statistically significant (95% CI: 0.18 to 0.22; t-test=54.07; P<0.001) (Fig. 2).

In the multivariable analysis, we estimated a random-effects negative binomial regression model. Table 3 presents the results. The incidence rate ratio (IRR) and the 95% confidence intervals are in the second and third columns of the table. Injured workers received 2.62 (95% CI: 2.46 to 2.79) times more opioid prescriptions from GHI within 60 days of injury than noninjured workers, controlling for preinjury number of opioid prescriptions and baseline covariates. The coefficients of the control variables were similar to the results presented in Table 2.

How Long did Injured Workers Receive Opioid Prescriptions from GHI?

We followed injured and noninjured workers for 360 days before and after the index date of injury to determine the length of time they received opioid prescriptions without interruption from GHI. The DiD results for each 60-day period following the index date of injury are presented in Figure 3. The percentage of injured workers who received opioid prescriptions declined after the first 60 days following the date of injury. However, there was statistically significant post-index date of injury differences in percentage of workers in the 2 cohorts who received opioid prescriptions continuously for up to 180 days. The descriptive analysis showed that 2.2% noninjured and 3.2% injured workers received opioid prescriptions continuously for 180 days before the index date of injury. After the index date of injury, the

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same percent of noninjured (2.2%) and 3.6% of injured workers received opioid prescriptions continuously for 180 days. This shows that workplace injury increased the percentage of injured workers who received opioid prescriptions from the GHI continuously for 180 days by 0.4% points [(3.6–3.2)–(2.2–2.2)] and the difference was statistically significant (t=2.14, P<0.05). After controlling for baseline covariates, the estimated odds for injured workers to receive opioid prescriptions continuously for 180 days after the date of injury were 50% [95% CI: 1.19 to 1.91] higher than for noninjured workers. Between 181 and 360 days from the index date of injury, there were still differences between the 2 cohorts, but the differences were not statistically significant.

DISCUSSION

The opioid crisis has become a public health crisis in the United States. Researchers have examined the impact of workplace injury on opioid prescriptions from the workers' compensation system but have known little about its impact on opioid prescriptions from GHI. One would expect injured workers to claim more opioids from GHI than noninjured workers. In this study, using a DiD method, we quantified the impact of workplace injury on receiving opioid prescriptions from GHI and for how long injured workers would receive opioid prescriptions from GHI after injury.

The results showed that the percentage of injured workers who received opioid prescriptions from GHI increased by 131% within 60 days from the date of injury, compared to the percentage noted within 60 days before the date of injury (from 7.76% to 17.89%). Compared to the percentage of noninjured workers, the percentage of injured workers who received opioid prescriptions within 60 days from the index date of injury also increased by 195% (17.89% vs 6.06%). The DiD results showed that workplace injury increased the percent of injured workers who received opioid prescriptions by 10.3% points within 60 days from the index date of injury. In the regression analysis, controlling for baseline variables (demographic, comorbidity, industry, health insurance type, union status, compensation type, and region), we noted that the estimated odds for injured workers to receive opioid prescriptions from GHI within 60 days from the index date of injury were more than 5 times higher than for noninjured workers. We observed similar results for the number of opioid prescriptions. For injured workers, the average number of opioid prescriptions increased by 112% (from 0.17 to 0.36) over the preinjury mean and increased by 193% (0.36 vs 0.12) over the mean for noninjured workers within 60 days from the index date of injury. The random-effects negative binomial regression results confirmed these descriptive results. These results are consistent with a causal link between workplace injury and receiving opioid prescriptions from GHI, thereby highlighting the importance of including data from GHI providers to more fully understand the extent of prescription opioid use following workplace injury. GHI providers are a source of opioids prescriptions and may be useful to include in workplace injury surveillance systems.

Our analysis also showed that workplace injury is a risk factor for long-term prescription opioid use. The weighted DiD results showed that nearly 8,760 workers with GHI and injured in 2014 (0.004 × 2.19 million workers inured in 2014) received opioid prescriptions from the GHI for 180 days continuously after the date of injury. A recent study by Asfaw

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and Boden[32] found that workplace injuries are risk factors for opioid misuse, overdose, or use disorder. Their results showed that the hazard of opioid-related morbidity for lost-time injured workers was 2.91 (95% CI 1.75 to 4.84) times that of matched noninjured workers. On the other hand, Sears et al[33] showed that injured workers hospitalized with prescription opioid overdose were more likely than other hospitalized inpatients to have a low back disorder diagnosis, but less likely to have an opioid dependence/abuse or cancer diagnosis, or a fatal outcome. More research is needed to understand the role of workplace injury in the opioid crisis and explore the mechanisms of how workplace injury might lead to adverse prescription opioid related outcomes. Together with data from workers compensation systems, GHI data can provide a more complete perspective on long-term prescription opioid use and potential impact of workplace injuries on opioid misuse, overdose, and use disorder.

We observed statistically significant differences in the preinjury prevalence of opioid prescriptions between the 2 cohorts. Whereas 6.2% of noninjured workers received opioid prescriptions from GHI in the 60-day period before the index date of injury, 7.8% of injured workers received opioid prescriptions from GHI during the same period (F-test=31.33; P<0.001). This result may have two implications. First, opioid prescriptions can be one of the risk factors for workplace injuries. Using data from Quebec, Canada, Buckeridge et al[34] showed that opioid prescriptions, particularly codeine combinations, were associated with the risk of injury for older adults. Söderberg et al[35] found that a new prescription of any opioid was associated with risk of injuries related to falls from ‘another, high level’ (OR: 5.33; 95% CI: 3.99 to 7.10). Similar results were reported by Franklin et al[36] and White et al.[37] Second, injured workers might have preexisting health conditions that may increase their chance of injury. As shown in Table 1, the average Charlson comorbidity index for noninjured workers was 0.35 [95% CI: 0.34 to 0.35] compared to 0.41 [95% CI: 0.41 to 0.42] for injured workers and the difference was statistically significant (F-test: 692, P<0.001). We also observed statistically significant differences across health plan types and regions. Future research might examine why workers with comprehensive health insurance and HMO plans were more likely to receive opioid prescriptions than workers with any other health insurance plan types. It is also worth investigating why the Northeast region had the lowest percent of workers who received opioid prescriptions in comparison with workers in all other regions of the country. Similar patterns were reported by Kelly et al[38] in prevalence of opioid use (prescription and nonprescription) in the US adult population and Unicka and Ciccaronein[39] in prescription opioid overdose hospitalization rates.

This rigorous approach and the reliability of the data make a compelling case that workplace injury had a significant impact on receiving opioid prescriptions from GHI. At face value, our findings are not surprising: one would expect injured workers to receive more opioid prescriptions than noninjured workers. However, the key finding of this study is that the impact of workplace injury on receiving opioid prescriptions goes beyond the workers’ compensation system, as we observe results consistent with a causal link between workplace injury and opioid prescriptions covered by GHI plans. Therefore, studies that use only workers’ compensation medical claim data might significantly underestimate the magnitude of impact of workplace injury on prescription opioid use. Previous research showed that plans other than workers’ compensation, such as GHI, out-of-pocket payments, Medicare,

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and Medicaid, covered a significant portion of the cost of workplace injuries and illnesses. Leigh et al[40] showed that in 2007 Medicare and Medicaid covered $14.22 billion of the medical costs of workplace injuries and illnesses not covered by the workers' compensation system. Asfaw and Souza[41] showed that injured workers were more likely than noninjured workers to be treated for depression after a workplace injury, and the costs were often paid by GHI.

We must interpret the results of this study in the context of limitations imposed by the data. First, the MarketScan® CCEA and HPM data do not include information on race or ethnicity, education, and income, which are factors that have often been used by researchers to help understand and explain the variation in outpatient opioid prescriptions;[42] opioid use, misuse, overdose, or use disorder and workplace injury.[43] The data also do not have information on Morphine Milligram Equivalents (MME) or on the necessary variables that could be used to compute MME. Second, if workers leave jobs because of severe injury or any other reasons, they might not be enrolled in the GHI plan for a full year and therefore would be dropped from the analysis. This might underestimate the effect of injury on prescription opioid use if severely injured workers are more likely to lose their jobs. Third, in the MarketScan® data, workplace injuries are identified only when workers' compensation claims are filed. However, studies showed that more than half of workers with workplace injuries and illnesses do not file workers' compensation claims, particularly those with private health insurances.[11,12] All workers in our sample had GHI and therefore were less likely to file for workers' compensation, even if they had suffered workplace injuries or illnesses. This might underestimate the impact of injury on prescription opioid use, because some of the control groups might have unreported workplace injury. Finally, the exclusion of workers injured more than once in 2014 might bias the impact of injury on opioid prescriptions toward zero because opioid use is a risk factors for workplace injury.

The study has several strengths. First, we used a large dataset that represents the working population in the country with GHI and contains accurate information about injury, service dates, and type of services obtained from GHI. Second, we used a DiD method that allowed us to control for trends among the rest of the noninjured workers and other factors that could affect receipt of opioid prescriptions from GHI during the preinjury and postinjury study periods.

CONCLUSION

To our knowledge, this is the first study that empirically examined the impact of workplace injury on receiving opioid prescriptions from GHI using a robust quasi-experimental framework. Among a cohort of workers with GHI, there were statistically significant differences in the percentage of workers who received opioid prescriptions and average number of opioid prescriptions received from the GHI in comparisons of injured and noninjured workers within the 60-day study period. Workplace injury could be a risk factor for long-term opioid prescriptions and increase the potential for opioid misuse, overdose, or use disorder. Our results showed that injured workers had increased estimated odds of receiving opioid prescriptions from the GHI for at least 180 days as compared to noninjured workers. Reducing workplace injuries can have a significant impact on decreasing the use of

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outpatient opioid prescriptions. Studies that use only workers' compensation medical claim data likely significantly underestimate the impact of workplace injuries on opioid prescriptions. Future studies should consider GHI and other sources of payment in order to more accurately measure the impact of workplace injury on prescription opioid use.

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Appendix

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Appendix

Distribution of variables between workers injured only once and more than once at the baseline, 2014

Variable	Injured once	Injured more than once
Number of total sampled workers	19,232	2048
Sex: Male (%)	47.2	44.0
Age categories in years (column sum %)		
18–29	10.1	11.5
30–44	39.5	38.6
45–54	30.6	31.3
55–65	19.7	18.6
Health insurance type (column sum %)		
PPO	54.7	48.7
Comprehensive	2.9	2.9
HMO	9.4	9.7
POS	11.7	21.1
CDHP	18.6	16.4
HDHP or EPO	2.7	1.4
Industry (%)		
Services	27.4	35.3
Manufacturing: durable goods	40.8	38.4
Manufacturing: nondurable goods	14.2	10.4
Transportation, communications, and utilities	17.2	15.7
Others	0.4	0.1
Compensation type (1 if hourly & 0 otherwise) (%)	86.2	95.1
Union status (1 if member of a union & 0 otherwise) (%)	29.9	34.7
Region		
Northeast	21.1	30.2
North Central	20.8	19.0
South	32.7	24.9
West	25.4	25.9

CDHP, Consumer Directed Health Plan; HDHP or EPO, High-Deductible Health Plan or Exclusive Provider Organization; HMO, Health Maintenance Organization; POS, Point of Service; PPO Preferred Provider Organization.

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Clinical significance:

Workplace injury increased the percentage of workers who received opioid prescriptions from group health insurance and could be a risk factor for receiving opioids for both short and longer terms. Studies that use only workers' compensation data likely underestimate the impact of workplace injuries on opioid prescriptions.

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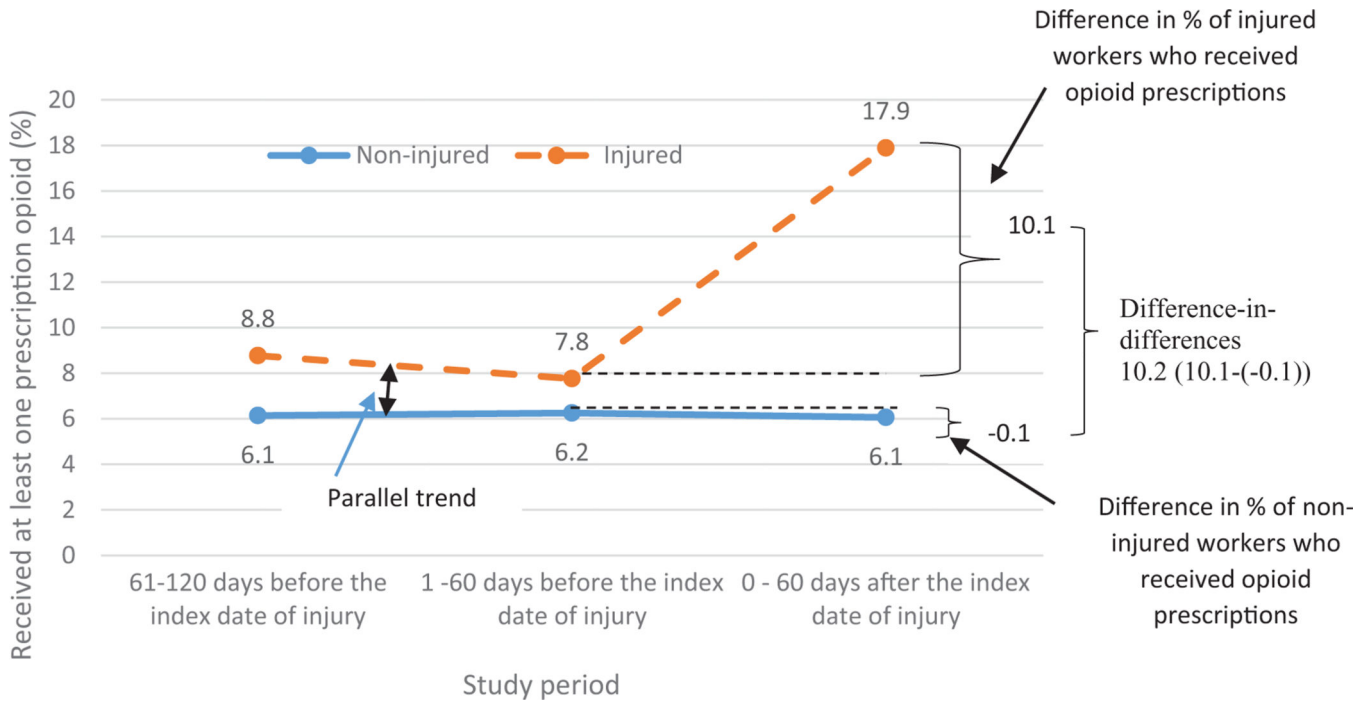

FIGURE 1.

Impact of workplace injury on receiving one or more outpatient opioid prescriptions from group health insurance (GHI).

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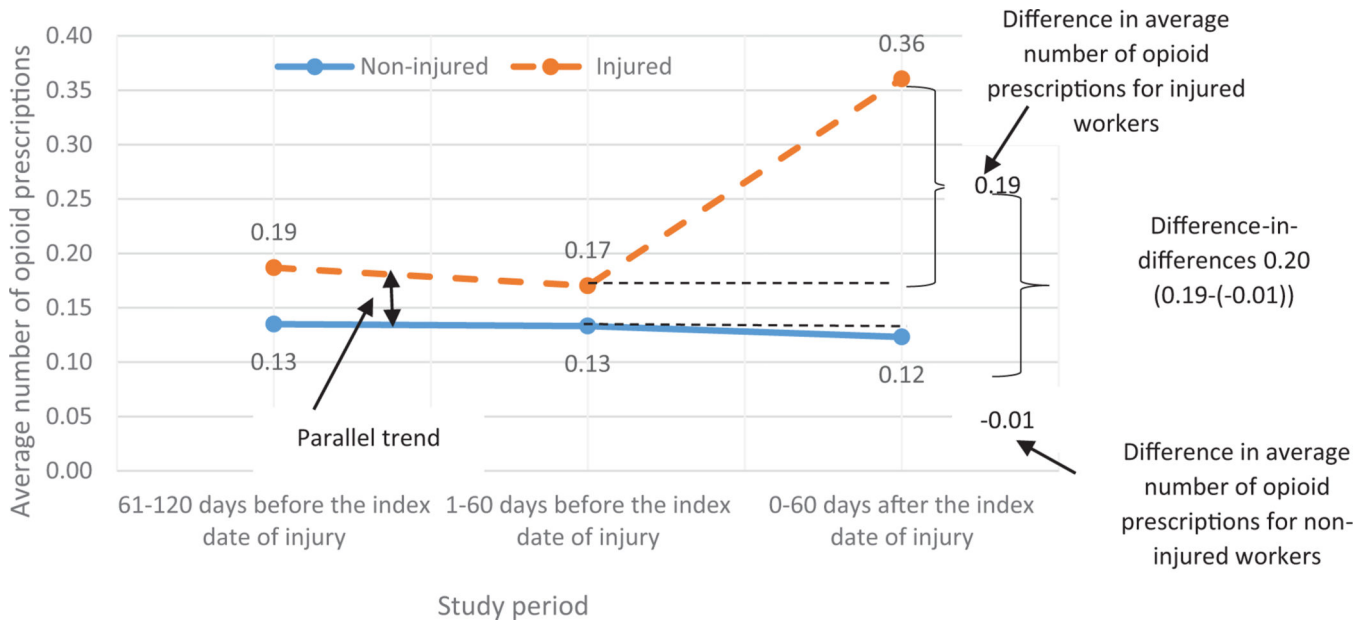

FIGURE 2.

Impact of workplace injury on average number of opioid prescriptions received from GHI.

GHI, group health insurance.

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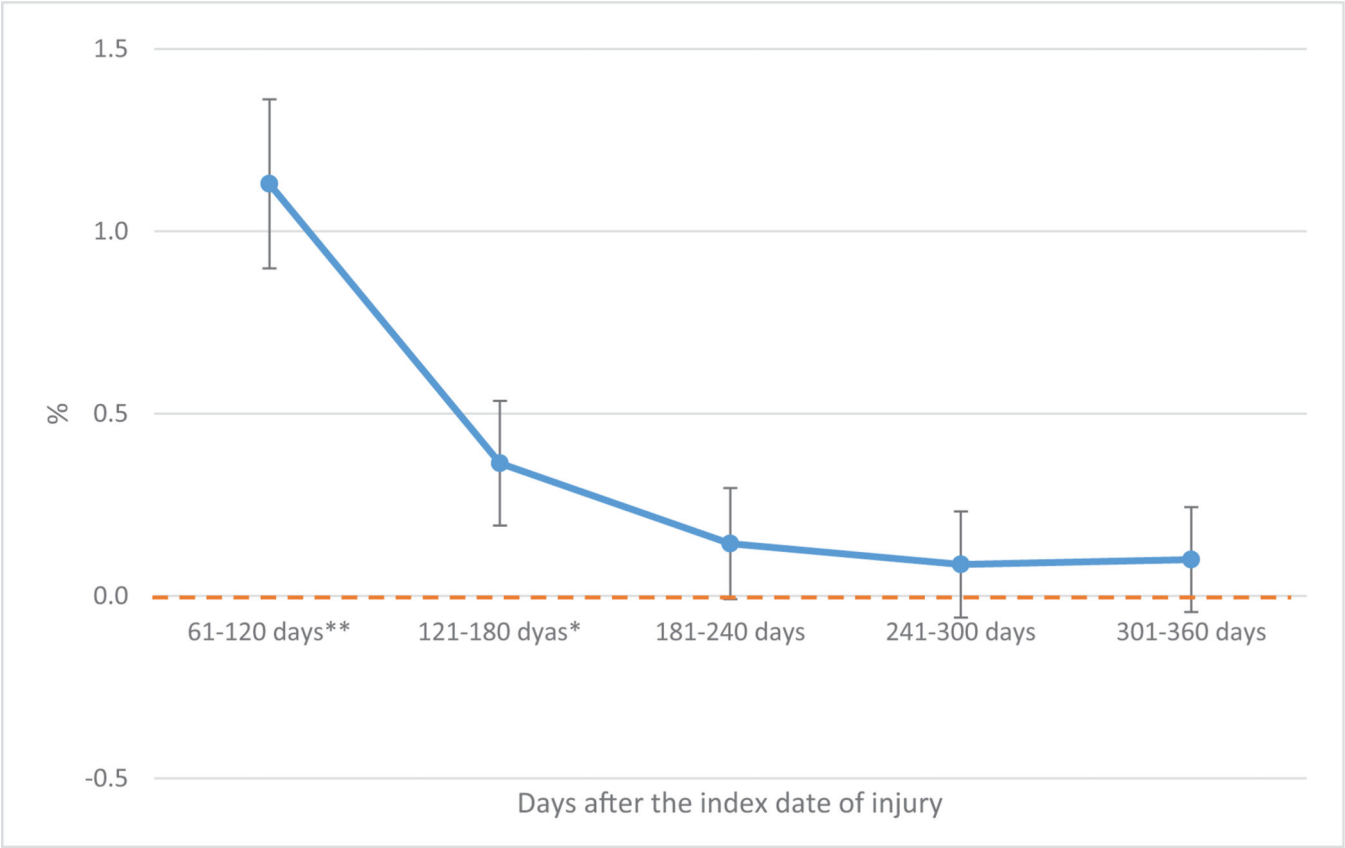

FIGURE 3.

Impact of workplace injury on receiving opioid prescriptions from GHI up to a year after the index date of injury: Difference-in-differences (DiD) results. GHI, group health insurance. Note. The vertical lines are 95% confidence intervals. [a]$P < 0.01$; [b]$P < 0.05$.

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TABLE 1.

Distribution of Variables at the Baseline, 2014

Variable	Noninjured	Injured	Total
Number of weighted observations	81,483,240	2,191,298	83,674,538
Percent of workers	97.4	2.6	100
Number of sampled workers	96,160 *	19,232	115,476
Male (%)	53.7	47.1	53.6
Age categories in years (column sum %)			
18–29	10.7	10.1	10.6
30–44	42.2	39.5	42.1
45–54	29.8	30.6	29.8
55–65	17.4	19.7	17.5
Charlson comorbidity index (excluding age) (mean)	0.34	0.41	0.35
Health insurance type (column sum %)			
PPO	55.5	54.7	55.5
Comprehensive	2.4	2.9	2.4
HMO	10.2	9.4	10.2
POS	5.8	11.7	5.8
CDHP	21.0	18.6	21.0
HDHP or EPO	5.1	2.7	5.1
Industry (%)			
Services	18.9	27.4	19.1
Manufacturing: durable goods	48.8	40.8	48.6
Manufacturing: nondurable goods	12.5	14.2	12.5
Transportation, communications, and utilities	16.9	17.2	16.9
Others †	2.9	0.4	2.8
Compensation type (1 if hourly & 0 otherwise) (%)	55.2	86.2	56.0
Union status (1 if member of a union & 0 otherwise) (%)	26.8	29.9	26.9
Region			
Northeast	19.0	21.09	19.0
North Central	22.5	20.81	22.5

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Variable	Noninjured	Injured	Total
South	36.0	32.71	35.9
West	22.6	25.4	22.6

CDHP, Consumer Directed Health Plan; HDHP or EPO, High-Deductible Health Plan or Exclusive Provider Organization; HMO, Health Maintenance Organization; POS, Point of Service; PPO, Preferred Provider Organization.

*Note that 5 times the number of injured workers were randomly selected from 759,942 noninjured workers in the dataset.

†Others include wholesale; finance, insurance, and real estate; and oil and gas extraction and mining industries. The total share of these industries from our sample is only 3.2%

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TABLE 2.

Impact of Workplace Injury on Receiving Outpatient Opioid Prescriptions from GHI within 60 Days after Injury: Random-Effects Logistic Regression

Variable	OR	95% CI
Injury (injured = 1)	1.23	1.12–1.36
Time (time = 1 for 0–60 days after injury)	0.93	0.89–0.98
Injury × Time	5.1	4.64–5.66
Male	0.63	0.59–0.68
Age category		
18–29 (reference)		
30–44	1.58	1.139–1.80
45–54	2.13	1.88–2.42
55–65	2.26	1.98–2.58
Charlson comorbidity index	1.50	1.47–1.54
Health insurance type		
PPO (reference)		
Comprehensive	1.29	1.11–1.50
HMO	1.27	1.15–1.41
POS	0.87	0.75–1.00
CDHP	0.70	0.62–0.78
HDHP or EPO	0.71	0.60–0.83
Industry		
Services (reference)		
Manufacturing: durable goods	1.68	1.52–1.86
Manufacturing: nondurable goods	1.11	0.99–1.25
Transportation, communications, and utilities	1.36	1.18–1.56
Others	1.33	1.04–1.71
Compensation type (1 if hourly & 0 otherwise)	2.01	1.87–2.16
Union status (1 if member of a union & 0 otherwise)	1.08	1.00–1.17
Region		
Northeast (reference)		
North Central	2.02	1.81–2.27
South	2.07	1.86–2.29
West	1.76	1.57–1.98
Number of observations	221,000	
Number of groups	110,500	
Wald $\chi^2(24)$	3955.87	
Prob > χ^2	0	

CDHP, Consumer Directed Health Plan; CI, confidence intervals; HDHP or EPO, High-Deductible Health Plan or Exclusive Provider Organization; HMO, Health Maintenance Organization; OR, odds ratio; POS, Point of Service; PPO, Preferred Provider Organization.

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TABLE 3.

Impact of Workplace Injury on Number of Outpatient Opioid Prescriptions Received from GHI within 60 days after Injury: Random-Effects Negative Binomial Regression

Variable	IRR	95% CI
Injury (injured = 1)	1.17	1.10–1.26
Time (time = 1 for 0–60 days after injury)	0.95	0.91–0.98
Injury × Time	2.62	2.46–2.79
Male	0.74	0.70–0.77
Age category		
18–29 (reference)		
30–44	1.49	1.36–1.64
45–54	1.88	1.71–2.07
55–65	1.89	1.72–2.07
Charlson comorbidity index	1.34	1.31–1.37
Health insurance type		
PPO (reference)		
Comprehensive	1.18	1.09–1.32
HMO	1.24	1.15–1.34
POS	0.89	0.80–0.99
CDHP	0.76	0.70–0.83
HDHP or EPO	0.72	0.65–0.81
Industry		
Services (reference)		
Manufacturing: durable goods	1.47	1.37–1.58
Manufacturing: nondurable goods	1.11	1.02–1.22
Transportation, communications, and utilities	1.26	1.14–1.40
Other	1.23	1.02–1.47
Compensation type (1 if hourly & 0 otherwise)	1.73	1.65–1.83
Union status (1 if member of a union & 0 otherwise)	1.06	1.00–1.12
Region		
Northeast (reference)		
North Central	1.65	1.52–1.79
South	1.65	1.53–1.78
West	1.51	1.38–1.64
Number of observations	221,136	
Number of groups	110,568	
Wald $\chi^2(24)$	4279.64	
Prob > χ^2	0.0001	

CDHP, Consumer Directed Health Plan; CI, confidence intervals; HDHP or EPO, High-Deductible Health Plan or Exclusive Provider Organization; HMO, Health Maintenance Organization; IRR, incidence rate ratio; POS, Point of Service; PPO, Preferred Provider Organization.