Underreporting of Work-Related Injury or Illness to Workers' Compensation: Individual and Industry Factors

Z. Joyce Fan, PhD
David K. Bonauto, MD, MPH
Michael P. Foley, MA
Barbara A. Silverstein, PhD, MPH, CPE

Objective: *We quantified the underreporting of work-related injury or illness to workers' compensation (WC).* ***Methods:*** *Using data from 2612 wage-earning respondents who participated in the 2002 Washington State Behavioral Risk Factor Surveillance System, we assessed work-related injury or illness in the previous year and identified the factors associated with WC claim filing by logistic regression.* ***Results:*** *The self-reported rate of work-related injury or illness of respondents was 13%. Among those who had a work-related injury or illness, 52% filed a WC claim. After adjustment for age, gender, and race, those who filed WC claims were more likely to be overweight and married. WC claim filing varies considerably across industry and occupation groups holding all other measured factors constant.* ***Conclusions:*** *Individual and industry/occupation factors are related to underreporting of work-related injury or illness to the WC system.* (J Occup Environ Med. *2006;48:914–922*)

The social and economic impact of work-related injury is substantial. An estimated 2.5 to 11.3 million workers suffer nonfatal workplace injuries in the United States annually.[1,2] The estimated annual cost is $140 billion.[3] Workers' compensation (WC) data are commonly used to measure rates of work-related injury, to assess trends, and to provide partial wage replacement benefits and reimbursement of medical costs for work-related injury or illness. Yet there is evidence of underreporting of occupational injuries and illnesses to WC systems.[4–7] Studies by Biddle et al[4,8] and Rosenman[6] suggest that 55% to 79% of people who could qualify for WC never file a claim. Using capture–recapture analysis of work-related musculoskeletal disorders (WMSDs) in Connecticut, Morse[9] estimated that only 5.5% to 7.9% of WMSD cases appear to have been reported to WC annually.

Predictors of underreporting include better health status,[4] lesser severity disorder,[5,10] higher annual income,[6] fear of retaliation,[11,12] working in the nonmanufacturing sector,[9] nonunionization,[9,10,13,14] working in small-sized firms,[4,15,16] receiving sick leave or short-term disability benefits from the employer,[4] a belief that pain was a normal consequence of work or aging,[11] possible lack of knowledge on the part of workers of WC systems,[6] and administrative obstacles that discourage injured workers from completing the claim filing process.[17]

Most of the previous reports were limited to particular industries or limited to particular health conditions.

From the Safety & Health Assessment and Research for Prevention (SHARP), Washington State Department of Labor & Industries, Olympia, Washington.

This research was supported in part by the U.S. National Institute for Occupational Safety and Health (U01 OH007292) and the Washington State Department of Labor and Industries.

This content is solely the responsibility of the authors and does not necessarily represent the official views of the funding agency.

Address correspondence to Z. Joyce Fan, PhD, Safety & Health Assessment and Research for Prevention (SHARP), Washington State Department of Labor & Industries, PO Box 44330, Olympia, WA 98504-4330; E-mail: fanj235@lni.wa.gov

DOI: 10.1097/01.jom.0000226253.54138.1e

This analysis appears to be unique in several ways: 1) because we used the Behavioral Risk Factor Surveillance System (BRFSS) to gather information on work-related injury or illness, our samples are more representative of the general working population with work-related injury or illness; 2) we assessed the extent of underreporting in conjunction with the level of self reported injury or illness; and 3) we further identified the individual and industry/occupation factors related to the risk of work-related injury or illness and underreporting of WC claims.

Materials and Methods

Washington State BRFSS 2002

The BRFSS is an ongoing nationwide telephone survey conducted at the state level for noninstitutionalized civilian adults aged 18 and older. The system was established in 1984 by the Centers for Disease Control and Prevention (CDC) in conjunction with state health departments.[18] The BRFSS collects information from adults on health behaviors and preventive practices related to several leading causes of death. The BRFSS questionnaire is designed to include a core set of questions used by all states and an additional set sponsored by each state that may be derived from optional modules developed by the CDC or other appropriate sources. In 2002, there were 18 CDC core questions, including "demographics," "health status," "healthcare access," "tobacco use," and "firearms."[19] Washington state implemented 12 modules, including "healthy days" and "workers compensation coverage." The "workers compensation coverage" gathered information on work-related injuries or illness and WC claim filing among those reporting work-related injury or illness.[20]

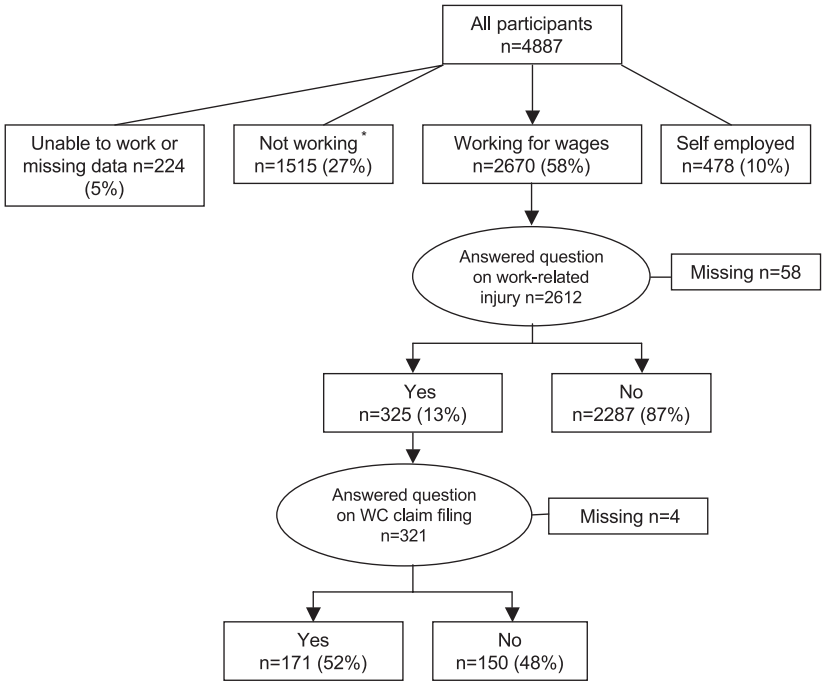
Study Population

Using the BRFSS 2002 core questionnaire, we defined working adults as those who were "currently employed for wages" or "out of work for less than a year." Of the 4887 participants in Washington State BRFSS 2002, 3148 (64%) were working adults at the time of the survey (Fig. 1). Among them, 2670 (85%) reported working for wages and 478 (15%) were self employed. Because the self-employed typically do not have WC coverage, we excluded them from this analysis. A total of 2612 respondents (85% of working adults and 55% of the survey population) answered the questions in the Washington State BRFSS added "workers compensation coverage" and were used for estimation of self-reported work-related injury or illness. We assessed WC claim filing among the 321 respondents reporting work-related injury or illness. Compared with the excluded survey participants, these 321 injured or ill workers were 2 years younger than those who were currently working for wages but did not report work-related injury or illness (n = 2287), 10 years younger than the self-employed (n = 478), and 16 years younger than the nonworking adults on the survey (n = 1797).

Study Variables and Measures

We defined work-related injury or illness as an affirmative answer to the question "In the past 12 months, have you been injured while performing your job, OR has a doctor or other medical professional told you that you have a work-related illness?" Among those reporting work-related injury or illness on survey, we defined WC claim filing as an affirmative answer to the question of "Who paid for your treatment?" with "workers compensation or L&I," "federal government (OWCP program)," "your employer through a workers' compensation claim," or "claim filed, still in process or not resolved." We also included among claim filers those who respondent to the question of "why not paid" with "rejected WC claims."

Workers' individual factors such as demographics, lifestyle, and health status that could be predictive factors or confounders to work-related in-



*Out of work for more than 1 yr (71), home maker (373), student (146) and retired (925).

Fig. 1. Establishment of the study population, Washington State BRFSS 2002. Data are reported as weighted percent.

jury or illness and filing WC claims were chosen from the BRFSS 2002 questionnaire. From the BRFSS 2002 *core* questionnaire, we obtained workers' demographic characteristics, including age, gender, race, education attainment, income, weight, height, marital status, and having children in the household. We also obtained lifestyle characteristics such as current smoking status and binge drinking (consuming five or more drinks on one or more occasion in the past 30 days) and (possession of) firearms, and health status on comorbid conditions of asthma or diabetes ("Have you ever been told by a doctor, nurse, or other health professional that you had . . ."), self-rated general health (poor, fair, good, very good, and excellent), and healthcare coverage ("Do you have any kind of health care coverage, including health insurance, prepared plans such as HMOs, of government plans such as Medicare?"). Body mass index (BMI) was calculated as weight in kilograms divided by height squared measured in meters.

From the Washington State added topic of "healthy days," we obtained data on other health status measures, including unhealthy physical days, unhealthy mental days, and activity limitation days because of health conditions (during the past 30 days).

We used self-reported business/industry ("What kind of business or industry do you work in?") and job title (or the answers on "What kind of work do you do?") for industry and occupation coding, respectively. Industry and occupation were coded and grouped based on the National Center for Health Statistics Instruction Manuals[21] and Standardized Occupation and Industry Coding[22] using the same industry/occupation coding format as is used for the Bureau of Labor Statistics (BLS) survey.

Data Analysis

We conducted descriptive analyses (calculated means and frequencies) to compare differences across groups. We used multivariable logistic regression analyses to evaluate the relationship between filing a WC claim and individual or industry/occupation factors. Preliminary regression models were developed for each variable to obtain the crude odds ratio (OR), odds of a person reporting work-related injury or illness having a particular individual characteristic compared with those with no injury or illness and odds of filing WC claims compared with those who did not file. Reference group of the categorical variables in the logistic regression was chosen as the one with the lowest proportion of self-reported injury or illness, that is, the lowest risk group. Based on these preliminary estimations, we considered all variables with a P value of <0.20 for inclusion in models that controlled for several variables simultaneously. The adjusted OR was obtained in the final multivariable logistic regression models, which kept only the significant factors and controlled for individual's age, gender, and race. Selected interactions were tested but none were found to affect the predictive power of the final models. Wald tests were conducted for pairwise comparisons on the differences among the industry groups and the occupation groups in the final models.

All of the analyses were weighted on the probability of selection and adjusted for nonresponse and disproportionate sampling of subgroups relative to the state's population distribution.[23] STATA SE 8.2[24] was used to account for the BRFSS' complex sampling design. Statistical inferences were based on a significance level of P (two-sided) <0.05.

Results

The proportion of respondents with self reported work-related injury or illness was 13%. Overall, 52% of the 321 workers reported work-related injury or illness on the survey filed WC claims.

When asked why they did not file WC claims, 30 (20%) workers reported their medical costs were paid by their "employer without a workers compensation claim or through on-site medical treatment," "military, veterans' administration, or CHAMPUS," "Medicare, Medicaid, or Uniform Medical Plan," or "the union," 120 (80%) workers were paid by "private insurance," "family," or "no one paid; no treatment." Of these 120 workers, 107 answered the question of "why not paid" (by WC claims or the previously listed sources) and gave the following reasons: 17 "did not know that they could file," eight "worried about retaliation" or "felt threatened by employer/employer would not support," and 82 for "other reasons" or "no reason given."

Individual Factors

Table 1 contains the weighted proportion of all respondents in the survey who were working for wages, the proportion who did not sustain a work-related injury or illness, as well as the proportion who filed or did not file WC claims among those reporting work-related injury or illness.

The individual factors that were directly associated with the odds of having a work-related injury or illness included being younger (18–34 vs 55+), being American Indian (vs white), having less education (high school vs more than high school), earning a lower income ($25–50 k vs >$50 k), not being married (married being protective), being a current smoker, reporting binge drinking, having loaded firearms at home, and having asthma (crude OR and 95% confidence interval [CI]; Table 2). Having a work-related injury or illness was associated with poorer health status. This was reflected as the odds of reporting 1) self-rated "fair" or "poor" general health as opposite to "good" or "better" health, and 2) unhealthy (physical and mental) days $\geq$14 days in the past 30 days (Table 2).

Among those who reported having a work-related injury or illness, the individual factors that were directly

TABLE 1
Self-Reported Work-Related Injury or Illness and Workers' Compensation (WC) Claim Filing by Individual Characteristics, Washington Behavioral Risk Factor Surveillance System 2002*

Percent	All, Working for Wages (N = 2612)	No Injury (n = 2287)	Injury: No WC Claims (n = 150)	Injury: Filed WC Claims (n = 171)
Age (yrs)				
18–34	39	38	49	42
35–54	50	50	44	48
≥55	11	12	7	10
Gender				
Male	53	47	54	60
Female	47	53	46	40
Race				
White	88	88	85	84
American Indian	2	2	2	6
Others	10	10	13	10
Education				
Less than high school	6	6	6	7
High school	26	25	31	36
More than high school	68	69	63	57
Income				
<$25 k	16	16	19	19
$25–50 k	34	33	45	34
>$50 k	50	51	36	47
Body mass index (kg/m^2)				
<25.0	43	44	49	30
≥25.0	57	56	51	70
Marital status				
Married	42	41	38	61
Not married	58	59	62	39
Having kids in household				
Yes	47	47	48	52
No	53	53	52	48
Current smoking status				
Yes	52	47	58	51
No	48	53	42	49
Binge drinking risk factors				
Yes	20	18	34	23
No	80	82	66	77
Having loaded firearms at home				
Yes	4	4	5	8
No	96	96	95	92
Asthma				
Yes	13	12	17	22
No	87	88	83	78
Diabetes				
Yes	4	4	3	6
No	96	96	97	94
General self-rated health				
Fair or poor	8	7	10	14
Good or better	92	93	90	86
Healthcare coverage				
Yes	87	88	81	86
No	13	12	19	14
Unhealthy days (physical), mean				
≥14 d	6	5	10	15
<14 d	94	95	90	85
Unhealthy days (mental), mean				
≥14 d	8	7	17	12
<14 d	92	93	83	88

*Percentages were weighted to population characteristics. Missing data were excluded from denominator.

associated with the odds of filing WC claim were being overweight or being married (crude OR and 95% CI; Table 2).

The independent effect of younger age and American Indian race on self-reported work-related injury or illness became insignificant when other predictors were in the model. Because age, gender, and race were used in the BRFSS weighting formula, they were kept in the final models as important population characteristics. In the final multiple logistic regression analysis, after adjustment for age, gender, and race, the individual factors of middle level income ($25–$50 k), binge drinking, having loaded firearms at home, having asthma, and having mentally ≥14 unhealthy days over the previous 30 days continued to be significantly associated with reporting work-related injury or illness. Individual factors associated with increased WC claim filing include having a BMI ≥25 and being married (adjusted OR and 95% CI; Table 2).

The impact of several individual factors on the odds of having a work-related injury or illness and the odds of filing a WC claim worked in opposite directions. Compared with workers who were not married, those who were married appeared to be less likely to report having a work-related injury or illness (crude OR = 0.7, 95% CI = 0.5–0.9) but they were more likely to file WC claims (crude OR = 2.5, 95% CI = 1.4–4.4) (Table 2). Similarly, younger (<35 vs 55+, and 35–54 vs 55+), middle-level income ($25–50 k vs $50 k+), current smokers, and binge drinkers were more likely to have an injury but were less likely to file claims, although the crude odds ratios for these factors were not statistically significant. By the same token, having worse health status, except for unhealthy mental days, was generally associated with higher WC claim filing. Injured or ill workers were more likely to have ≥14 unhealthy mental days (during the 30-day period) than those uninjured (Table 2).

TABLE 2
Logistic Regression on the Likelihood of Self-Reporting Work-Related Injury or Illness and Workers' Compensation (WC) Claim Filing, Washington Behavioral Risk Factor Surveillance System 2002

	Crude OR (95% CI)*		Adjusted OR (95% CI)†	
	Reporting Work-Related Injury or Illness	Filed WC Claims	Reporting Work-Related Injury or Illness	Filed WC Claims
Age (yrs)				
18–34 vs 55+	1.6 (1.0–2.5)	0.6 (0.3–1.4)	1.4 (0.8–2.3)	0.8 (0.3–2.2)
35–54 vs 55+	1.2 (0.8–1.9)	0.7 (0.3–1.6)	1.3 (0.8–2.3)	0.7 (0.3–1.9)
Gender				
Male vs Female	1.2 (0.9–1.6)	1.3 (0.7–2.3)	1.1 (0.7–1.5)	0.9 (0.4–1.8)
Race				
American Indian vs white	2.2 (1.1–4.6)	4.1 (0.8–20.7)	1.9 (0.8–4.5)	2.5 (0.4–15.3)
Others vs white	1.2 (0.7–2.0)	0.7 (0.2–2.0)	1.1 (0.6–2.0)	0.7 (0.3–1.9)
Education				
Less than vs >high school	1.2 (0.7–2.1)	1.2 (0.4–3.4)	—	—
High school vs >high school	1.5 (1.1–2.2)	1.3 (0.7–2.5)		
Income				
<$25 k vs >$50 k	1.4 (0.9–2.2)	0.8 (0.3–1.9)	1.2 (0.6–2.1)	—
$25–50 k vs >$50 k	1.5 (1.1–2.1)	0.6 (0.3–1.1)	1.5 (1.1–2.2)	
Body mass index (kg/m^2)				
≥25.0 vs <25.0	1.2 (0.9–1.6)	2.3 (1.3–4.0)	—	2.2 (1.2–4.0)
Marital status				
Married vs not married	0.7 (0.5–0.9)	2.5 (1.4–4.4)	—	2.8 (1.5–5.0)
Having kids (<18 yrs) in household				
Yes vs no	1.1 (0.8–1.5)	1.2 (0.7–2.0)	—	—
Current smokers				
Yes vs no	1.7 (1.3–2.4)	0.8 (0.5–1.5)	—	—
Binge drinking				
Yes vs no	1.8 (1.3–2.6)	0.5 (0.3–1.0)	1.9 (1.2–2.8)	—
Having loaded firearms at home				
Yes vs no	2.0 (1.2–3.4)	2.6 (0.8–8.1)	2.3 (1.3–4.0)	—
Asthma				
Yes vs no	1.7 (1.1–2.7)	1.4 (0.7–2.7)	2.0 (1.3–3.1)	—
Diabetes				
Yes vs no	1.3 (0.7–2.5)	1.9 (0.6–6.2)	—	—
General self-rated health				
Fair or poor vs good or better	1.9 (1.2–3.0)	1.5 (0.6–3.5)	—	—
Having any healthcare coverage				
No coverage vs having coverage	1.5 (1.0–2.2)	0.7 (0.3–1.5)	—	—
Unhealthy days (physical)				
≥14 d vs <14 d	1.7 (1.8–4.3)	1.6 (0.7–3.5)	—	—
Unhealthy days (mental)				
≥14 d vs <14 d	2.3 (1.5–3.6)	0.7 (0.3–1.4)	2.4 (1.4–4.0)	—
Industry				
Finance, insurance, real estates (referent)	—	—	—	
Public administration	3.3 (1.2–8.7)	4.5 (0.4–46.5)	3.5 (1.2–10.4)	
Construction	6.0 (2.2–15.9)	3.7 (0.4–37.5)	4.5 (1.5–13.6)	
Manufacture	3.8 (1.4–9.8)	8.6 (0.8–90.3)	3.7 (1.3–10.9)	—
Transportation	4.0 (1.4–11.6)	10.6 (0.8–40.6)	3.3 (1.0–10.3)	
Wholesale trade	1.5 (0.4–5.7)	3.5 (0.2–69.1)	1.6 (0.3–7.0)	
Retail trade	3.1 (1.2–8.3)	5.1 (0.5–54.1)	3.2 (1.1–9.4)	
Agriculture, forestry, fishing	7.3 (1.9–28.5)	3.9 (0.2–67.4)	8.9 (2.2–36.1)	
Services	3.1 (1.3–7.6)	3.5 (0.4–33.0)	3.1 (1.1–8.4)	
Occupation				
Managerial, professional specialty (referent)	—	—		—
Technical, sales, administrative support	1.1 (0.7–1.7)	2.4 (1.0–5.8)		2.3 (0.9–5.7)
Services	3.3 (2.0–5.6)	3.2 (1.20–8.5)	—	4.3 (1.7–11.1)
Farming, forestry, fishing	4.8 (1.6–14.3)	1.7 (0.3–11.5)		2.9 (0.5–15.9)
Precision, craft, repair	3.7 (2.3–6.0)	3.4 (1.5–8.0)		3.7 (1.4–9.4)
Operators, fabricators, laborers	2.3 (1.4–3.7)	2.6 (1.1–6.4)		3.3 (1.2–9.5)

*Odds ratios (95% confidence intervals) are reported as weighted population characteristics.
†Adjusted for age, gender, and race.
OR indicates odds ratio; CI, confidence interval.

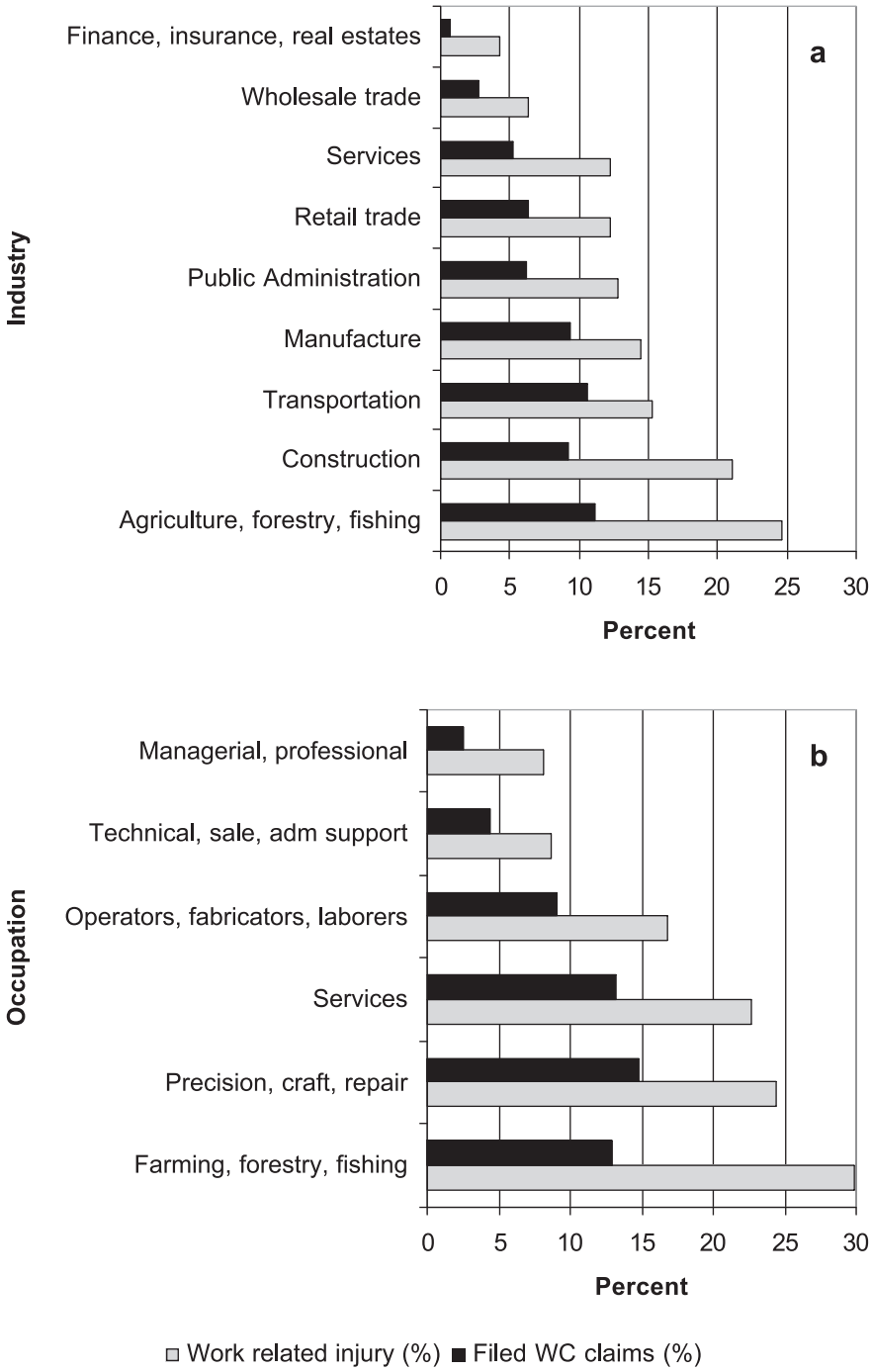


Fig. 2. Self-reported work-related injury or illness in the previous year among respondents working for wages (n = 2612) and workers' compensation claim filing among injured or ill workers (n = 321) by (A) industry and (B) occupation groups. Data are reported as weighted percent.

Industry/Occupation Factors

Self-reported work-related injuries or illnesses ranged from 4% to 25% across the industry groups and 8% to 30% across the occupation groups (Fig. 2). The corresponding weighted proportions for WC claim filing among the injured or ill workers were 18% to 69% and 31% to 61%, respectively. Several occupation and industry groups reported a higher proportion of work-related injury or illness but lower WC claim filing (Fig. 2). By industry, agriculture/forestry/fishing and construction ranked higher in reporting work-related injury or illness and lower in WC claim filing. By occupation, farming/forestry/fishing ranked the highest in reporting work-related injury or illness and second lowest in WC claim filing.

The odds of having a work-related injury or illness by industry groups were similar in both univariate and multiple logistic regression estimations. As indicated in Table 2, compared with finance/insurance/real estate, the lowest risk group in this analysis, the odds of having a work-related injury or illness were significantly higher for all but the wholesale trade group (adjusted OR and 95% CI). Wald tests on differences between industry groups indicated that the odds of work-related injury or illness were significantly higher in agriculture/forestry/fishing relative to wholesale trade ($P = 0.0247$) and services ($P = 0.0490$). Construction, manufacturing, public administration, transportation, and retail trade were similar in the odds of reporting work-related injury or illness (Wald tests, $P > 0.05$).

The odds of WC claim filing differed by occupation groups but not by industry groups as indicated in the final adjusted multiple logistic regression analysis. Compared with the managerial/professional specialty, which had the lowest WC claims rate, the odds of filing WC claims were significantly higher in services, precision/craft/repair, and operators/fabricators/laborers after the same adjustment (Table 2, adjusted OR and 95% CI). There were no pairwise differences in odds of filing WC claims among the occupation groups of services, precision/craft/repair, and operators/fabricators/laborers (Wald tests, $P > 0.05$).

Discussion

We assessed underreporting of work-related injuries or illnesses to the WC system among Washington state workers using the BRFSS 2002 survey. Among the 321 workers reporting any work-related injury or illness in the previous year, 52%

reported filing WC claims. This is higher than the previous population-based studies, which were limited to WMSDs,[6,8,25] but similar to results by another state-based population survey.[25] In a cross-sectional study, Rosenman et al reported that of 1582 of unionized Michigan autoworkers who were diagnosed with WMSDs, 25% filed WC claims.[6] In a population-based telephone survey of 292 Connecticut workers reporting WMSDs, only 11% of workers filed WC claims.[8] The Oregon Population Survey (OPS) 2002 reported that 46% of the injured or ill workers did not file a WC claim[25]; however, the OPS data included self-employed workers, who were excluded from our study. Other studies of workers who qualified for WC reported filing percent ranges of 9% to 45% in the United States[4] and 65% in Canada.[10] Despite the differences in study design and survey population, this analysis complement and support the previous findings on overall WC underreporting.

This study provides new perspectives on population-based work-related injury or illness and WC claim filing. The study has multiple strengths in determining underreporting to WC. First, our samples are representative of the general working for wages population in Washington. Our data are comparable to the proportions of industry and occupation groups of the current population survey conducted by the Department of Census for the BLS.[26] Second, BRFSS information has been validated and has been used to track changes in behavior and measure progress toward achieving national, state, and local public health objectives. Third, we identified several demographic- and employment-related factors associated with the risk of work-related injury or illness and the demographic characteristics related to the likelihood of underreporting to the WC system.

The most significant individual factors associated with WC claim filing in this analysis were having BMI $\geq$25 kg/m^2 and being married. To our knowledge, overweight or obesity as a predictor of WC claim filing has not been reported before. Poor health has been reported as a predictor of WC claim filing.[4,5] Although the variable "fair or poor general health" itself was not significantly associated with WC claims in this analysis, overweight or obese workers reported having worse general health compared with those with normal weight ($P = 0.004$). Moreover, this analysis suggested that BMI appeared to be functioning as a surrogate measure of behaviors such as having loaded firearms at home and current smoking. Additional analyses indicated that the odds of having loaded firearms at home was approximately twofold higher for those having BMI $\geq$25 kg/m^2 (crude OR = 1.9, 95% CI = 1.3–2.9). The odds of being a current smoker for those having BMI $\geq$25 kg/m^2 was 0.8 (95% CI = 0.6–1.0). Although the results suggested that the current smokers tend to have lower BMI and were less likely to file claims (Table 2), neither having loaded firearms nor currently smoking, nor the interaction terms of these two variables with BMI, were significantly associated with the odds of WC claims filing in the multivariate logistic regression adjusting for age, gender, and race.

This analysis also suggests that those who were not married (including divorced) were more likely to report having had a work-related injury or illness but were less likely to file claims. This is similar to the previous report by Morse,[8] although Morse's study did not explore factors for WC claims. Moreover, compared with workers who had health coverage, those without health coverage were more likely to report having an injury but were less likely to file a claim (Table 2). Although this association was not statistically significant, the direction of the effect is worth noting. Because WC pays for lost wages and medical expenses, failure to submit a WC claim means that the cost of medical treatment is shifted from employers to other sources, both public and private. In the case of Medicaid payment, the burden would eventually shift to the general public, the taxpayers. For example, low income was associated with reporting work-related injury or illness (Table 2), yet health insurance coverage among the low-income workers was much less than for the higher income workers ($P < 0.0001$) (66%, 88%, and 97% with annual income of <$25 k, $25–50 k, and >$50 k, respectively). The impact of failure to claim benefit among the low-income population should not be overlooked.

Underreporting to plant medical departments has been documented in the meat processing[27] and automotive industries,[7] although the reasons for underreporting were not explored in these studies. Conceptual filters[17] may explain underreporting to the WC systems and then likely may depend on the predictors evaluated in this study. Although overall, there was no statistical significant relationship of WC claim filing and industry group, due to the limited sample size, it is important to note the industry groups with higher risk of injury and lower WC claim filing. Manufacturing had the second highest proportion of reporting work-related injury or illness but middling in WC claim filing. This was different than previous studies of WMSDs, in which cases in manufacturing had a high rate of filing.[14] The final adjusted logistic regression model suggested that occupational groups in services were more likely to file a WC claim compared with the reference group of managerial/professional. Services include hospital workers such as dental assistants, health aides, executive nursing, and nursing aides/orderlies. The sample size did not allow for further estimation of WC claim underreporting of hospital workers.

WC laws vary by state.[28] In Washington state, a physician and worker initiate a WC claim by filing a report

of accident (ROA) form. The workers' employer completes an employer ROA form when they are notified of a physician and worker ROA filing. An occupational injury claim must meet the following criteria to be accepted in Washington WC system: 1) a physician must present an opinion that work conditions, on a "more probable than not basis" (a greater than 50% chance), are the cause of illness or have temporarily or permanently aggravated a preexisting condition; *and* 2) objective medical findings must support the diagnosis; *and* 3) the disease must arise "'naturally and proximately out of employment."[29] The impact of differing state WC laws on claim filing for injured workers deserves consideration when attempting to generalize these findings. The BRFSS module used in this study is adaptable for use in other states. Administration of this BRFSS module in multiple states would allow a comparative determination of occupational injury and illness rates, and the degree of underreporting of occupational injury and illness across states' WC systems.

Some limitations of our study should be noted. This study is limited by its cross-sectional design. Although some associations are evident, it is difficult to understand the direction of causality.

The reasons for not reporting in this analysis included not knowing about WC coverage (16%) and fear of retaliation (8%). These were also noted in previous studies.[6,12] Low-severity injuries could be another reason. Biddle and Roberts,[5] using body site-specific disability indices, and Shannon,[10] using injuries that involve time off from work as a measure of injury severity, reported more claim filing among those who were more severely injured. Lacking the knowledge of injury type or severity of the injury or illness could result in an overestimation of underreporting.

Another limitation is the ascertainment of eligible cases by the WC system. We defined work-related injury or illness based on either the workers' own perception of having an injury at work or "told" by "a doctor or other medical professional" in the past 12 months. There was no further affirmation on whether a loss of work time or lighter job duty was involved. As reported by Oleinick[30] in Michigan, the number of "days away from work" cases ascertained by the BLS' annual Survey of Occupational Injuries and Illness is approximately 92% to 97% concordant with the number of WC claims during 1992–2000. Our analysis, without ascertainment of cases with days away from work, indicates that approximately one half of the workers in the full sample attempted to make use of the WC system.

Our analysis indicates that individual and industry/occupation factors are related to underreporting of work-related injury or illness to WC system. The extra burden for those workers who were more likely to be injured or ill at work but less likely to file WC claims suggested that stronger surveillance and focused surveys on these high-risk groups should be implemented.

Acknowledgment

The authors thank Dr Katrina Simmons for assistance in obtaining the data from Washington State Department of Health. The authors also thank Darrin Adams for technical assistance in obtaining data from the Current Population Survey and Christy Curwich for assistance in developing the Washington added questionnaire of the "Workers Compensation Coverage."

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