Feature

Uninsured Workers Have More Severe Hospitalizations: Examining the Texas Workers' Compensation System, 2012

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Abstract

Texas' unique elective system of workers' compensation (WC) coverage is being discussed widely in the United States as a possible model to be adopted by other states. Texas is the only state that does not mandate that employers provide state-certified WC insurance. Oklahoma passed legislation for a similar system in 2013, but it was declared unconstitutional by the Oklahoma Supreme Court in 2016. This study examined 9523 work-related hospitalizations that occurred in Texas in 2012 using Texas Department of State Health Services data. We sought to examine work-related injury characteristics by insurance source. An unexpected finding was that among those with WC, 44.6% of the hospitalizations were not recorded as work related by hospital staff. These unrecorded cases had 1.9 (1.6–2.2) times higher prevalence of a severe risk of mortality compared to WC cases that were recorded as work related. Uninsured and publicly insured workers also had a higher prevalence of severe mortality risk. The hospital charges for one year were $615.2 million, including at least $102.8 million paid by sources other than WC, and with $29.6 million that was paid for by injured workers or by taxpayers. There is an urgent need for more research to examine how the Texas WC system affects injured workers.

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Introduction

Texas is the only state in the United States that has never required employers to purchase workers' compensation (WC) coverage.[1] This fact has resulted in a three-tiered system of benefits for workers who are injured in Texas: a traditional WC insurance plan, an alternative employer-provided insurance plan, or no coverage at all.[2] Despite high workplace fatality rates and Texas' unique WC system, no studies have been conducted to date that examine how injured workers in these three tiers differ in terms of demographic characteristics, injury severity, and type of injury.

The purpose of this study was to examine how workers in this three-tiered payment system differ in terms of worker demographic characteristics, as well as in the severity of their work-related injury or illness. We utilized inpatient hospitalization data from the Texas Department of State Health Services, which is one of the most comprehensive sources of information about work-related injuries or illness requiring hospitalization that is publicly available.[3] We begin by providing information about the historical context of Texas' WC system in light of current political trends occurring across the United States around changes to state WC requirements.

WC in Texas

In 1855, Georgia was the first state to pass an employer liability law, which required employers to pay for the cost of an injured worker's medical care if the employer was found to be negligent.[4] These liability laws set the stage for statewide WC laws in the early 1900s, which were passed at the behest of employers, insurance companies, and the labor force.[5] Most states originally had an elective system that allowed employers to choose to participate until federal legislation legalized mandatory WC coverage in 1917, but Texas has been the only state to consistently maintain the elective nature of its WC system.[6,7] Employers of any size in Texas today can choose to offer an alternative plan that may cover medical costs and/or indemnity benefits instead of the standard WC plan, or they can choose to completely forego any form of coverage.[5] Employers who choose to purchase alternative plans or no plan at all are both referred to as non-subscribers.[8] This system creates three tiers of coverage for workers in Texas: (1) standard WC coverage (including medical and indemnity benefits), (2) alternative employer-provided plans, which may or may not provide indemnity benefits, and (3) no coverage of any kind (see Table 1).

In 2013, Oklahoma followed Texas' example by allowing employers of any size to opt out of providing WC.[9] However, Oklahoma requires that employers

Table 1. Overview of Texas' Three-Tier Workers' Compensation System.

Payer type	Percent of Texas work force	Employer status in Texas workers' compensation system	Insurance carriers	Provides medical benefits?	Provides indemnity benefits?	Provides death benefits?
Standard workers' compensation insurance	80	Subscriber	Regulated insurance carriers that are licensed or certified by the state	Yes	Yes	Yes
Alternative insurance plan	15	Non-subscriber*	Private commercial insurance carriers not certified by the state	Maybe; may cover an employer-selected set of injuries or illnesses	Maybe	Maybe
No workers' compensation insurance	5	Non-subscriber*	No insurance or worker self-pay OR public assistance programs (emergency medicaid, medicare, county indigent program)	Yes, but only if covered by public assistance source	No	No

*Non-subscriber indicates that a company has not subscribed to the Texas Workers' Compensation system.

must provide an alternative plan that offers the same or better benefits as the traditional WC plan; no such requirement exists in Texas. Such opt-out plans have been under increasing scrutiny, and in September 2016, the Oklahoma Supreme Court declared the opt-out system unconstitutional.[10] The court said that the policy "1) constituted an unconstitutional special law; 2) denied equal protection to Oklahoma's injured workers; and 3) denied injured workers the constitutionally protected right of access to courts."[10] Other states, including Tennessee and South Carolina, were considering opt-out legislation, but no other opt-out laws have been passed to date.[11]

According to the Texas Department of Insurance, 67% of Texas employers offer WC insurance.[8] Larger companies are more likely to offer WC insurance, so approximately 80% of the Texas work force has WC coverage, and 15% has an employer that offers an alternative insurance plan for work-related injury and illness events and 5% have no insurance coverage.[8] The 5% of workers with no coverage equates to approximately six hundred fifty thousand workers.

No regulations exist in Texas about what alternative plans must provide or what types of injuries or illnesses are covered under such plans.[5] Very little is known about the types of benefits received by workers who are injured and are covered under alternative employer insurance plans (or companies that are "non-subscribers"). Research conducted by Morantz[12] found that among 15 large non-subscribing companies in Texas, their plans generally excluded coverage for non-traumatic injuries and illnesses.

Data from the Texas Department of Insurance indicate that non-subscribers may also be less likely to provide general health insurance benefits to their workers. In 2012, 60% of employers who subscribed to WC also provided health insurance for their employees, while only 30% of non-subscribers provided general health insurance.[8] This situation may further limit injured employees' access to health care. Rates of non-subscription to the Texas WC program are highest among small businesses, with 41% of employers with one to four employees being non-subscribers relative to 17% of employers with at least five hundred workers.[8] Data from the Bureau of Labor Statistics and from the Occupational Safety and Health Administration suggest that small businesses have a disproportionate share of work-related injuries, so it is possible that workers most at risk of being injured are more likely to lack WC insurance coverage.[13] Non-subscription rates also vary greatly by industry. Health and educational services, as well as the arts, entertainment, and food service industries have some of the highest non-subscriptions rates with approximately 40% of employers choosing to opt out of the Texas WC system.[8] Non-subscription rates are lowest in mining, agriculture, utilities, and construction but approximately 20% of employers in these industries also opt out.

The three tiers of insurance coverage are distinguished by legal means available to workers for holding employers responsible for costs associated with work-related injuries. Injured workers employed by an entity that has opted-in

to the Texas WC system cannot sue their direct employer for negligence, but those who are employed by a non-subscribing company may file suit against that employer in the case of an injury.[5] In theory, this characteristic should discourage employers from opting out of WC, but these non-subscribing companies are often shielded against such negligence liability, given that the injured employee must be able to find a lawyer willing to take an injured worker's case. Recent research has found that large non-subscribing companies rarely face large legal costs associated with lawsuits from injured workers.[12] Finding an attorney is challenging for workers for multiple reasons, including the changes in Texas legislation enacted in 1991 that greatly reduced the financial reimbursement allowed for attorneys who defend injured claimants.[14] This change dramatically reduced the number of law firms that provide WC-type services in Texas.[15] Currently, there are approximately thirty firms statewide that offer these services relative to hundreds that existed prior to 1991.[15] When an injured worker is able to obtain an attorney, the legal process takes an average of three to five years in Texas.[16] Additionally, 14% of non-subscribers who offered an alternative plan to workers in 2014 required their employees to sign arbitration agreements in which they agreed to settle potential future work-related injury lawsuits through employer-selected arbitrators, limiting their ability to take legal action if needed.[8] This fact is further compounded by the fact that non-subscribers in Texas face no regulations barring them from taking retaliatory actions against an injured employee who files a medical claim through the employer's alternative plan.[5, 17] This loophole, in conjunction with the lack of available attorneys and the legal burdens placed on the employee, greatly limit negligence liability as a viable form of accountability for non-subscribing Texas companies.

Workplace Injuries in Texas

Texas' elevated workplace fatality rates and the high number of workplace injuries and illnesses make the issues within Texas' WC system even more acute. From 2012 to 2014, an average of 525 workers died annually from fatal injuries in Texas, a number greater than any other state.[18] The number of workplace fatalities in Texas remains elevated after accounting for the size of the work force. An average of 4.6 workers were killed in Texas for every one hundred thousand full-time workers from 2012 to 2014, a rate 2.1 times higher than California's fatality rate.[18] This difference is not entirely due to a greater proportion of dangerous industries being present in Texas, as this disparity is also seen within industries. In agriculture and construction, two of the nation's most dangerous industries, Texas' average fatality rates were 1.5 times higher and 2.2 times higher than California's during 2012 to 2014, respectively.[18] These findings suggest that workers in Texas experience more dangerous working conditions compared to workers in other large states, and WC coverage is critical for the thousands of Texans who are injured on work sites every year.

Methods

This cross-sectional study examined work-related injuries and illnesses resulting in a hospitalization over a twelve-month period (January 1 through December 31, 2012) among Texas workers aged eighteen to seventy-four years. Texas inpatient hospital data, which are publicly available from the Texas Department of State Health Services (TX-DSHS), were used for these analyses.[3] All hospitals in Texas located in counties with thirty-five thousand or more residents are required to submit a standard set of variables on all inpatient hospitalizations on a quarterly basis to TX-DSHS. According to the 2010 Census, 93% of Texas residents resided in counties with thirty-five thousand or more residents, so this data set includes the vast majority of Texas hospitals.[19] TX-DSHS reviews all data for completeness, and hospitals are provided with an opportunity to submit corrections and notes with their submissions quarterly. According to TX-DSHS, 593 hospitals in Texas submitted data for more than 2.7 million inpatient hospitalizations in 2012.

This data set was restricted to hospital claims considered to be work-related among patients aged eighteen to seventy-four years. Each hospitalization could be recorded as work-related three different ways: (1) WC was recorded as the payer, (2) the injury was recorded as work related, or (3) the illness was recorded as work related. In order for either the injury or the illness to be recorded as work related, the patient would have to disclose this information, and the clinician or administrator would have to record it as such. It was possible for a case to have WC indicated as the payer for the hospitalization but lack the code indicating that it was a work-related illness or injury. Personal communication with TX-DSHS staff indicated that each hospital collects the work-relatedness code in different ways: in some hospitals, it is recorded by the care provider, in others it may be by intake staff, and in others it may be done by an administrator. Because billing departments collect information about the payer and do not also record the work-relatedness code, discrepancies between the payer source and the work-relatedness code were possible.

To examine the three-tiered system of WC coverage, an expected payer source variable was constructed which included those with a standard WC insurance plan, those with an alternative insurance plan, and those with no insurance. Upon construction of the expected payer source variable (i.e., standard WC insurance, alternative insurance, or no insurance), it was noted that a large proportion of hospital claims ($n = 3648$; 44.6%) with ''workers' compensation'' as the payer source lacked a code indicating that the injury or illness was work related, so we split the group of patients with a standard WC insurance plan into two groups—those who recorded that the injury or illness was work related and those that did not. The variable of expected payer source was expanded to include: (1) non-insured (payer source of medicaid, medicare, self-pay,

or a county indigent health program), and their condition was recorded as work related; (2) standard WC with the code of being work related; (3) WC without the code of being work related; and (4) alternative non-subscriber plans or worker's private insurance with the code of being work related. Thus we created three original groups based on the expected payer of the hospitalization and split the WC group based on whether or not the hospitalization was recorded as work related. There was no way to capture uninsured or privately insured cases that were not recorded as work related in this data set.

The data set included variables pertaining to workers' demographic characteristics, including gender, age, race, and ethnicity (Hispanic or non-Hispanic). The age variable was provided in categories of age per five-year increments, with the exception of those with HIV or substance abuse positive status ($n = 483$, 5.1%), in which their age was categorized as either eighteen to forty-four years or forty-five to seventy-four years to protect patient anonymity. For purposes of including the HIV or substance abuse participants, we created an overall age variable that reflected these cut-points. Only limited race data were available. For purposes of ensuring patient anonymity, race information was suppressed when a patient resided in the same zip code with ten or fewer patients.

Worker hospitalization characteristics included measures of (1) risk of mortality, (2) risk of physical decompensation, (3) external causes of hospitalization per e-codes, (4) type of hospital admission, (5) total monetary costs for the hospitalization, and (6) fatalities after the hospital admission. The risk of mortality and physical decompensation were determined by the 3M All Patient Refined Diagnosis Related Groups algorithm, which assigns a 4-point severity ranking (1 = lowest to 4 = highest) to each hospitalization based on its combination of ICD-9-CM codes and the patient's age.[20] All patients received scores for both the mortality risk and physical decompensation risk variables in the original Department of State Health Services data set, and we dichotomized the severity scores as severe cases (Scores 3 and 4) and less severe cases (Scores 1 and 2). The risk of mortality was defined as the likelihood of the patient dying, based on their age and the combination of diagnoses given during the hospitalization.[20,21] The risk of physical decompensation was defined as the likelihood of decompensation, also based on the patient's age and combination of diagnoses.[20] Physical decompensation occurs when organ systems fail because they are no longer able to maintain their normal function due to disease.[21,22] Both of these scores could receive a score of 1, 2, 3, or 4, with 1 being the lowest risk and 4 being the highest risk. The type of admission was classified as (1) emergency, (2) trauma, (3) urgent, or (4) elective. The type of admission variable was dichotomized as emergent or trauma versus urgent or elective. External causes of the hospitalizations were recorded based on the International Classification of Diseases, Ninth Revision (ICD-9-CM) codes.[23]

Data Analysis

Descriptive statistics were employed to describe the demographic and hospital admissions characteristics of the study population. Differences between groups were examined using Pearson's chi-squared test.[24] We then analyzed within demographic and hospitalization characteristic strata in each expected payer source. For example, for patient ethnicity, we examined the frequency and 95% confidence intervals of how Hispanic workers were covered by these four payment sources separately from non-Hispanics workers. For a qualitative assessment of the four expected payment sources, we also ranked the top five external cause codes for hospitalizations within each group.

We sought to examine if the risk of more severe work-related hospitalizations was associated with the expected payer source or with the age or ethnicity of the patient. Three separate descriptive and multivariate analyses were conducted for the outcomes of (1) risk of mortality, (2) risk of physical decompensation, and (3) hospital admission type. Using log-binomial regression, crude and adjusted prevalence ratios, and 95% confidence intervals were calculated to examine relative differences in prevalence of these three outcomes with respect to payer source while adjusting for age, gender, and ethnicity. Few differences were observed between the unadjusted and adjusted models; therefore, only the adjusted models are presented.

All data were analyzed using SAS Version 9.4 and R Version 3.1.0.[25,26] This research was approved by the University of Texas Health Science Center Committee for the Protection of Human Subjects #HSC-SPH-15-0074.

Results

A total of 9978 work-related hospitalizations were identified in this time period. The total number of work-related records among patients aged eighteen to seventy-four years was 9523. The remaining 455 records were dropped because the patient was younger than eighteen years, older than seventy-four years, or no payer source was recorded. The majority of patients were male (74.5%) and between the age of forty to fifty-nine years (49.9%). One-third of all patients were Hispanic (Table 2). Of those in which race information was included, the majority were White (60.0%) followed by significantly fewer of other races. The majority of hospitalizations were covered by WC (85.9%), although almost half (44.6%) of the WC cases were not reported as work related. The payer source for the remaining hospitalizations included an alternative plan or personal private insurance (9.1%), followed by public insurance or no insurance (4.9%). Almost half of admissions were categorized as emergent (42.8%) or trauma related (5.6%), while the other half were urgent (10.4%) or elective (41.2%). The data set captured sixty-four fatalities that occurred during the hospitalizations as a result of the work-related injury or illness.

Table 2. Demographic Characteristics of Texas Workers Hospitalized Due to Work-Related Injury or Illness in 2012 ($N = 9523$).

	All participants $N = 9523$ (%)
Age (years)	
18–29	1295 (13.6)
30–39	1557 (16.3)
40–49	2070 (21.7)
50–59	2661 (27.9)
60–69	1250 (13.1)
70–74	207 (2.2)
Age-HIV+/substance abuse*	
18–44	248 (2.6)
45–74	235 (2.5)
Sex	
Male	7098 (74.5)
Female	1942 (20.4)
Missing	483 (5.1)
Race	
White	5813 (61.0)
Black	821 (8.6)
AI/AN, Asian/PI	88 (1.0)
Missing	2801 (29.4)
Ethnicity	
Non-Hispanic	6202 (65.1)
Hispanic	3187 (33.5)
Missing	134 (1.4)
Expected primary payer source	
Public or self-pay	469 (4.9)
Private insurance	876 (9.1)
Workers' compensation	8178 (85.9)
[Not coded as work related]	[3648 (44.6)]
[Coded as work related]	[4530 (55.4)]
Admission type	
Trauma	531 (5.6)
Emergency	4077 (42.8)
Urgent	987 (10.4)
Elective	3928 (41.2)

(continued)

Table 2. Continued.

	All participants $N = 9523$ (%)
Severity of injury or illness ranking score*	
High injury mortality	834 (8.8)
High severity of Illness	1252 (13.2)
Neither high injury or illness severity	7437 (78.1)
Fatality during hospitalization	
Yes	64 (0.7)
No	9456 (99.3)

If there were fewer than ten patients of a particular race per zip code, race was suppressed and coded as "other."
*Severity ranking based on the diagnosis codes and the patient's age; 5% (483) participants' actual ages were not provided because of HIV+ status or history of substance abuse.

Workers who died during their hospitalization were found to be similar to the general population of hospitalized workers. The majority were male (92.2%), 30.2% were Hispanic, and the median age range was between fifty and fifty-four years. Causes of the injury that led to the worker's death were noted in two-thirds of the fatality cases. Accidental falls from one level to another ($n = 4$), and unspecified falls ($n = 4$) were the most common causes. The median charges were \$116,900, and the interquartile range was from \$54,190 to \$230,700. The majority (62.5%) of fatalities occurred in the group of patients who reportedly had WC but did not have their hospitalizations recorded as work related. Uninsured patients also had a disproportionate burden of fatalities.

Distinct demographic trends were found under the four different categories of payer sources. Hispanic workers were more likely to lack any form of insurance (6.0%; 5.2–6.8) compared to non-Hispanic workers (4.4%; 3.9–4.1). Younger workers were also more likely to lack any form of insurance. Among patients with WC, significantly higher proportions of younger workers (44.2%; 41.5–46.9) and Hispanic workers (44.2%; 42.4–45.8) lacked the variable indicating that the hospitalization was work related compared to older workers (33.7%; 31.9–35.5) and non-Hispanic workers (34.9%; 33.8–36.1) (see Table 3). Expected payer sources did not differ greatly between men and women, although slightly higher proportions of women were found in the alternative insurance and in the WC group whose conditions were recorded as work related.

Higher proportions of emergency admissions and severe hospitalization conditions were found in the publicly insured or uninsured group and in the unrecorded WC group: These two groups represented 42.4% of all hospitalizations in this data set but represented 52.0% of the emergency admissions and 56.0% of hospitalizations ranked as very or extremely severe. The majority of fatality

Table 3. Frequencies of Expected Payment Source of Work-Related Hospitalizations by Texas Worker Demographics and Hospitalization Characteristics in 2012 ($N = 9523$).

	All records*	Public or uninsured, coded as work related	Workers' compensation, not coded as work related	Workers' compensation, coded as work related	Private insurance, coded as work related
	9523	469	3648	4,530	876
	N	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Age (years)					
18–29	1295	6.4 (5.1, 7.8)	44.2 (41.5,46.9)	41.7 (39.0, 44.3)	7.0 (5.7, 8.5)
30–39	1557	5.8 (4.7, 7.0)	38.7 (36.3, 41.1)	44.8 (42.4, 47.3)	8.5 (7.2, 9.9)
40–49	2070	4.5 (3.7, 5.5)	35.3 (33.2, 37.3)	48.6 (46.4, 50.7)	9.5 (8.3, 10.8)
50–59	2661	3.6 (2.9, 4.4)	33.7 (31.9, 35.5)	50.2 (48.3, 52.1)	10.2 (9.1, 11.4)
60–69	1250	3.6 (2.6, 4.7)	34.8 (32.2, 37.4)	50.6 (47.8, 53.3)	10.1 (8.6, 11.9)
70–74	207	5.3 (2.7, 9.2)	38.6 (32.0, 45.6)	48.3 (41.5, 55.3)	7.7 (4.6, 12.1)
HIV+/substance abuse+ (18–74)	483	9.0 (6.7, 11.9)	55.7 (51.2, 60.2)	28.7 (24.7, 32.9)	5.5 (3.7, 7.9)
Sex**					
Male	7098	4.8 (4.3, 5.3)	37.6 (36.5, 38.7)	47.1 (46.0, 48.3)	8.9 (8.2, 9.6)
Female	1942	4.1 (3.3, 5.0)	33.4 (31.3, 35.5)	49.7 (47.5, 52.0)	10.5 (9.2, 11.9)
Ethnicity***					
Non-Hispanic	6202	4.4 (3.9, 4.9)	34.9 (33.8, 36.1)	48.8 (47.5, 50.0)	10.8 (10.1, 11.6)
Hispanic	3187	6.0 (5.2, 6.8)	44.1 (42.4, 45.8)	43.0 (41.3, 45.0)	5.8 (5.1, 6.7)
Severity of Hospitalization					
High risk of mortality	834	6.0 (5.2, 6.8)	49.8 (46.3, 53.2)	37.1 (33.8, 40.4)	7.2 (5.6, 9.1)

(continued)

Table 3. Continued.

	All records* 9523 *N*	Public or uninsured, coded as work related 469 % (95% CI)	Workers' compensation, not coded as work related 3648 % (95% CI)	Workers' compensation, coded as work related 4,530 % (95% CI)	Private insurance, coded as work related 876 % (95% CI)
High risk of physical decompensation	1252	4.4 (3.3, 5.7)	44.8 (42.0, 47.6)	44.2 (41.5, 47.0)	6.5 (5.3, 8.0)
Minor or moderate risk of mortality or physical decompensation	7437	4.9 (4.4, 5.4)	35.9 (34.8, 37.0)	49.3 (48.2, 50.4)	9.9 (9.2, 10.6)
Type of hospital admission					
Hospital admission (emergency or trauma)	4608	7.2 (6.5, 8.0)	44.4 (43.0, 45.9)	42.7 (41.3, 44.2)	5.7 (5.0, 6.4)
Hospital admission (urgent or elective)	4735	2.8 (2.4, 3.3)	31.0 (29.7, 32.4)	53.2 (51.8, 54.7)	12.9 (12.0, 13.9)
Died during admission	64	9.4 (4.2, 19.1)	62.5 (50.0, 73.7)	23.4 (14.4, 35.2)	4.7 (1.3, 12.8)
Cost of hospitalization					
Total charges	$615,264,196	$29,579,649	$225,812,923	$286,612,625	$73,259,000
Total charges (Median, interquartile range)	$38,050 ($20,670–$64,610)	$37,070 ($20,880–$62,940)	$34,340 ($18,300–$61,900)	$39,710 ($21,950–$63,270)	$49,200 ($24,480–$94,600)

*Patient records were grouped by two variables: (1) the expected payment source for the hospitalization and (2) whether the hospitalization was reported or coded by the provider or worker as work related.

**Sex missing 5.1%.

***Ethnicity missing 1.4%.

cases (71.9%) were among the publicly insured o runinsured workers and the WC group who did not have their hospitalization recorded as work related. Publicly insured or uninsured patients also experienced a higher mortality rate during the hospitalization, as 1.3% of patients in this payer group died during the hospitalization, compared to 0.3% of the patients with alternative insurance (data not shown).

The median charge for each hospitalization differed greatly by payer source. Despite having a higher proportion of severe injuries and illnesses, the publicly insured or uninsured and the WC not reported as work related had lower median charges ($38,730 and $37,030, respectively) compared to those with alternative insurance ($49,200). Total charges for all records were $615.2 million, and the total charges for the two groups outside of the WC system were approximately $102.8 million. It is unknown what percentage of WC hospitalizations were actually approved and paid for by the WC insurance carrier, so the cost to workers and the public may be significantly higher than the $102.8 million charged to injured workers with non-subscribing employers.

The five most commonly occurring external cause codes by payer group are described in Table 4. Among the publicly insured or uninsured, falls were the most commonly reported causes of hospitalizations. This group was the only one to have falls out of buildings or other structures appear as one of the most common causes of a hospitalization. Falls from ladders, falls from one level to another, and injuries occurring in an industrial place were also commonly reported in this group. Hospitalizations caused by falls or being struck by an object emerged as common causes in the unreported WC group. Surgical complications from treatment of prior work-related injuries or conditions were common in the reported WC group and among those with alternative insurance, and injuries resulting from slips and trips were more frequently reported in these two payer groups.

The prevalence of severe mortality risk was 1.4 (95% confidence interval: 1.0–2.0) times higher among the publicly insured or uninsured and nearly two times higher (1.9; 1.6–2.2) among those with WC that was not reported as work related when compared to those with WC that was reported as work related (Table 5). No differences were observed with the alternative insurance group. For high risk of physical decompensation, only those with WC not reported as work related had a higher severity ranking (1.4; 1.2, 1.5) while those with alternative insurance had a significantly lower prevalence of high risk (0.78; 0.63, 0.98), and no significant differences were observed for publicly insured or uninsured workers.

An elevated prevalence ratio of emergency or trauma hospital admissions compared to urgent or elective admissions was also observed for uninsured or publicly insured workers (1.5; 1.4–1.6), and those with WC not coded as work related (1.3; 1.2–1.3) relative to those with WC coded as work related. Similar to the other outcomes, those with alternative insurance had a significantly lower prevalence (0.68; 0.61, 0.75) of emergent hospital admissions.

Table 4. Expected Payment Source for Work-Related Hospitalizations by Most Commonly Occurring External Cause Codes in Texas Workers in 2012 ($N = 9523$).

	Public or uninsured, coded as work related ($N = 469$)		Workers' compensation, not coded as work related ($N = 3648$)		Workers' compensation, coded as work related ($N = 4530$)		Private insurance, coded as work related ($N = 876$)	
Rank	Reported cause	*N* (%)	Reported cause	*N* (%)	Reported cause	*N* (%)	Reported cause	*N* (%)
First	Fall from ladder	24 (5.1)	Accident in industrial place	166 (4.6)	Abnormal patient reaction or later complication from surgery with implant of artificial device	164 (3.6)	Abnormal patient reaction or later complication from surgery with implant of artificial device	25 (2.9)
Second	Accident in industrial place	18 (3.8)	Injury from civilian activity done for pay	76 (2.1)	Fall from slipping, tripping, stumbling	132 (2.9)	Abnormal patient reaction or later complication from other surgery	17 (1.9)
Third	Fall from one level to another	17 (3.6)	Struck by falling object	70 (1.9)	Accident in industrial place	104 (2.3)	Fall from slipping, tripping, stumbling	17 (1.9)
Fourth	Fall out of building or other structure	13 (2.8)	Fall from one level to another	69 (1.9)	Fall from one level to another	94 (2.1)	Unspecified fall	16 (1.8)
Fifth	Unspecified fall	10 (2.1)	Other accident caused by being struck by/striking objects or persons	68 (1.9)	Unspecified fall	87 (1.9)	Struck by falling object	13 (1.5)

Table 5. Adjusted Prevalence Ratios (95% CI)* for Extreme Injury Mortality Ranking, Illness Severity Ranking, and Emergent Hospital Admissions by Expected Primary Payment Source.

	Risk of mortality ranking			Risk of physical decompensation ranking			Emergent admission+		
Expected payer source	High $N = 834$ %	Low $N = 7437$ %	aPR (95% CI)	High $N = 1252$ %	Low $N = 7437$ %	aPR (95% CI)	Yes 4608 %	No 4735 %	aPR (95% CI)
Public assist	6.0	4.9	1.4 (1.0, 2.0)	4.4	4.9	1.0 (0.77,1.3)	7.2	2.8	1.5 (1.4, 1.6)
Private	7.2	9.9	1.0 (0.74, 1.3)	6.6	9.9	0.78 (0.63, 0.98)	5.7	12.9	0.68 (0.61, 0.75)
WC (No code)	49.8	35.9	1.9 (1.6, 2.2)	44.8	35.9	1.4 (1.2, 1.5)	44.4	31.1	1.3 (1.2, 1.3)
WC (Yes code) (Ref)	37.1	49.3	1.0	44.3	49.3	1.0	42.7	53.2	1.0

Note. aPR = adjusted prevalence ratios; WC = workers' compensation.

*Adjusted for age, gender, and ethnicity.

The risk of mortality and physical decompensation rankings are determined by a combination of all diagnoses given to the patient and the patient's age. A high ranking (Score 3 or 4) indicates a higher likelihood of dying or of physical decompensation, while the low ranking (Score 1 or 2) indicates a lower likelihood of dying or physical decompensation.

+Yes = Trauma/Emergency Admission; No = Urgent/Elective Admission.

Discussion

We used publicly available data to examine work-related hospitalizations for injuries and illness incurred by Texas workers in 2012 in Texas' three-tier WC system. We observed that uninsured workers were more likely to have emergent hospital admissions, which may reflect the severity of the injury requiring an emergent admission or the use of emergency rooms for care in lieu of being treated in a private primary care clinic which those with insurance may more easily access.[27] Uninsured workers also had more severe injury cases as indicated by their higher risk of mortality, regardless of age and gender adjustments in the analysis. Workers whose hospitalizations were not recorded as work related (nearly half of all WC cases) also had more emergent hospital admissions and more severe injuries and illnesses. Conversely, workers with WC in which the claim was coded as being work related, as well as those with alternative insurance, fared better with respect to injury and illness severity, as well as type of hospital admission. These findings across payer source groups may reflect that workers employed in industries with a higher risk for workplace injuries and illnesses may be more likely to be uninsured. Research published concerning workplace injuries among immigrant workers and workers employed in high-risk industries such as agriculture and construction support these findings.[28–30] However, workers with alternative insurance plans may also be less likely to report that their condition was work related given that employers may legally retaliate against them if they file a medical claim with the alternative insurance plan.

We observed that uninsured workers had a disproportionate prevalence of severe injuries, but this data set only captured cases where the worker (or a family member or colleague) informed the hospital staff that their condition was work related, and the hospital staff recorded it as such. Given the large proportion of WC cases that were not recorded by patient or provider as being work related, it is possible that this same pattern of under-reporting existed for uninsured workers. We did observe that Hispanic workers were more likely to be uninsured or publicly insured, and that Hispanic workers were more likely to not have their hospitalization recorded as work related. Uninsured Hispanic and immigrant workers may face linguistic and cultural barriers to reporting with their supervisors and with health-care providers and many may fear retaliation from the employer, such as wage theft, firing, or deportation.[29,30] Thus there is likely to be a group of uninsured workers who did not have their hospitalizations recorded as work related and were not accounted for in this study.

Workers who had WC coverage but did not have their hospitalization recorded as work related were very similar to uninsured workers. These two groups had higher proportions of younger workers and Hispanic workers compared to privately insured workers or WC cases that were recorded as work related.

They also had more severe injuries and higher proportions of emergent admissions and fatalities. This finding was surprising, since the recording of work relatedness among WC cases was expected to be somewhat random, but this expectation was not found in the data. The reasons for this finding are unclear, and further research with these workers would provide insight into why these workers (or hospital staff) are not recording these hospitalizations as work related, even though the hospital indicated that they had WC coverage.

Data about industry or occupation of hospitalized workers were not reported, but the external cause codes provide some limited insight into which industries a worker may have been employed at the time of the hospitalization. The external cause codes found among the publicly insured or uninsured and in the unreported WC groups indicated that falls from ladders, falls from one level to another, and falls out of structures were frequent in these two groups, suggesting that construction workers bear much of the burden of severe workplace injuries in these two groups.[31] Texas WC data indicate that the construction industry accounted for a greater proportion of these types of falls than any other single industry.[32] This fact is somewhat contradictory to employer WC subscription data collected by the Texas Department of Insurance, which finds that hazardous industries such as construction tend to have higher subscription rates to WC.[8] It is important to note that this survey would not sample independent contractors or unregistered businesses, both of which are very common in the construction industry.[33,34] Employees who are misclassified as independent contractors and employees of unregistered businesses are unlikely to have WC coverage and their coverage status would not be reflected in the Texas Department of Insurance surveys.

The costs of hospital-related workplace injuries and illnesses in 2012 amounted to more than $615.2 million, with $102.8 million paid by sources other than WC. It is possible that the amount shifted to injured workers and taxpayers is much higher, given that it is unknown what percentage of WC cases were approved and paid for by the WC insurance company. More than $29.5 million in hospital charges were accumulated by 469 workers who were uninsured or had to rely on public sources of insurance. These findings highlight the shift in cost away from the employer to the state of Texas' taxpayers and/or injured workers due to a lack of WC coverage. These estimates represent only a fraction of the true cost given the under-reporting of work relatedness shown in prior studies, as well as suggested in this data set (as described below). These costs do not account for lost wages and indirect economic effects, such as reduced productivity, lost work time, or the cost of caring for injured workers during their recovery period after an injury. These findings are consistent with a national examination of emergency department data which found that 40% of work-related visits were not paid for by WC, and patients in the southern United States were more likely to utilize other sources of payment.[35]

Findings from this study suggest significant under-reporting of work-related injury among workers and/or under-capturing of events on the part of hospitals in Texas. Almost half of the hospitalizations that had a payer source coded as WC were not coded as work related, either on the part of the worker or the health-care provider. Moreover, these non-coded WC cases were more likely to incur the highest burden of very severe injuries and illnesses. This may be due, in part, to patients with the most severe hospitalizations being unable to report that their condition was work related upon admission because they were incapacitated or the intake process was not fully completed due to an extreme emergency. It is unknown how the lack of a work-relatedness code in the medical record impacts the later approval or denial of a WC claim for these cases.

Previous research substantiates these findings regarding under-reporting of non-fatal work-related injuries. An analysis of Texas-specific data from the Behavioral Risk Factor Surveillance System revealed that only 47% of injured or ill workers had their work-related condition covered by WC.[36] Further evidence of possible under-reporting was observed in the number of work-related deaths included in the data set, which is collected from the vast majority of hospitals in Texas; however, only sixty-four deaths were identified. According to the Bureau of Labor Statistics, 536 workers died in Texas from a work-related injury in 2012.[18] While it is likely that a substantial proportion of workers die on the job and not in the hospital, this discrepancy may also be due to under-reporting of work-related hospitalizations that result in fatalities that occur in the hospital setting.

These analyses were limited to a single year of hospitalization data and lack information regarding the worker's job or industry as well as contextual details about how the injury occurred. The omission of details limits the ability to inform occupational injury prevention programs in Texas. Another major limitation of the data is that it is collected quarterly and is not updated unless errors were made, so it is unknown whether the reported payers ended up covering all, part, or none of the hospital charges. It is possible that some of the hospitalizations included in this research that listed WC as the primary payer were later denied by the WC insurance carrier. Moreover, details about the process of how injuries and illnesses are coded as work-related are not provided and in a personal communication, TX-DSHS staff said that each hospital may collect this information differently. Almost half of claims coded with the payer source of WC were not coded as work related; however, it is unclear why the hospitalization failed to be recorded as work related. These data were advantageous in that they provided the means to underscore potentially systematic issues in how the Texas WC system affects injured workers, and that they are much more comprehensive in scope than other existing workplace injury surveillance sources in Texas.

Conclusion

Texas workers who are not covered by a WC insurance policy bear a disproportionate amount of the most severe injuries and illnesses relative to those who are insured. Workers who do have WC insurance but failed to have their hospitalization recorded as work related also experienced an elevated prevalence of severe injuries, illnesses, and fatalities. The costs of these injuries are shared by injured workers, their families, and Texas taxpayers rather than the companies that employ these workers and benefit from their contributions. These findings highlight the call to the state of Texas for improved insurance coverage for workers as well as improved occupational injury and illness data to inform prevention strategies. Further research is urgently needed to examine which occupational groups and industries are most likely to have workers who are uninsured, as well as how the Texas opt-out system creates inequities in access to insurance coverage for workers employed in high-risk industries.

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References

1. Morantz A. Opting out of workers' compensation in Texas: a survey of large, multistate nonsubscribers (pp. 197–238). National Bureau of Economic Research, Inc., https://ideas.repec.org/h/nbr/nberch/11965.html (2010, accessed 19 October 2016).
2. Texas Department of Insurance. About workers' compensation, http://www.tdi.texas.gov/WC/dwc/index.html (2016, accessed 19 October 2016).
3. THCIC. Inpatient PUDF, http://www.dshs.texas.gov/thcic/hospitals/Inpatientpudf.shtm (2017, accessed 3 October 2016).
4. Fennell TF. Employer's liability acts, as to co-employees. *Cornell law library*, http://scholarship.law.cornell.edu/cgi/viewcontent.cgi?article=1337&context=historical_theses (1896, accessed 19 October 2016).
5. Ohana J. Texas elective workers' compensation: a model of innovation. *William Mary Bus Law Rev* 2011; 2: 323.
6. Guyton GP. A brief history of workers' compensation. *Iowa Orthop J* 1999; 19: 106–110.

7. TXANS. Nonsubscription questions and answers, http://www.txans.org/questions.htm (accessed 3 October 2016).
8. Texas Department of Insurance, Workers' Compensation Research and Evaluation Group. Employer participation in the Texas workers' compensation system: 2014 estimates, http://www.tdi.texas.gov/reports/wcreg/documents/nonsub.pdf (2014, accessed 3 October 2016).
9. Harrison S. Oklahoma joins Texas in passing workers comp opt-out legislation. *Business Insurance,* http://www.businessinsurance.com/article/20130505/NEWS08/305059976 (2013, accessed 3 October 2016).
10. Oklahoma Workers' Comp Opt Out Ruled Unconstitutional. Insurance Journal, http://www.insurancejournal.com/magazines/features/2016/10/03/427806.htm (2016, accessed 3 October 2016).
11. Opt-out bills put on hold in two states. Business Insurance, http://www.businessinsurance.com/article/20160214/NEWS08/160219898/Workers-compensation-opt-out-legislation-appears-to-be-all-but-dead,-with-bills- (2016, accessed 24 February 2017).
12. Morantz AD. Rejecting the grand bargain: what happens when large companies opt out of workers' compensation?. Rochester, NY: Social Science Research Network. Report No. ID 2750134, https://papers.ssrn.com/abstract=2750134 (16, accessed 19 October 2016).
13. Flynn M, Cunningham T, Guerin R, et al. Overlapping vulnerabilities: the occupational health and safety of young immigrant workers in small construction firms. National Institute of Occupational Safety and Health, https://www.cdc.gov/niosh/docs/2015-178/ (2015, accessed 3 October 2016).
14. Williford J. Reformers' regress: the 1991 Texas workers' compensation act. *St Marys Law J* 1990–1992; 22: 1111.
15. ABA Journal. Insult to injury: Texas workers' comp system denies, delays medical help. ABA Journal, http://www.abajournal.com/magazine/article/insult_to_injury_texas_workers_comp_system_denies_delays_medical_help/ (2011, accessed 19 October 2016).
16. Kirkpatrick J, Jorden S, Benn D, et al. Texas workplace injury compensation. *Texans for Lawsuit Reform Foundation,* http://www.tlrfoundation.com/files/TexasWorkplaceCompensation.pdf (2009, accessed 13 October 2016).
17. Rebecca Smith JD. Immigrant workers and worker's compensation: the need for reform. *Am J Ind Med* 2012; 55: 537–544.
18. Bureau of Labor Statistics. State occupational injuries, illnesses, and fatalities, http://www.bls.gov/iif/oshstate.htm (2016, accessed 3 October 2016).
19. 2010 Census: Population of Texas Counties Arranged in Descending Order | TSLAC, https://www.tsl.texas.gov/ref/abouttx/popcnty32010.html (2013, accessed 3 October 2016).
20. Averill R, Goldfield N, Hughes J, et al. All patient refined diagnosis related groups (APR-DRGs): methodology overview, https://www.hcup-us.ahrq.gov/db/nation/nis/APR-DRGsV20MethodologyOverviewandBibliography.pdf (2003, accessed 3 October 2016).
21. Treo Solutions. All patient refined DRGs: an overview, https://www.bcbst.com/providers/webinar/APRDRG.pdf (accessed 26 February 2017).

22. Decompensation. Miller-Keane encyclopedia and dictionary of medicine, nursing, and allied health, seventh edition, http://medical-dictionary.thefreedictionary.com/decompensation (2003, accessed 26 February 2017).
23. Transitioning From E Codes in ICD-9-CM to V, W, X, Y Codes in ICD-10-CM. *Journal of AHIMA*, http://journal.ahima.org/2014/08/13/monthly-code-cracker-transitioning-from-e-codes-in-icd-9-cm-to-v-w-x-y-codes-in-icd-10-cm/(2014, accessed 3 October 2016).
24. Bernard R. *Fundamentals of biostatistics* (7th ed.), http://www.cengage.com/search/productOverview.do;jsessionid=9F1B296D368BDAB0F2BFCBEC048D8A9D?N=4294922413+43+16&Ntk=P_EPI&Ntt=126156020291950950515342199475634503 20&Ntx=mode%2Bmatchallpartial (2011, accessed 3 October 2016).
25. R. The R project for statistical computing, https://www.r-project.org/ (accessed 3 October 2016).
26. SAS. SAS 9.4 Software, http://www.sas.com/en_us/software/sas9.html (accessed 19 October 2016).
27. Trzeciak S and Rivers EP. Emergency department overcrowding in the United States: an emerging threat to patient safety and public health. *Emerg Med J EMJ* 2003; 20: 402–405.
28. Azaroff LS, Levenstein C and Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. *Am J Public Health* 2002; 1; 92: 1421–1429.
29. Orrenius PM and Zavodny M. Do immigrants work in riskier jobs? *Demography* 2009; 46: 535–551.
30. Fan ZJ, Bonauto DK, Foley MP, et al. Underreporting of work-related injury or illness to workers??? Compensation: individual and industry factors. *J Occup Environ Med* 2006; 48: 914–922.
31. Occupational Safety and Health Administration, U.S. Department of Labor. Adding inequality to injury: the costs of failing to protect workers on the job, https://www.dol.gov/osha/report/20150304-inequality.pdf (2015, accessed 3 October 2016).
32. TDI-DWC. Customized reports: workers' compensation claims data, https://wwwapps.tdi.state.tx.us/inter/perlroot/sasweb9/cgi-bin/broker.exe?_service=wcExt&_program=progext.hsdata3.sas (accessed 3 October 2016).
33. National Employment Law Project. Independent contractor misclassification imposes huge costs on workers and federal and state treasuries, http://www.nelp.org/content/uploads/Independent-Contractor-Costs.pdf (2015, accessed 26 February 2017).
34. University of Texas at Austin Division of Diversity and Community Engagement, Workers Defense Project. Build a better Texas, http://www.workersdefense.org/Build%20a%20Better%20Texas_FINAL.pdf (2013, accessed 27 October 2016).
35. Groenewold MR and Baron SL. The proportion of work-related emergency department visits not expected to be paid by workers' compensation: implications for occupational health surveillance, research, policy, and health equity. *Health Serv Res* 2013; 48: 1939–1959.
36. Centers for Disease Control and Prevention. Proportion of workers who were work-injured and payment by workers' compensation systems - 10 states, 2007. *MMWR Morb Mortal Wkly Rep* 2010; 59: 897–900.

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