Workers' Compensation Benefits and Shifting Costs for Occupational Injury and Illness

J. Paul Leigh, PhD and James P. Marcin, MD, MPH

Background: Whereas national prevalence estimates for workers' compensation benefits are available, incidence estimates are not. Moreover, few studies address which groups in the economy pay for occupational injury and illness when workers' compensation does not. **Methods:** Data on numbers of cases and costs per case were drawn from the Bureau of Labor Statistics and National Council on Compensation Insurance data sets. Costs not covered by workers' compensation were estimated for private and public entities. **Results:** Total benefits in 2007 were estimated to be $51.7 billion, with $29.8 billion for medical benefits and $21.9 billion for indemnity benefits. For medical costs not covered by workers' compensation, other (non–workers' compensation) insurance covered $14.22 billion, Medicare covered $7.16 billion, and Medicaid covered $5.47 billion. **Conclusion:** Incidence estimates of national benefits for workers' compensation were generated by combining existing published data. Costs were shifted to workers and their families, non–workers' compensation insurance carriers, and governments.

The National Academy of Social Insurance (NASI) produces national estimates of workers' compensation benefit payments for medical providers and injured workers each year. The estimates for 2007 were $27.2 billion for medical benefits and $28.3 billion for indemnity benefits, for a total of $55.4 billion.[1] The NASI estimate is prevalence based, that is, the estimated annual costs include costs of injuries and illnesses from the reported year as well as costs still being generated during the reported year by injuries and illnesses from previous years. The first purpose of this study was to develop a methodology to estimate incidence costs that are the current and expected future costs of a particular years' injuries and illnesses; this estimate of cost purposefully excludes the costs of injuries or illnesses from previous years. The second purpose was to estimate which groups in the economy pay for the costs of occupational injury and illness that workers' compensation benefits do not cover.[2]

The terms *prevalence* and *incidence* are derived from epidemiology. Economists refer to the former as "paid" costs and the latter as "incurred" costs. Incidence-based estimates are useful for investigating differences in benefits across workers' compensation categories, analyzing investment decisions that require information about forecasted costs, and assessing the extent of shifting costs to non–workers' compensation payers.

DATA AND METHODS

All estimates reported in this study were generated by applying a set of methodological assumptions to available data. This section about data and methods is divided into three subsections. The first subsection describes data and the second describes the method for estimating the incidence-based benefits paid by workers' compensation in 2007. The third subsection describes the method for analyzing which groups in the economy pay for the cost of occupational injury and illness when workers' compensation does not. All sections are brief. Complete explanations for the two methods are available in two unpublished appendices.

Data

Numbers of nonfatal injuries for the private sector as well as state and local governments were drawn from the Bureau of Labor Statistics' Annual Survey of Occupational Injuries and Illnesses (SOII). In recent years, the Annual Survey collected data from roughly 190,900 private firms, establishments, and governments. Data represented roughly 296,082 nonfatal injury and illness cases involving days away from work as well as more than an equal number of cases not involving days away from work.[3] Data on fatal injuries were drawn from the Bureau of Labor Statistics' (BLS) Census of Fatal Occupational Injury (CFOI).[4] Data from civilian federal employees were drawn from the Federal Office of Workers' Compensation.[5] Average benefit payments were drawn from the National Council on Compensation Insurance's (NCCI) *Annual Statistical Bulletin*, 2008 edition.[6] The NCCI is the largest collector of workers' compensation data nationwide, with information from 36 to 46 states (depending on the type of information) and Washington, District of Columbia.[7] Data were available for medical benefits as well as indemnity (wage-replacement) benefits within the five workers' compensation categories: (1) medical-only, (2) temporary total and partial disability, (3) permanent partial disability, (4) permanent total disability, and (5) death.

Data were available for "first reports," "second reports," and so on, up to "fifth reports." "First reports" contain claims data from insurance policies covering the first approximately 18 months surrounding the initial claim. "Second reports" contain some data from the "first reports" together with data from the next 12 months (year) following the initial 18 months. Each subsequent report adds an additional year. Each report contains estimates for current and forecasted future expenses. These NCCI figures are therefore incidence based, not prevalence based. After reports are written, they are not updated for inflation in subsequent years.

To estimate costs for the medical-only and "death" categories, we used "first reports." We reasoned that virtually all expenses would be captured within the first 18 months for medical-only because it is the least severe of all the categories. More than 97% of death cases are injuries, and fatal injuries tend to be immediate or resolved within at least the first 18 months.[2] To estimate costs for all disability categories, we used "third reports," reasoning that expenses for disability sometimes take longer to resolve and that forecasts for future costs would be more accurate based on experience from 2 years and 18 months versus just 18 months. "Fifth year" reports were judged to be "too old," perhaps containing medical procedures from the 1990s that were no longer in use in more recent years.

Method for Incidence-Based Worker Compensation Benefits

Broadly speaking, to estimate the national benefit payments for workers' compensation, we multiplied estimated numbers of injuries and illnesses times estimated costs per case within

From the Center for Healthcare Policy and Research (Drs Leigh and Marcin), and Departments of Public Health Sciences (Dr Leigh) and Pediatrics (Dr Marcin), University of California Davis School of Medicine, Davis, Calif.
Disclosure: First author acknowledges partial support from the National Institute for Occupational Safety and Health (OH008248-01 and U54OH007550).
The authors declare no conflict of interest.
Address correspondence to: J. Paul Leigh, PhD, Department of Public Health Sciences, UC Davis Medical School, One Shields Ave. Davis, CA 95616. Email: pleigh@ucdavis.edu.

DOI: 10.1097/JOM.0b013e3182451e54

workers' compensation categories. In this subsection, we first consider nonfatal and then fatal cases. Second, we consider benefit payments data. Third, we explain our partitioning technique. Finally, we explain the arithmetic model.

Nonfatal Cases

We began with the "raw" BLS SOII and federal Office of Workers' compensation data that represented employees in private firms and the federal government across all 50 states and the District of Columbia. The combination of these two data sources covers the vast majority of injury and illness cases because private firms and the federal government together accounted for roughly 86% of civilian employment in 2005.[8]

Because not every state provided data on state and local government workers to the BLS, an estimate was generated. This study extrapolated from all 26 states for which BLS had data for 2007. This study assumed these 26 states were representative of government employees in the nation and multiplied injuries per employee (rates) for these 26 states times the number of state and local employees nationwide.

Fatal Cases

The BLS's CFOI counted 5488 deaths in 2007,[4] but only some of these were identified through workers' compensation records. For 2007, "state workers comp" data helped identify 1852 of these 5488 deaths (personal communication, May 19, 2009, Joyce Northwood, PhD). The ratio is 0.3375, or 33.75%, but these 1852 would not include federal deaths. It was assumed that all federal deaths would receive workers' compensation. It was also assumed that federal fiscal year 2008 was an estimate for 2007 calendar year. For fiscal year 2008, federal civilian deaths were 65.[5] Adding these to 1852 yields 1917 and the ratio is 0.3493, or 34.93%.

Average Benefit Payments

Weighted average benefits for 36 states and the District of Columbia for which NCCI provided extensive information were combined with weighted average benefits for 10 additional states with less extensive information to generate combined average benefits for 46 states and the District of Columbia. States with single-payer plans were not included (Wyoming, Washington, and Ohio), nor was North Dakota because data for this latter state was not available to us. These 47 jurisdictions were assumed to be representative of the nation. All benefits were inflated from their original estimated years (2002 and 2004) to 2007 using BLS' Consumer Price Index's medical care portion for medical benefits and Employment Cost Index for all civilian workers for indemnity benefits.[9,10] We reasoned that inflation from "employment costs"—largely comprising wages—would be the most appropriate measure for inflation of indemnity benefits.

Partitioning Technique

The BLS SOII classification of cases (0 day lost, 1 day, 2 days, 3 to 5, 6 to 10, 11 to 20, 21 to 30, and >30 days) did not match the five workers' compensation classifications. The numbers of BLS SOII cases were therefore partitioned into workers' compensation categories as follows: nondisability cases or medical-only (cases with 0 to roughly 4 workdays lost) and disability- or indemnity-benefits cases (cases with roughly 4 or more days of work lost). The word *roughly* is used because it was assumed that one-half of the BLS SOII cases in the 3 to 5 days category were medical-only cases and the other half were indemnity cases. Of the indemnity cases, 66.21% were classified as temporary total; 33.26% as permanent partial; and 0.53% as permanent total. These percentages were estimated on the basis of data on numbers of cases within workers' compensation categories in the *NCCI Annual Bulletin*, 2008 edition, averaging "first" through "fifth" reports. The decision to divide the 3 to 5 days category in half was based on the knowledge that all states have waiting periods before workers can qualify for indemnity benefits. These waiting periods range between 3 and 7 days. An alternate estimate was also generated that assumed 75% of the 3 to 5 day cases would be medical-only and 25% would involve indemnity benefits.

Arithmetic Model

This study's BLS SOII-based estimates of frequencies within workers' compensation categories were multiplied by the NCCI-based average medical and indemnity cost estimates within workers' compensation categories to produce estimates of total medical and total indemnity benefits. Additional details about data sources, estimates for state and local governments, and average NCCI costs per case are available from the authors in an unpublished appendix and a separate article that estimates societal costs of all occupational injuries and illnesses but not workers' compensation benefits.[2]

Method for Shifting Costs of Occupational Injury and Illness

This section describes how we estimated which groups in society pay when workers' compensation does not. We begin with data from the recent study of the costs for all occupational injury and illness that was not limited to solely workers' compensation costs.[2] This recent study also used the incidence-based approach. The recent study estimates $249.64 billion in total costs in 2007 with $67.09 billion attributed to medical costs and $182.54 attributed to indirect or productivity costs. Within the indirect costs, there are three categories: (1) lost earnings ($110.02 billion); (2) lost fringe benefits ($29.03 billion); and (3) lost home production ($43.49 billion). As data given later indicates, $37.232 billion will represent medical costs that were not paid by workers' compensation and $160.675 will represent indirect costs not paid by workers' compensation.

We assume the medical costs not paid by workers' compensation will be paid by private and public funds in accordance with percentages paid by these same funds for total national medical spending on all health care.[11] For example, we multiply the 53.8% for private funds in the Hartman et al[11] study of all health care spending times the $37.232 billion to generate $20.03 billion for our estimate of medical costs not covered by workers' compensation that is paid by private funds. We also generate estimates for subcategories: private non–workers' compensation health insurance; out of pocket spending; federal government; state and local governments; and Medicare and Medicaid.

We next turn to indirect costs. As we will show, the amount not paid by workers' compensation is $160.675 billion. To construct the estimates for indirect costs, we combined workers' compensation and BLS categories into the following groups: temporary and medical-only nonfatal injury and illness; permanent nonfatal injury and illness; fatal injury; and fatal disease. We also separated earnings from fringe benefits and from home production. These three indirect cost categories are useful because private and public funds treat them differently. For example, Social Security Disability Insurance (SSDI) payments are cash benefits similar to workers' compensation indemnity benefits and are logically associated with lost earnings. But because people using SSDI qualify for Medicare implies that Medicare is paying for fringe benefits. Neither SSDI nor Medicare, however, pays for lost home production. In a detailed appendix, we constructed 72 separate estimates for the four workers' compensation categories combined with six private and public categories as well as the three indirect cost categories. We made the following assumptions, discussed in the appendix: Workers' compensation indemnity payments did not cover fringe benefits or home production; percentage contributions of private and public funds to fringe benefits were identical to those funds' contributions to medical spending; 44% of households have someone with a life insurance policy that

pays 10% of lost lifetime earnings; private disability insurance and SSDI covers one-half of lost earnings[12]; and all lost home production is absorbed by private households.

RESULTS

Table 1 presents estimates for employment and numbers of all nonfatal injury and illness cases and numbers of days-away-from-work cases. Within the first row for employment and cases for the BLS SOII private sector, the ratio of the number of all cases to employment is 3.5 cases per 100 employees (3.5 = 4,002,700/114,246,100). Within the first row for BLS SOII private sector, the percentage of days-away-from-work cases out of all cases is 28.95%. In the second row, for state and local governments, the ratio of cases to employment is 5.25 per 100 employees and the percentage of days-away-from-work cases out of all cases is 33.93% (331,732/977,695). In the last row, for the total including all government employees, the ratio of cases to employment is 3.76 per 100 employees and the percentage contribution for days-away-from-work cases is 30.18%. Notice that for the total, which includes government workers, the ratios and percentages are larger than the ratios and percentages for the private-sector only. These data suggest that government records report more cases per employee than private sector records and that these government cases are more likely to involve days away from work than private-sector records.

Table 2 presents estimates for numbers of cases as well as average and total benefit payments within workers' compensation categories. In the top row, first cell, 69.83% (3,558,133/5,095,627) of all nonfatal cases did not involve any days of work loss; 10.65% (542,896/5,095,627) of all nonfatal cases involved 1 through roughly 4 days of workdays lost. The NCCI-based estimate for the workers' compensation category of medical-only, average benefits paid to medical providers, was $985. Total benefits for the "injuries with no days away from work" category was $3.558 billion, or 7.1% of total benefits of $51.722 billion. For all medical-only cases (combining rows 1 and 2), the estimate for benefits was $4092.431 million, ($3557.678 + $534.753), or 8.16% of total benefits. For all temporary total cases (row 3), the estimate for combined medical and indemnity benefits was $8860.524 million ($5147.392 + $3713.132), or 17.13% of total benefits. For permanent partial cases (row 4), the estimate for combined medical and indemnity benefits was $32,098.029 million ($16,043.389 + $16,054.640), or 62.06% of total benefits. The estimate of cases involving permanent total disability (row 5) was 5301 and the estimate for fatal cases (row 6) was 1917. Average indemnity payments for fatalities were roughly $88,000 less than indemnity payments for permanent total disabilities. The medical benefits for all nonfatal cases represented 57.73% and the indemnity benefits for all nonfatal cases represented 42.27% of total benefits of $51.722 billion.

Table 3 presents data comparing this study's estimates with those from NASI for 2007. Numbers are similar. The NASI employment number was 131.7 million compared with this study's estimate of 135.6 million, a difference of about 3%. This study's total benefit payments number ($51.7 billion) is about 7% less than the 2007 NASI number ($55.5 billion). The most striking differences between this study's estimates and those of the NASI apply to the percentage of spending on medical versus on indemnity benefits. Whereas this study estimates 58% and 42% for medical and indemnity benefits, respectively, NASI estimates 49% and 51%, respectively. Because these differences were unexpected, average cost data from the *NCCI Annual Statistical Bulletin* were carefully checked.[5] Excluding fatalities and medical-only cases (for which indemnity is 0, by definition), temporary total, permanent partial, and permanent total categories had higher average medical than indemnity benefits in the great majority of figures for each state for NCCI's "average costs per case by injury type." This higher amount for medical benefits was also apparent across all reports—"first" through "fifth."[5]

In additional calculations, it was assumed that 75% of the 3 to 5 day BLS cases involved medical-only and 25% involved indemnity. The estimated amount for medical and indemnity benefits combined was $48.49 billion, some $3.23 billion less than was estimated assuming a 50/50 division. In further calculations, a separate incidence of fatalities was estimated using ratios of NCCI estimates of numbers of death claims to numbers of permanent partial claims and per 100,000 employees. Numbers of permanent partial claims were used as anchors because there were many of them and therefore were likely to be more reliable than permanent total claims. This study's NCCI-based estimate was 3190 whereas the CFOI-based estimate for workers' compensation was 1917 for fatalities.

Total costs for occupational injury and illness was estimated to be $249.64 billion[2] but workers' compensation paid for only $51.725 billion, or 20.72%. Table 4 presents results of how the difference ($197.91 billion, or 79.28% of total costs) was shifted onto other payers. Workers' compensation did a better job covering medical (44.5% of total) than indirect (11.98%) costs. This is reasonable given that workers' compensation is designed to pay 100% of medical bills for qualified cases but designed to pay roughly 50% to 67% of lost wages and nothing for lost fringe benefits or home production. Within the four subgroups, workers and their families paid the most

TABLE 1. Estimate for Employment and Numbers of Nonfatal Cases Across Categories 2007

Category	Employment (in Thousands)	No. All Nonfatal Cases	No. Only Nonfatal Days-Away-From-Work Cases (% All Cases Within Row)
Private sector employees and injury and illness cases represented by BLS's Annual Survey (SOII)	114,246.1	4,002,700	1,158,900 (28.95)
Government employees and injury and illness cases			
State and local government	18,627.585*	977,695	331,732 (33.93)
Federal government	2,726.300*	115,232	47,317 (41.06)
Total	135,599.98	5,095,627	1,537,949 (30.18)†

*Quarterly Census of Employment and Wages Web site http://data.bls.gov/PDQ/outside.jsp?survey=en.

†This 30.18% is larger than the 28.95% in top right cell because this bottom right cell includes state and local and federal cases that have 33.93% and 41.06% days-away-from-work percentages.

SOII indicates Survey of Occupational Injuries and Illnesses.

TABLE 2. Number and Average Benefits Per Case

Category	No. Cases	Average Medical Benefits, $	Average Indemnity Benefits, $	Total medical Benefits (No. × Average), $ in Million	Total Indemnity Benefits (No. × Average), $ in Million
Injuries with no days away from work	5,095,627 – 1,537,949 = 3,558,133	Medical-only, 985	0	3,557.678	0
Injuries with days away from work between 1 and roughly 3–4.	1,537,949 × 35.3% = 542,896	Medical-only, 985	0	534.753	0
Temporary total disabilities	1,537,949 – 542,896 = 995,053 and 995,093 × 66.21% = 658,824 (subtract 1 for rounding)	7,813	5,636	5,147.392	3,713.132
Permanent partial disabilities	995,053 × 33.2573% = 330,928	48,480	48,514	16,043.389	16,054.640
Permanent total disabilities	995,053 × 0.5327% = 5301	661,901	313,837	3,508.737	1,663.650
Fatal	1917	55,590	225,919	1,065.66	433.087
Total for nonfatal and fatal	5,095,627 nonfatal and 1917 fatal			29,857.609*	21,864.509†
Total for dollars of benefits				51,722.117‡ million combining medical with indemnity	

*$28,791.949 million for nonfatal only.
†$21,431.422 million for nonfatal only.
‡50,223.371 million for nonfatal only.

TABLE 3. Compare Incidence Estimate With National Academy of Social Insurance Prevalence Estimate

Category	Our 2007 Estimate Using BLS-SOII and NCCI Data	NASI 2007 Estimate (Top 4 Rows) and NASI Estimate Derived From NCCI Data (Bottom 3 Rows)
Total covered employees	135,599,980	131,734,000
Total, $	51.722 billion	55.4 billion*
Medical-only, $ (%)	29.859 billion (57.73)	27.2 billion (49.0)
Indemnity only, $ (%)	21.865 billion (42.27)	28.3 billion (51.0)
Temporary total disabilities	All indemnity cases = 66%; all benefit dollars for indemnity cases = 19%	NASI estimate derived from NCCI: All indemnity cases = 63%; all benefit dollars for indemnity cases = 17%
Permanent partial disabilities	All nonfatal indemnity cases = 33%; all benefit dollars for indemnity cases = 67%	NASI estimate derived from NCCI: All indemnity cases = 36%; all benefit dollars for indemnity cases = 66%
Permanent total disabilities and deaths	All nonfatal indemnity cases = 1%; all benefit dollars for indemnity cases = 14%	NASI estimate derived from NCCI: All indemnity cases = 1%; all benefit dollars for indemnity cases = 17%

*Does not sum due to rounding.
NASI indicates National Academy of Social Insurance; NCCI, National Council on Compensation Insurance; SOII, Survey of Occupational Injuries and Illnesses.

(124.88 billion, or 50.02%), followed by non–workers' compensation private health insurance ($32.92 billion, or 13.19%), followed by the federal government ($26.76 billion, or 10.72%), and finally state and local governments ($13.35 billion, or 5.35%). Additional analysis estimated that Medicare absorbed $7.16 billion, or 10.67%, of medical spending for occupational injury and illness and Medicaid absorbed $5.47 billion, or 8.15%, of the same medical spending. Neither Medicare nor Medicaid entered into rows of Table 4 because neither paid cash benefits to cover lost wages and therefore would have had 0 in cells for indirect costs.

DISCUSSION

These incidence estimates for national benefit payments for workers' compensation for 2007 were $51.7 billion total, with $29.8 billion (57.7%) going to medical costs and $21.9 billion (42.3%) going to injured workers and their families. This study's aggregate dollar estimate compares well with the 2007 prevalence estimate of $55.4 billion from the NASI.[1] These are significant amounts. For example, the national medical costs for chronic obstructive pulmonary disease, allowing for medical inflation from 2005 to 2007, were $23.8 billion.[13] The national medical costs for treatment of breast cancer, allowing for medical inflation from 2002 to 2007, were $7.6 billion.[14] "Incremental" medical costs for Parkinson disease were $6.7 billion in 2002.[15] Hepatitis C was forecasted to cost more than $1 billion for medical care each year from 2010 to 2019.[16] Medical spending on workers' compensation was, therefore, about 25% more than that spent on chronic obstructive pulmonary disease, roughly four times the amount spent on either breast cancer or Parkinson

TABLE 4. Payers of Medical and Indirect Costs*

Category	Medical Costs, Dollar Amount in Billions	Medical Costs, % Total ($67.09)	Indirect Costs, Dollar Amount, in Billions	Indirect Costs, % Total ($182.54)	Total Costs, Dollar Amount, in Billions	% Total Costs ($249.64)
Total cost of occupational injury and illness	67.09	100	182.54	100	249.64	100
Paid by workers' compensation	29.86	44.5	21.865	11.98	51.725	20.72
Not paid by workers' compensation	37.232	55.5	160.675	88.02	197.91	79.28
Private funds	20.03	29.867	137.77	75.47	157.80	63.21
Out of pocket	5.81	8.66	119.07	65.23	124.88	50.02
Private health insurance	14.22	21.2	18.70	10.24	32.92	13.19
Public	17.20	25.64	22.91	12.55	40.11	16.07
Federal	12.51	18.65	14.25	7.81	26.76	10.72
State and local	4.69	6.99	8.66	4.74	13.35	5.35

*Rows and columns may not sum due to rounding.

disease, and more than 25 times the amount spent on hepatitis C. Casual viewing of medical journals, however, indicates that these diseases get far more attention than the job-related injuries and illnesses that generate workers' compensation costs.

This study's estimates complement those from NASI. Just as natural science requires independently run experiments, economic science requires independent investigations. That final estimates were close and percentages within workers' compensation categories were similar (Table 3) lends credence to both estimates. In addition, this study's method has some advantages over NASI. First, the data are available from the BLS, the Federal Office of Workers' Compensation, and the NCCI. Second, this study estimates incidence of costs whereas NASI estimates prevalence; and incidence-based, forward-looking estimates may be more important than prevalence-based estimates for informing economic investment decisions.[17] Third, our incidence-based workers' compensation estimates allow for direct comparisons with a recent study of the costs of occupational injury and illness, which also used the incidence approach for nonfatal injuries and illnesses and fatal injuries.[2]

This study's estimates draw attention to some BLS and NCCI data that are overlooked by many researchers. For example, BLS data reveal greater ratios of injuries to employment for government workers than for private sector workers; and NCCI data reveal that indemnity payments for fatalities are roughly 40% less than payments for permanent total injuries.

Whereas this study estimated 57.7% for medical costs and 42.3% for indemnity costs, NASI estimated 49% and 51%, respectively. The reason for the discrepancy is likely due to the incidence verses prevalence approaches. This study accounts for forecasted future spending whereas the NASI estimates do not. Both NASI and NCCI acknowledge that the percentage of medical spending has been increasing whereas the percentage of indemnity spending has been decreasing for many years and both acknowledge that these trends are likely to continue.[1,18] More recent (2008) data from NCCI suggest the percentage of costs spent on medical care is now approaching 60%.[18]

An earlier study estimates that state and local cases per employee were fewer than private-sector cases per employee.[19] This study suggests just the opposite. Because of a superior method, we believe this study's results are more accurate. The earlier study extrapolated from the BLS CFOI, but fatality rates are not the same as nonfatality rates. This study used actual nonfatal data from 26 states to extrapolate to all 50 states and the District of Columbia. Why cases per employee and percents of days-away-from-work cases are greater for state and local employees than private-sector employees is unclear. It might be that state and local employment is more hazardous than private-sector employment. Alternatively, it might be that record keeping within state and local agencies is better than that in the private sector.

Boden and Ozonoff[20] suggest that workers' compensation systems capture more injuries than the BLS SOII in six representative states: Washington, West Virginia, Oregon, Wisconsin, New Mexico, and Minnesota. The greater percentage captured has not been definitively estimated, however. Nevertheless, in reviewing the Boden and Ozonoff[20] article, Nestoriak and Pierce[21] state that "the SOII and workers' compensation case lists overlap substantially, but not completely: the SOII list covers about 70% of all cases observed by workers' compensation and SOII and the workers' compensation list covers about 81%." One estimate, therefore, would be that SOII counts 86.4% (70/81) as much as or 13.6% less than workers' compensation systems, assuming all of the SOII cases are also counted by workers' compensation. This is likely a high estimate, however; SOII undoubtedly finds some cases that workers' compensation does not. Nevertheless, this SOII undercount of workers' compensation cases is likely a partial explanation for this study's BLS SOII estimate for total benefits being about 7% less than the NASI estimate.

Given the vast amount of data available to NCCI, one might imagine that NCCI itself would generate national estimates for workers' compensation costs. We are not aware of any recent NCCI document that produces such an estimate, however.

There are several implications for the large amount of cost shifting apparent in Table 4. First, because workers' compensation absorbs only roughly 21% of true cost, workers' compensation premiums are "too low." The ability of workers' compensation premiums to perform their economic function as a signal to firms and governments is blocked. When the costs of what economists refer to as an *externality*—in this case, injury and illness—are too low, a greater than optimal amount of the externality will be produced; "the market" will generate a level of occupational injury and illness that is inefficiently too high. Second, equity is undermined. Victims and their families absorb most of the cost shifting. Moreover, "innocent" third parties such as other private non–workers' compensation insurance carriers as well as taxpayers absorb roughly 37% of the amount not paid by workers' compensation. Third, the significant amount of cost shifting illustrates the inadequacy of existing data sets (such as those available from the BLS and SOII) for capturing the true costs of occupational injury and illness.

LIMITATIONS

Constructing cost-of-illness estimates for any disease or injury requires numerous assumptions.[13–15] The most consequential of these for estimating incidence of benefits involved the partitioning BLS categories into "0 days," "1 day," "2 days," "3 to 5 days," and so on into workers' compensation categories for medical-only, temporary total, permanent partial, and permanent total. Because of this limitation, a different estimate was generated that allowed for 75% of the "3 to 5 days" BLS category to be in the medical-only category and 25% in all other indemnity categories. The estimate for medical and indemnity combined was 6.2% less under the assumption of a 75%/25% division than under a 50%/50% division.

There were additional, less consequential, assumptions for the benefits estimate. The BLS SOII does not sample employees on farms with fewer than 11 employees, the self-employed, or other "out of scope" workers such as domestics. However, most of these same workers (eg, self-employed) would not qualify for workers' compensation.[1] The CFOI does not count illnesses. However, illness deaths that are compensated by workers' compensation likely amount to a fraction of 1% of overall workers' compensation costs.[12] Another limitation is that the NCCI data do not contain information from any self-insured firms, and the self-insured firms contributed roughly 24% of all benefits in 2007.[1] We used average, not total costs, from NCCI, so it is not clear whether this limitation would result in an over- or underestimate of total costs. The NCCI *Annual Bulletin* data did not contain information from Wyoming, Washington, North Dakota, or Ohio. To the extent that average costs of injuries in these states differ from the other 46 and the District of Columbia, our estimate will suffer. However, these four states only comprise roughly 6% of the US population.[8] There may be questions involving the assumed percentages of 66.21%, 33.2573%, and 0.5327% of disability cases in the categories of permanent total and partial, permanent partial, and permanent total, respectively. But these assumed percentages were derived from NCCI frequency data and were similar to those described by NASI in their Figure 3.[1] Sengupta et al[1] estimated that 14.7% of all benefits in 2007 were financed through deductibles. The NCCI *Annual Bulletin* does not contain separate data on deductibles, but deductibles are included in the NCCI average cost figures we used in our estimates.

Judgment was used when selecting "third report" over "fifth report" or "first report" data for disabling cases. There is a trade-off. "Fifth report" data would likely contain more accurate figures than "third report" for the fourth and fifth years after the injury. But "fifth reports" would date back to injuries from 2000 to 2001. Medical treatments frequently improve over time and prices rise each year, suggesting that more recent injuries and treatments from 2002 to 2003 ("third reports") would be more accurate. At the other extreme, "first reports" may be problematic for disabling injuries because prognosis for recovery and medical treatment requirements are more fully understood in the second or third year after the injury than in the first. In any case, "first," "third," and "fifth" report data are not widely divergent. "First report" total costs (medical plus indemnity) for the largest category group of states at the bottom of pages in the NCCI 2008 *Annual Bulletin* for fatal, permanent total, and permanent partial were $226,432, $795,470, and $85,629, respectively. For "third report" data, the same categories were $235,186, $800,582, and $76,530. For "fifth reports," the categories were $219,408, $652,693, and $69,151. Finally, additional limitations as well as more thorough discussions of the limitations mentioned earlier are addressed in the appendix for the incidence-based estimate.

The most consequential assumptions for estimating the true costs of occupational injury and illness are addressed in a separate study.[2] These assumptions include 40% of cases never being reported to the BLS; wage replacement rates from 35% for permanent partial disabilities to 55% for temporary total disabilities; ranges for numbers of disease deaths; numbers of injuries that result in cases of osteoarthritis; and employer turnover costs.

CONCLUSIONS

First, this study generates incidence-based estimates of workers' compensation benefits using publically available data from the BLS's SOII, BLS's CFOI, the federal government's Office of Workers Compensation, and NCCI's annual *Statistical Bulletin*. These estimates contain forecasted costs that are necessary for decisions involving returns on investment. Second, this study generates estimates of the extent of cost shifting from workers' compensation to all other payers including injured workers and their families, non–workers' compensation private health insurance, and taxpayers.

REFERENCES

1. Sengupta I, Reno V, Burton JF. *Workers' compensation: Benefits, Coverage, and Costs, 2007*. Washington, DC: National Academy of Social Insurance; 2009. Available at: http://www.nasi.org/sites/default/files/research/Workers_Comp_Report_2007.pdf. Accessed August 16, 2011.
2. Leigh JP. Economic burden of occupational injury and illness in the United States. *Milbank Q*. 2011;89:728–772.
3. Bureau of Labor Statistics. Appendix A. Scope and method of survey. 2009. Available at: http://www.bls.gov/iif/oshwc/osh/os/osh06_appa.pdf. Accessed June 30, 2009.
4. Bureau of Labor Statistics. National census of fatal occupational injuries in 2010: preliminary results. 2009. Available at: http://www.bls.gov/news.release/pdf/cfoi.pdf. Accessed July 31, 2009.
5. Office of Workers' Compensation. Federal injury and illness statistics for fiscal year 2008 (Final). 2009 Available at: http://www.osha.gov/dep/fap/statistics/fedprgms_stats08_final.html. Accessed July 31, 2009.
6. National Council on Compensation Insurance. *Annual Statistical Bulletin, 2008 Edition*. Boca Raton, FL: National Council on Compensation Insurance; 2008.
7. National Council on Compensation Insurance. *About NCCI*. 2009 Available at: https://www.ncci.com/nccimain/pages/default.aspx. Accessed June 30, 2009.
8. US Census Bureau. *Statistical Abstract of the United States, 2007*. Available at: www.census.gov/compendia/statab/2007/2007edition.html. Accessed March 22, 2010.
9. Bureau of Labor Statistics. Consumer price index, medical care index. 2009. Available at: http://data.bls.gov/PDQ/outside.jsp?survey=cu. Accessed June 30, 2009.
10. Bureau of Labor Statistics. Employment cost index. 2009. Available at: http://www.bls.gov/web/echistrynaics.pdf. Accessed June 30, 2009.
11. Hartman M, Martin A, McDonnell P, Catlin A and the National Health Expenditure Accounts Team.. National health spending in 2007: slower drug spending contributes to lowest rate of overall growth since 1998. *Health Aff*. 2009;28:246–261.
12. Leigh JP, Markowitz SB, Fahs M, Landrigan PJ. *Costs of Occupational Injuries and Illnesses*. Ann Arbor, MI: University of Michigan Press; 2000
13. Foster TS, Miller JD, Marton JP, Caloyeras JP, Russell MW, Mensin J. Assessment of the economic burden of COPD in the U.S.: a review and synthesis of the literature. *J Chron Obstr Pulmon Dis.* 2006;3:211–218.
14. Brown ML, Yabroff KR. Economic impact of cancer in the United States. In:Schottenfeld D, Joseph F, Fraumeni JF, eds. *Cancer Epidemiology and Prevention*. 3rd ed. New York, NY: Oxford University Press; 2006
15. Huse DM, Schulman K, Orsini L, Castelli-Haley J, Kennedy S, Lenhart G. Burden of illness in Parkinson's disease. *Mov Disord.* 2005;20:1449–1454.
16. Wong JB, McQuillan GM, McHutchison JG, Poynard T. Estimating future hepatitis C morbidity, mortality, and costs in the United States. *Am J Public Health*. 2000;90:1562–1569.
17. Bodie Z, Kane A, Marcus AJ. *Essentials of Investment*. 6th ed. New York, NY: McGraw-Hill; 2007.
18. Shuford H, Restrepo T. *2009 Research Brief, Winter 2009*. Boca Raton, FL: National Council on Compensation Insurance. Available at: https://www.ncci.com/documents/MedicalBenefits08.pdf. Accessed August 20, 2009.
19. Leigh JP, Marcin JP, Miller TR. An estimate of the US government's undercount of nonfatal occupational injuries. *J Occup Environ Med*. 2004;46:10–18.
20. Boden LI, Ozonoff A. Capture-recapture estimates of nonfatal workplace injuries and illnesses. *Ann Epidemiol*. 2008;18:500–506.
21. Nestoriak N, Pierce B. Comparing workers' compensation claims with establishments' responses to the SOII. *Mon Labor Rev*. 2009;132:57–64.

