Workers' Compensation Filings of Temporary Workers Compared to Direct Hire Workers in Illinois, 2007–2012

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Background *The physical and psychological risks of temporary employment are well documented but there are still many questions regarding the consequences of injuries among these workers.*
Methods *This analysis examines Illinois Workers' Compensation Commission filings from 2007 through 2012 to compare total cost of the decision, days of work missed, and percent disability of employees of temporary agencies with direct hire claims.*
Results *Total award median was $5,813.66 for direct hire employees and $2,625.00 for temporary workers. Of those employees claiming time off from work, median total time off was 1.3 weeks for direct hire employees compared to 1.2 weeks for temporary workers. Median total percent disability was 16.0% for direct hire and 10.0% for temporary employees.*
Conclusions *There are differences between temporary workers and direct hire employees in terms of total workers' compensation awards, total time off, and percent disability. Additional studies are needed to validate these findings.* Am. J. Ind. Med. 60:11–19, 2017.

KEY WORDS: temporary employment; contingent labor; workers' compensation; injury; disability

INTRODUCTION

There has been a shift in the United States' labor market toward an increased demand for contingent laborers. In the 1990s, employment data showed a rapid growth in the use of employees from temporary staffing agencies, with 2.7 million employed by temporary staffing agencies by 2012, accounting for 2% of the workforce [Luo et al., 2010; BLS, 2016]. Throughout this period employment patterns in the Midwest have been similar to that of the US as a whole in terms of growth of temporary employment [Luo et al., 2010]. In Illinois, employment by temporary staffing agencies increased from 58,645 to 158,800 persons between 1990 and 2012, although these numbers do not include other contingent labor hired directly by a company for a limited contract period or as subcontractors [Illinois Department of Employment Security, 2015]. In the U.S., temporary workers are disproportionately employed in the following industries or occupational groups: Administration and Support and Waste Management and Remediation Services; Arts, Entertainment, and Recreation; Construction industries; and Farming, Fishing, and Forestry [Alterman et al., 2013]. Surveillance data shows that temporary workers are more likely to be male, aged 18–29, Hispanic, and without a high school diploma, [Alterman et al., 2013] reflecting unskilled workers newly entering the workforce.

Research indicates an association between temporary employment status and adverse worker health and safety risk factors and outcomes such as paced work, repetitive work,

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awkward postures of the wrist, and intensive use of vibrating tools/machinery, lack of autonomy and skill discretion at work, lower self-rated health, musculoskeletal symptoms in the upper extremities such as pain, numbness, discomfort, and tenderness, depression [Jung, 2001; Bodin et al., 2012; Roquelaure et al., 2012; Wagenaar et al., 2012; Sakurai et al., 2013]. These workers are also less likely to return to work following an injury [Lilley et al., 2012]. In Spain, temporary workers were almost three times as likely to suffer non-fatal occupational injuries, but this was largely associated with length of employment [Benavides et al., 2006]. Quinlan and Bohle [2009] have provided a comprehensive review of restructuring and downsizing of the global and US workforce, summarizing, mainly, self-reported measures of health and well-being of the increasing number of workers hired on a temporary, contractual basis. Major gaps in our understanding of the effects on these workers include long-term health outcomes and the financial impacts of occupational illness and injury.

One of the difficulties in researching temporary employment is the wide variety of definitions used to capture this group of workers. As seen in the studies presented here, a short-list of terms used to describe vulnerable employment status include temporary, contingent, precarious, non-standard, and sub-contractor. Even studies using the same terms can have slightly different definitions of who is included and the way employees answer this question may vary depending on factors such as length of employment. Not only is this present in the vulnerable employee groups, but similar variability exists in terminology of the reference group's employment status. Terms used here include permanent, full-time, and direct-hire employees.

Particularly in the United States, the inability to better define the effects of temporary employment may stem from a variety of limitations in available data. Additionally, occupational health and safety regulations and procedures can vary by state, giving wide fluctuations in data available. These rights and responsibilities can be complicated when the employee-employer relationship is altered by contingent worker status. Because the temporary staffing agency is not the physical site of employment, recordkeeping of injuries and illnesses and transmission of reports to OSHA or to the workers' compensation carrier may not occur, limiting the ability to capture cases for research [Foley et al., 2014; Wuellner and Bonauto, 2014]. Adding to the problems in obtaining data regarding temporary employees, there are known problems regarding injury reporting to the Bureau of Labor Statistics, [Oleinick and Zaidman, 2010; Wuellner and Bonauto, 2013; Boden, 2014; Foley et al., 2014]. State level surveillance data could complement what is reported at the national level.

As temporary workers are a growing segment of the workforce but there is relatively little known about their reported injuries, this study aims to examine Illinois Workers' Compensation Claims for temporary workers to (i) determine the number of temporary workers filing contested claims in Illinois in comparison to national estimates of recordable cases; (ii) describe the demographics of temporary workers filing contested claims; and (iii) evaluate outcomes involving days away from work, permanent partial disability (PPD), permanent total disability and total workers' compensation settlement costs to better describe injuries and compensation for those injuries among temporary employees in comparison to claims filed by direct hire employees.

METHODS

Data Source

All claims from the 2007–2012 Illinois Workers' Compensation Commission (IWCC) filings were examined, which includes employer information, employee demographics, cause and type of injury or illness, level of temporary and permanent disability, and the total compensation awarded for contested claims. The IWCC represents the administrative court system that resolves claims that the employer and employee are unable to resolve without administrative intervention. Approximately 50,000–55,000 claims are filed in Illinois annually, representing 20–28% of the estimated 200,000–250,000 employee injuries and illnesses occurring annually based on a national survey [Latz, 2012]. These claims do not represent claims or portions of claims that are not disputed by either party. Unpublished data demonstrates that 90% of all indemnity cases are contested in the court system. Generally, "medical only" claims are not disputed in the administrative court system and do not appear in the dataset (unpublished data indicates that 90–95% of medical only cases do not appear in the dataset). The University of Illinois at Chicago Institutional Review Board for the Protection of Human Participants approved the study (#2008-0060). This study was exempt from written consent requirements as the data obtained is from court records and are therefore public documents.

Case Selection

As IWCC data does not include industry or occupation codes, we used the company name that holds the workers' compensation policy for the employee to identify claims filed against staffing agencies. Claims filed by employees of temporary agencies were identified using a list of temporary agencies provided by the Illinois Department of Labor. In addition, we filtered by keywords to find additional companies using in part or whole word matches on the following terms: inclusion of "staff," "temporary," "manpower," "personnel,"

"temp," "placement," "employment," "human resources," and "labor." The keyword search included variants of the keywords to account for misspellings or abbreviations in the IWCC dataset. The final list of filtered company names was manually checked through comparisons to the list provided by the Illinois Department of Labor and internet searches of the companies to remove companies not in the temporary staffing industry.

Outcome Variables

We focused this analysis on three key outcome variables that are available in the workers' compensation dataset: total monetary compensation, temporary total disability (TTD), and permanent partial disability (PPD). The total monetary compensation is the entire amount of money awarded to the employee in settled and decided cases. This comprises all the individual components involved in a claim including remaining unpaid medical costs, attorney fees, penalties, rehabilitation, vocational training, missed work, disability, settlement payments, and other forms of compensation. Total compensation dollars were adjusted for inflation using the Urban Consumer Price Index (CPIU) in 2012 real dollars (USD).

Injured employees are granted TTD when they are temporarily unable to return to work. The average weekly wage in 2012 real dollars is calculated based on the employee's gross income before taxes and includes income from additional jobs that the employee may have had at the time of the injury. There is a minimum and maximum benefit an employee can collect on TTD which depends on the number of dependents and wage level; this varied between 2007 and 2012. In this analysis, we describe TTD in terms of weeks of time lost. Thus, the minimum number of weeks used for analysis was 0.14 which is equivalent to 1 day.

PPD is a measure of partial loss of body function at the point of maximum medical improvement, measured as a percentage of bodily impairment that takes into account the nature of the accident and subsequent injury, medical findings, lost time, ability to return to work, and demographic factors such as weekly wage. We used the statutory formula to calculate cumulative percent disability when more than one body part was injured and limited in function. The statutory formula for computing cumulative disability is $A + ((1 - A) \times B)$, where A is the percent disability for a specific injury involving a specific body part and B is the percent disability for a second specific injury involving a specific body part.

Statistical Analysis

Analysis was performed using SAS 9.4 (SAS Institute, Inc.; Cary, NC). Frequency of claims filed by employees of temporary agencies, as well as claim rates were calculated. To determine claim rates, the denominator came from the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) for Illinois temporary employees using North American Industry Classification System (NAICS) codes 561320 for temporary help services and a second claim rate was calculated using the higher level NAICS 5613 for employment services [Illinois Department of Employment Security, 2015]. Distribution of demographic characteristics was determined and appropriate non-parametric (Wilcoxon) tests and parametric (student's *t*-test) tests were used to compare continuous variables, and the chi-square test was utilized when comparing categorical variables. Accident description, nature of injury, body part injured and claim outcomes such as total monetary compensation, percent disability, and TTD (time needed away from work) were also described.

Regression analysis of median values was performed using temporary worker status as the variable of interest for each of the claim outcomes and multivariate modeling was performed for the three outcomes, total monetary compensation (claims awarded $100 or more), TTD, and PPD as they were all right-skewed (PROC QUANTREG; SAS Institute, Inc.; Cary, NC). In all three multivariable models, statistical evaluation of covariates, as well as a priori knowledge, was used to determine inclusion of covariates in the final models. The variables analyzed as potential covariates included: gender, age, marital status, number of dependents, average weekly wage, use of an attorney, claims involving monetary compensation, median days from accident to filing of the claim, and body part injured. Multicollinearity of the three outcome variables by temporary worker status was tested (PROC REG; SAS Institute, Inc.; Cary, NC).

RESULTS

Temporary Workers

A total of 8,936 claims were filed from 2007 to 2012 with the IWCC for workers hired through temporary staffing agencies, representing 2.9% of all claims. Claim rates per 100 temporary workers with average number of annual employees of temporary agencies are found in Table I, and remained generally stable with 1.1 claims filed per 100 workers using NAICS code 561320 for temporary workers and 0.8 claims filed per 100 workers when using NAICS code 5613 for employment services. The number of injuries estimated in the Bureau of Labor Statistics Annual Survey of Occupational Illnesses and Injuries from 2007 to 2012 for Illinois was 3,700 using NAICS 5613, only 41.4% of cases extracted from the Illinois Workers' compensation claims dataset (8,936).

Demographic information for workers hired through temporary agencies compared to direct hire employees is

TABLE I. Claim Rates for Temporary Agency Employees Filing Claims Through Illinois Workers' Compensation and BLS Estimates During 2007–2012

Filing year	Workers hired through temporary agencies (N = 8,936)	Number of temporary workers in Illinois (NAICS 561320)	Litigated claim rate (per 100 workers)	Number of temporary workers in Illinois (NAICS 5613)	Litigated claim rate (per 100 workers)	Total recordable cases estimated by SOII	Number of temporary workers in Illinois (NAICS 5613)	SOII rate (per 100 workers)
2007	1,495	152,901	1.0	199,325	0.8	500	199,325	0.3
2008	1,522	137,813	1.1	181,556	0.8	500	181,556	0.3
2009	1,159	107,668	1.1	143,686	0.8	400	143,686	0.3
2010	1,446	125,696	1.2	163,316	0.9	1,000	163,316	0.6
2011	1,600	139,562	1.1	178,676	0.9	500	178,676	0.3
2012	1,714	158,800	1.1	193,895	0.9	800	193,895	0.4
Total	8,936	822,440	1.1	1,060,454	0.8	3,700	1,060,454	0.3

included in Table II. Workers hired through temporary employment agencies were significantly more likely to be male, younger, single, have more dependents, and earn approximately $400 less on average per week. Additionally, they were significantly more likely to have attorney representation than their direct hire counterparts (89.2% vs. 80.8%, $P < 0.001$) and have approximately 3–5 months less time between accident and the initial date the claimant filed a dispute as well as accident and decision (<0.01). Less than 5% of claims in both groups were dismissed.

Body Part Affected, Accident Description, and Work Related Deaths

The distribution of injuries and illnesses by body part affected was very similar between temporary workers and the comparison group, however, temporary workers had a slightly higher frequency of upper extremity injuries and lower frequencies of lower extremity and multiple parts unspecified injuries (Table III). Median awards by body part affected was lower in temporary workers for all regions with the exception of systemic (Table III). Accident description was not well documented with 53.0% of claims of temporary workers and 49.3% of direct hires having a poorly specified injury or illness mechanism. Among the temporary workers with a well described cause of injury, the most common causes were overexertion (13.4% of temporary workers, 11.9% of direct hires), slip/trip/falls (11.6% of temporary workers, 15.8% of direct hire), struck by/against (7.2% of temporary workers, 4.4% of direct hires), repetitive trauma (4.6% of temporary workers, 8.5% of direct hires), and caught in/under/between (3.7% of temporary workers, 1.5% of direct hires). Additionally, there were 15 (0.2%) fatalities reported and 69 (0.8%) amputations or enucleations by temporary workers, compared to 775 (0.3%) fatalities and 1,151 (0.4%) amputations or enucleations among the comparison cases.

Workers' Compensation Award, Temporary Total Disability, and Percent Partial Disability

Table IV shows the differences between temporary workers and direct hires on the three main outcome variables. Temporary workers were awarded approximately half the amount of the direct hires. Additionally, they were less likely to be awarded TTD, but similarly awarded PPD. When TTD and PPD were awarded, temporary workers were awarded lower time off and lower percent of PPD. TTD and PPD were both awarded for 37.3% of direct hires and 28.2% of temporary workers. There were similar rates of permanent total disability (0.3% vs. 0.2%; $P = 0.10$) and disfigurement claims (2.0% vs. 2.9%; $P = 0.08$) among the temporary workers and direct hire employees.

Multivariable Analysis

Cases with less than $100 awarded were removed; resulting in the loss of 3,560 (39.8%) cases for temporary workers and 113,040 (37.3%) for direct hires. Unadjusted models showed temporary worker status to be a significant predictor of total workers' compensation and percent PPD (Table V). However, temporary worker status was no longer a significant predictor in adjusted models for total workers' compensation (became insignificant when weekly wage, PPD, and TTD were added), but remained significant in the model for percent PPD ($P < 0.01$) when adjusting for important covariates known to be considered by the court in determining total monetary compensation, TTD, and PPD.

TABLE II. Demographic Characteristics of Workers Filing Claims through Illinois Workers' Compensation During 2007–2012

	Workers hired through temporary agencies (n = 8,936)	Direct hire employees (n = 303,263)	*P*-value
Gender			<0.01
Male	6,139 (68.7%)	198,885 (64.6%)	
Marital status			
Single	5,015 (56.1%)	130,868 (43.2%)	
Married	3,827 (42.8%)	168,458 (55.5%)	<0.01
Widowed/divorced	1 (0.0%)	219 (0.1%)	
Unspecified	93 (1.0%)	3,718 (1.2%)	
Mean number of dependents (SD)	1.3 (sd = 1.5)	0.9 (sd = 1.3)	<0.01
0	3,993 (44.7%)	175,501 (57.9%)	
1	1,625 (18.2%)	50,090 (16.5%)	
2	1,569 (17.6%)	43,377 (14.3%)	
3	997 (11.2%)	21,872 (7.2%)	
4	496 (5.6%)	8,397 (2.8%)	
5 or more	256 (2.9%)	4,026 (1.3%)	
Mean age at accident (SD)	38.0 (sd = 11.3)	44.2 (sd = 11.7)	<0.01
Under 18 years	17 (0.2%)	988 (0.3%)	
18–24 years	1,230 (13.8%)	16,658 (5.5%)	
25–34 years	2,559 (28.6%)	53,563 (17.7%)	
35–44 years	2,494 (27.9%)	79,469 (26.2%)	
45–54 years	1,911 (21.4%)	94,558 (31.2%)	
55–64 years	579 (6.5%)	49,354 (16.3%)	
65 years and older	78 (0.9%)	6,989 (2.3%)	
Attorney representation used	7,974 (89.2%)	244,886 (80.8%)	<0.01
Weekly wage			
Mean (SD)	$420.35 (sd = 206.88)	$825.68 (sd = 466.92)	<0.01
Median	$367.20	$727.60	
Days between			
Accident and filing, mean (SD)	139.4 (305.2)	284.9 (573.9)	<0.01
Accident and filing, median	54.0	153.0	
Accident and decision, mean (SD)	688.3 (499.1)	841.9 (709.1)	<0.01
Accident and decision, median	558.0	689.0	

There was no evidence of multicollinearity (tolerance >0.9 and variance inflation <1.1 for all variables).

DISCUSSION

This study presents data on injuries and illnesses that are typically the more severe cases. A very small proportion of cases handled by the administrative court system involve medical only claims; the cases they deal with are the most costly and predominately involve lost work and permanent disability. Nearly a third of the claims of temporary workers were for lost wages with a median of a week of work lost and over half were seeking compensation for PPD. The demographic characteristics of the temporary workers differed slightly from what has been reported in the literature, however, this may be attributable to this data set only including workers that are filing contested claims. Temporary workers are said to be concentrated in the younger age groups and in the older age groups, but the claims in this analysis only support that the temporary worker populations is slightly younger than direct hire claimants with over 50% of the temporary worker claimants falling between 25 and 44 years of age. This may be due to older temporary workers being placed in less hazardous jobs or that younger temporary workers have less job experience and safety training. The younger age of temporary workers may account for the differences seen in marital status. Additionally, temporary workers are traditionally described as male; however, this study shows that 30% of IWCC claims are from women and may indicate a neglected population of temporary workers.

Despite the fact that IWCC data does not include most medical only cases and predominately deals with indemnity

TABLE III. Body Part Injured of Workers Filing Claims through Illinois Workers' Compensation During 2007–2012

Body part	Workers hired through temporary agencies (n = 8,936)	Direct hire employees (n = 303,263)	*P*-value
Head and neck	537 (6.0%)	19,921 (6.6%)	0.08
Median award	$1,789.95	$3,210.00	
Back and spine	1,575 (17.6%)	52,439 (17.3%)	0.58
Median award	$2,675.00	$4,743.38	
Upper extremities	3,489 (39.0%)	106,048 (35.0%)	<0.01
Median award	$2,763.97	$8,121.30	
Torso	141 (1.6%)	4,844 (2.0%)	0.79
Median award	$2,580.60	$5,987.95	
Lower extremities	1,478 (16.5%)	58,130 (19.2%)	<0.01
Median award	$2,834.55	$8,452.34	
Systemic	771 (8.6%)	26,789 (8.8%)	0.62
Median award	$1,070.00	$999.00	
Multiple parts unspecified	1,544 (17.3%)	56,413 (18.6%)	<0.01
Median award	$2,295.00	$3,421.40	

cases of greater than $1,000.00, we identified 8,936 cases of injuries and illnesses among employees of temporary staffing agencies representing 2.9% of claims. In 2012, there were an estimated 5.64 million workers in Illinois, of which 2.8% were working under the NAICS 561320 (temporary worker classification) or 3.4% under NAICS 5613 (employment services) [Illinois Department of Employment Security, 2015]. In contrast, the Survey of Occupational Injuries and Illnesses only estimated a total of 3,700 recordable injuries and illnesses between 2007 and 2012 for the Employment Services industry in Illinois (NAICS 5613). The large discrepancy can be attributed in part to poor reporting of injuries in general to the Bureau of Labor Statistics, [Oleinick and Zaidman, 2010; Wuellner and Bonauto, 2013; Boden, 2014; Foley et al., 2014] but may also result from a lack of understanding of reporting requirements by employers for workers who are not on the payroll. Technically, the party responsible for a worksite is required to record injuries on the 300 log, while in contrast, the workers' compensation policy holder, in the case of our population of interest is the temporary staffing agency, is responsible for filing a First Report of Injury and in settling any workers' compensation claim filed by the temporary workers. Studies have shown that most record-keepers do not comply with OSHA recordkeeping regulations and do not understand whose responsibility it is for recording injuries and illnesses of temporary workers [Wuellner and Bonauto, 2014]. Regardless of if this discrepancy is due to reporting error or misclassification (the temporary worker is reported under the industry code of the worksite), workers' compensation databases may have some advantages in studying temporary workers and complement the data available in BLS SOII.

TABLE IV. Total Award, Temporary Total Disability, and Percent Partial Disability for Temporary Agency and Direct Hire Employees With Claim Decisions Through Illinois Workers' Compensation During 2007–2012

	Workers hired through temporary agencies (n = 8,936)	Direct hire employees (n = 303,263)	*P*-value
Total workers compensation (USD)	8,238 (92.2%)	258,137 (85.1%)	
Median	$2,625.00	$5,813.66	<0.01
Mean (SD)	$9,411.07 (sd = 25,367.42)	$20,199.68 (sd = 68,868.85)	
Temporary total disability (weeks)	2,509 (28.1%)	112,782 (37.2%)	
Median	1.2	1.3	<0.01
Mean (SD)	2.3 (sd = 4.0)	2.8 (sd = 6.6)	
Percent permanent partial disability	4,747 (53.1%)	166,256 (54.8%)	
Median	10.0%	16.0%	<0.01
Mean (SD)	17.0% (sd = 17.2)	19.2% (sd = 15.8)	
Permanent total disability	24 (0.3%)	580 (0.2%)	0.10
Disfigurement	182 (2.0%)	8,754 (2.9%)	0.08

TABLE V. Association between Temporary Worker Status and Worker Compensation Claim Outcomes in Illinois Workers' Compensation Filings during 2007–2012

Model outcome	Unadjusted model estimate	Standard error	Confidence interval (95%)		*P*-value	Adjusted model estimate	Standard error	Confidence interval (95%)		*P*-value
Total workers compensation (USD)[a]	−9,156.35	165.78	−9,481.27	−8,831.43	<0.01	−4.18	82.37	−165.62	157.26	0.96
Temporary total disability (weeks)[b]	−0.04	0.04	−0.11	0.03	0.22	−0.07	0.04	−0.14	0.01	0.08
Percent permanent partial disability[b]	−6.00	0.20	−6.40	−5.60	<0.01	−1.27	0.17	−1.60	−0.94	<0.01

[a]Adjusted for average weekly wage, Temporary total disability, Percent permanent partial disability, Lower extremity injury site, Upper extremity injury site, Days from accident to filing, Age at accident, Male gender, Married, and Use of attorney.
[b]Adjusted for average weekly wage, Lower extremity injury site, Upper extremity injury site, Days from accident to filing, Age at accident, Male gender, Married, and Use of attorney.

Injury reporting responsibilities need to be clarified as the number of injuries recorded in the IWCC is much higher than what has been reported in SOII for this population. Previous recommendations of including better instructions with forms distributed by OSHA and BLS, simplification of communication channels between data collection staff, workplace record-keepers, healthcare providers, legal representation, and the injured party, and establishing consequences for gross neglect in reporting injuries may help improve injury reporting [Wuellner and Bonauto, 2014].

While the lower average weekly wages seen among temporary workers may be expected, surprisingly, temporary workers were more likely to have attorney representation. This may be because temporary workers feel unable to navigate their claim alone. It is important to consider that the already significantly lower award for temporary workers is, in part, going to pay their attorney fees and likely reflects temporary workers taking home even less after their claim is settled. Additionally, temporary workers generally had over 3 months less time between accident and filing as well as accident and decision which may highlight an urgency of temporary workers to settle claims.

In the median regression analysis, temporary worker status became insignificant in predicting total workers' compensation and TTD. This is not surprising given that total monetary compensation is generally mathematically determined based on predetermined factors. However, in the case of temporary workers who are being utilized in the workforce to keep corporate costs low, this mathematical formula may not adequately compensate workers for their injuries as the payout is driven strongly by average weekly wage. Temporary worker status was significant in determining percent partial disability in the median regression model suggesting that this variable may be more likely to be impacted by factors associated with temporary employment, especially given the determination of PPD is not as formulaic in Illinois as for the other outcomes.

Temporary workers in this study had a higher rate of amputations compared to direct hires. This could be due to work in more hazardous workplaces, differential workplace factors that influence safety (like following machine guarding and lock-out-tag-out rules), differences in payments that are satisfactory between the groups, or a difference in claim filing behaviors. This finding warrants further examination, especially given that many injuries were poorly specified in the data so this is likely an undercount and a more rigorous analysis considering potential confounders was not done for amputations.

Limitations

A potential limitation within this analysis was that temporary workers were identified in the claims database using keywords rather than a NAICS industry code. However, we were provided annual lists of temporary staffing agencies by the Illinois Department of Labor for each year between 2007 and 2012. Since they have regulatory authority over these employers, they are required to maintain comprehensive lists that are updated annually with the help of the Illinois Department of Employment Security [2015]. To augment their lists, we also used general keywords that were commonly used in almost all of the temporary staffing agency names. Additionally, the finding that the percentage of claims filed by temporary workers is of a similar proportion to the percentage of temporary workers in the workforce provides some evidence that this method reasonably identified the claims of temporary workers. Regardless, the process we used in identifying temporary worker claims may have resulted in excluding valid claims.

In addition to potential problems identifying temporary workers, the lack of industry information does not allow for matching on industry classification. While this potentially results in a difference between temporary workers and

controls, these are all indemnity cases and likely represent the worst cases in all workers. The compensation is a formulaic payout that does not factor in the industry or occupation so having information only on the temporary agency rather than the worksite as they hold the insurance policy should not matter. This study is not assessing or comparing risk of injury of these groups of workers in which matching on industry classification would be critical. Any bias presented in not having industry information would be evident in both the temporary workers and direct hires.

Another key limitation of the workers' compensation dataset is that it only captures contested cases and excludes any cases settled out of court. Based on internal analyses, the administrative court dataset does not capture the vast majority of medical-only cases and is restricted to the more costly indemnity cases (greater than $1,000). Despite the likely underestimate of true incident cases, the total number of claims filed in the IWCC court system remains almost three fold higher than the estimated number of injuries and illnesses reported to the Bureau of Labor Statistics on its Survey of Occupational Injuries and Illnesses. Furthermore, the court data does not capture any medical costs accrued prior to or during the filing process for compensation that were paid by the insurance carrier. The final monetary compensation total in the dataset only includes the disputed costs. This can potentially underestimate the cost of injury to this group of workers.

Finally, much of the information captured within the dataset is provided by the lawyers litigating the cases. As a result, the cause of accident and nature of injury is poorly specified. For the majority of cases, the data provided is nonspecific (e.g., "injury"). This limits our ability to describe the cause of injury and assess hazards; however, among the cases that had a cause of injury provided, the characterization was comparable to what has been reported in the literature. This dataset does not include information regarding industry type or the tasks being done by either the temporary workers or direct hires. Because of the types and severity of injuries that lead to the filing of claims, it is likely that the hazards are similar, but how similar is unknown. This could account for the difference in injury types and, hence, the TTD, PPD, and TWC payments. Further, this analysis provides no explanations or context for differences seen between direct hire and temporary worker claimants regarding attorney use, days between accident and filing or outcome, and time taken away from work.

CONCLUSIONS

Temporary worker status itself is not deterministic of lower total worker compensation claim award and percent PPD per se. However, it is highly correlated with the factors that determine those payouts such as significantly lower weekly wages and less time taken away from work after injury. With such discrepancies between these deterministic factors, additional methods of determining compensation should be explored to ensure temporary workers are adequately compensated for similar injury to their direct hire counterparts.

Consideration for using other exposure criteria in determining workers' compensation premiums, such as hours worked rather than wages, may be warranted as this estimation could provide a better indicator of risk since hazardous work can often be low-wage [Smith et al., 2010]. The risks associated with temporary work are well documented and despite temporary workers being regulated by the same OSHA protections for other workers, there are additional safeguards needed, such as work agreements with clear delineation of responsibility for providing safety training and controls, reporting injuries without negative consequences, and accommodations when returning to work with an injury may be recommended [Smith et al., 2010].

This study demonstrates the value of using state based data for occupational surveillance. Further exploration is required to determine the reasons for the BLS undercount of injuries among temporary workers and also the disparity in amputation injuries between temporary workers and direct hires.

AUTHORS' CONTRIBUTIONS

All authors participated in the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; drafting the work and revising it critically for important intellectual content; final approval of the version to be published; and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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ETHICS APPROVAL AND INFORMED CONSENT

The University of Illinois at Chicago Institutional Review Board for the Protection of Human Participants approved the study (#2008-0060).

DISCLOSURE (AUTHORS)

The authors report no conflicts of interest.

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Steven B. Markowitz declares that he has no competing or conflicts of interest in the review and publication decision regarding this article.

DISCLAIMER

None.

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