

Surveillance of Occupational Skin Diseases: A Method Utilizing Workers' Compensation Claims

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In order to determine the feasibility of using workers' compensation claims (WCC) for surveillance of occupational skin diseases, we reviewed all WCC received in the state of Ohio from 1980 through 1984. A total of 4,214 WCC for occupational skin diseases were filed by 2,610 Ohio companies, of which 1,656 (63%) companies were classified in Standard Industrial Classification (SIC) categories with average annual WCC rates above the overall state average for skin diseases. During the five year study period, 102 companies filed six or more WCC, of which 85 (83.3%) companies were classified in SICs with above-average WCC rates. WCC from 65 (63.7%) of these 102 companies implicated either the same occupation or causal agent in 50% or more of WCC received from each respective company. Using SIC classifications with WCC rates above the state average and six or more filed WCC as measures of risk, there was good correlation between company risk ranking by SIC categorization and number of WCC filed. This study suggests that active intervention strategies to prevent occupational skin diseases can be based on primary identification of companies filing WCC, followed by secondary identification of high-risk occupations or causal agent exposures within these companies.

Key words: surveillance, occupational skin disease, prevention strategies, Bureau of Labor Statistics

INTRODUCTION

Occupational skin diseases have consistently accounted for approximately 40% of all occupational illnesses recorded in the Bureau of Labor Statistics (BLS) Annual Survey of Occupational Injuries and Illnesses; approximately 6.3 out of every 10,000 private sector workers in the United States experienced work-related skin diseases in 1984 [Centers for Disease Control, 1986]. Annual costs attributable to occupational skin diseases, based on lost worker productivity, medical fees, and disability payments, have been estimated at between 222 million and one billion dollars [Mathias, 1985].

Although the BLS Annual Survey is useful for monitoring occupational illness

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trends, it does not specifically identify affected workers, employers, occupations, or causal agents. Workers' compensation claims (WCC), on the other hand, provide detailed information on employees, employers, occupations, and causal agents which could potentially be utilized to develop active intervention strategies. In order to determine the feasibility of such an approach, we have reviewed all WCC filed in the State of Ohio for the five year period 1980 through 1984.

METHODS

Description of Data Base

Ohio law requires that all employers carry Workers' Compensation insurance coverage for all full-time and part-time employees. The state provides this coverage through an exclusive state fund (Ohio insured, OI); large corporations meeting minimum state employment criteria are given the option of providing their own workers' compensation coverage (self-insured, SI), thus exempting themselves from the state plan. Employees of OI companies are required to file all claims for occupational injuries and illnesses with the Ohio Bureau of Workers' Compensation, but SI companies are only required to file those claims which involve greater than seven (GT 7) lost workdays (LWD). However, some SI companies opt to file all their claims with the Bureau to facilitate their record keeping, irrespective of the number of LWD. Thus, total WCC for occupational skin diseases are likely to be underreported from SI companies compared to OI companies in this data file, but the extent of underreporting cannot be directly ascertained.

The Division of Safety and Hygiene (DSH) of the Industrial Commission of Ohio was created to investigate and prevent industrial accidents and diseases. The DSH maintains a yearly record of lost-time occupational injury and illness claims filed with the Bureau of Worker's Compensation. For occupational diseases, this data base contains detailed information derived from WCC which involved at least one LWD prior to 1983 and all WCC, irrespective of LWD, since 1983. The variables in this data base for which detailed information exists include age, sex, occupation, employer, Standard Industrial Classification (SIC) of the employer, nature of the injury or illness, causal agents, affected body part(s), and LWD dichotomized as less than or equal to seven days (LT 7) or GT 7. The data base does not contain information on the employment size of the companies filing WCC.

SIC Claims Rates and Relative Rankings

We identified WCC for occupational skin diseases filed in Ohio during the five year period 1980 through 1984 by using nature of illness codes for dermatitis as specified in this data base. This approach identified all WCC for occupational skin diseases except those for skin cancer, which were filed under a general nature code for cancer of all types.

Companies reporting claims were stratified by industry at the two-digit Standard Industrial Classification (SIC) level [Statistical Policy Division, Office of Management and Budget, 1972]; the WCC for occupational skin diseases filed during the study period were totalled within each SIC. In order to adjust for probable underreporting of LT 7 LWD claims by SI companies, we multiplied the GT 7 LWD claims for SI companies by the ratio of LT 7 LWD to GT 7 LWD claims for the OI companies within the same SIC to obtain an expected number of LT 7 LWD claims.

Whenever this expected number exceeded the LT 7 LWD claims actually reported by the SI companies, the total claims for the SIC were increased by this difference. In the event that total GT 7 LWD claims for OI companies within any SIC were five or fewer, we deemed the SIC specific adjustment to be unreliable and adjusted the SI claims with the overall LT 7 to GT 7 ratio for OI companies combined across all SICs.

We obtained average annual employment estimates for each two-digit SIC from the Ohio Bureau of Employment Services for each year of the five year study period. These estimates were based on numbers of workers whose unemployment benefits were covered under Ohio Unemployment Compensation Law. These employment estimates probably underestimate the number of employees covered by Workers' Compensation. However, the degree of underestimation is probably small except for agriculture, where many more employees of small farms are likely to be covered by Workers' Compensation, but not by unemployment compensation.

Average annual WCC rates for occupational skin diseases within each SIC stratum were calculated by dividing total claims (after adjusting for underreporting by SI companies) by total employment estimates within each SIC for the entire five year study period, and then expressing per 10,000 employees. Relative rankings of SICs were then determined based upon these calculated rates. Hazard rankings of Ohio private sector SIC industries (i.e., SIC 01 through 89) were compared to hazard rankings based on national private sector incidence rates from the 1984 BLS Annual Survey [Mathias and Morrison, 1988] by using a Spearman rank correlation coefficient test.

Risk Assessment by SIC and Number of Claims

Companies filing WCC for occupational skin diseases were stratified by both SIC and number of claims filed. Since company specific employment denominators were not available, we considered all companies classified in SICs with above-average WCC rates to have high risk. We also considered those companies which filed six or more WCC during the five year study period (i.e., averaging more than one WCC per year) to have high risk. We included SI companies with three or more GT 7 LWD claims in this latter high-risk group since LT 7 LWD claims were probably underreported by some SI companies; we estimated the extent of this underreporting to be 1.5 times the number of GT 7 LWD claims. We measured the association between these two measures of risk by using a Mantel-Haenszel chi square test, stratified by type of insurance plan (OI vs. SI).

Risk Assessment by Occupation and Causal Agent

For companies which filed six or more WCC during the study period, we determined the number whose WCC involved either the same occupations or causal agents in 50% or more of claims. This analysis was performed at the most detailed level for which this information was coded in the data base.

RESULTS

SIC Claims Rates and Relative Rankings

From 1980 to 1984, a total of 4,214 WCC for occupational skin diseases were filed by 2,242 OI and 368 SI Ohio companies. Average annual employment in Ohio for this same period was approximately four million workers. After adjusting for

probable underreporting of an estimated 573 LT 7 LWD claims by SI companies (Table I), the overall average annual WCC rate for occupational skin diseases in Ohio was 2.4 per 10,000 workers for all industries combined. Excellent agreement was obtained when the relative risk rankings of Ohio private sector SIC industries based on average annual WCC rates were compared to the relative rankings of U.S. private sector SIC industries based on incidence rates in the 1984 BLS Annual Survey (Fig. 1, Spearman rank correlation coefficient = 0.79, $p = 0.0001$).

Risk Assessment by SIC and Number of Claims

As company-specific employment figures were not available in the WCC data file, we used the relative rankings of the average WCC rates for the SICs in which reporting companies were classified (Table I) as one measure of risk. This ranking was compared to a second measure based upon the number of WCC filed by reporting companies (Table II). WCC for occupational skin diseases were received from a total of 2,610 Ohio companies, of which 1,656 (63%) were classified in SICs with average annual WCC rates above the state average. Among all reporting companies, 102 filed six or more WCC. Eighty-five (83%) of these 102 companies were classified in SICs with average annual claim rates above the overall Ohio state average, but these comprised only 5% of the 1,656 Ohio companies with above-average annual rates. On the other hand, 98% of the companies in low-risk SICs had fewer than six claims. As the median number of claims per company during the study period was one, the use of less stringent criteria as a cut point (e.g., \geq five claims) made little impact on the sensitivity or positive predictive value. A test of homogeneity did not reveal any significant differences between proportions based on type of insurance plan.

Risk Assessment by Occupation and Causal Agent

The same occupations or the causal agents were implicated on 50% or more of WCC from 65 (63.7%) of the 102 respective Ohio companies filing six or more WCC. There were no significant differences between proportions based on the type of insurance plan (Table III, chi square = 1.9, $p = 0.17$).

DISCUSSION

WCC data have been utilized for statistical descriptions of occupational skin diseases. California data based on WCC have related causal agent groups to general industries of employment for occupational skin diseases [Occupational Disease Statistics Unit, Division of Labor Statistics and Research, 1982]. Researchers from the National Institute for Occupational Safety and Health (NIOSH) have previously demonstrated good agreement between cutaneous hazard rankings for industries based on estimated incidence rates in the Supplementary Data System, a national data base of occupational safety and health statistics derived from WCC [O'Malley et al., 1988], and hazard rankings in the BLS Annual Survey. The feasibility of using WCC for surveillance of occupational lead poisoning followed by identification of high-risk companies has been demonstrated [Seligman et al., 1986].

Incidence rates for occupational skin diseases based on WCC probably do not measure true incidence rates and are not directly comparable to incidence rates reported in the BLS Annual Survey. WCC are not filed unless payment for medical treatment by a physician is necessary. Occupational skin diseases recorded in the

TABLE 1. Workers' Compensation Claims (WCC) Rates and Relative Rankings for Occupational Skin Diseases by Standard Industrial Classification (SIC), "Top 20" Ohio Companies, 1980-1984

Rank	SIC	Title	Average annual claims rate ^a	WCC, total and adjusted ^b	State insured companies ^c	Self-insured companies ^d
1	08	Forestry	424.1	5 (2)	4	1
2	93	Public Finance, Taxation, Monetary Policy	21.9	65	27 (3)	0
3	01	Agricultural Production—Crops	17.0	60	29 (2)	0
4	07	Agricultural Services	14.2	75 (11)	50 (1)	2
5	95	Administration of Environmental Quality & Housing Programs	9.3	62	28 (4)	0
6	91	Executive, Legislative & General Government	8.8	144	97 (2)	0
6	16	Construction Other Than Building—General Contractors	8.8	96	79	0
8	31	Leather & Leather Products	8.6	20 (3)	5	3 (1)
9	34	Fabricated Metal Products, Except Machinery & Transportation Equipment	7.1	449 (60)	214 (4)	40 (8)
10	38	Measuring, Analyzing & Controlling Instruments; Photographic, Medical, & Optical Goods	6.7	67 (3)	31 (1)	2
11	30	Rubber & Miscellaneous Plastics Products	6.1	216 (50)	84 (3)	20 (3)
12	32	Stone, Clay, Glass, & Concrete Products	5.5	106 (50)	50 (1)	14 (3)
13	25	Furniture & Fixtures	5.3	35 (4)	21	4
13	28	Chemicals & Allied Products	5.3	156 (17)	57 (4)	12 (2)
15	39	Miscellaneous Manufacturing Industries	5.0	34	17	3
16	41	Local & Suburban Transit & Interurban Highway Passenger Transportation	4.9	9 (5)	1	2 (1)
17	35	Machinery, Except Electrical	4.6	341 (66)	147 (2)	55 (7)
18	20	Food & Kindred Products	4.4	107 (40)	56	19 (2)
19	44	Water Transportation	4.3	3 (5)	0	1 (1)
20	36	Electrical & Electronic Machinery, Equipment, & Supplies	3.9	159 (30)	58 (2)	21 (5)
21-71	All Other SICs		1.6	2,006 (548)	1,187 (16)	169 (29)
Totals	All SICs		2.4	4,214 (573)	2,242 (45)	368 (57)

^aExpressed per 10,000 employees, after adjusting for estimated underreporting of WCC by self-insured companies.

^bAdditional estimated WCC not reported by self-insured companies are enclosed in parentheses (WCC with seven or fewer lost workdays).

^cAll companies filing WCC. Companies filing ≥ 6 claims are enclosed in parentheses.

^dAll companies filing WCC. Companies filing ≥ 3 WCC with at least seven lost workdays are enclosed in parentheses.

Ohio Workers' Compensation Rank (1980-1984)

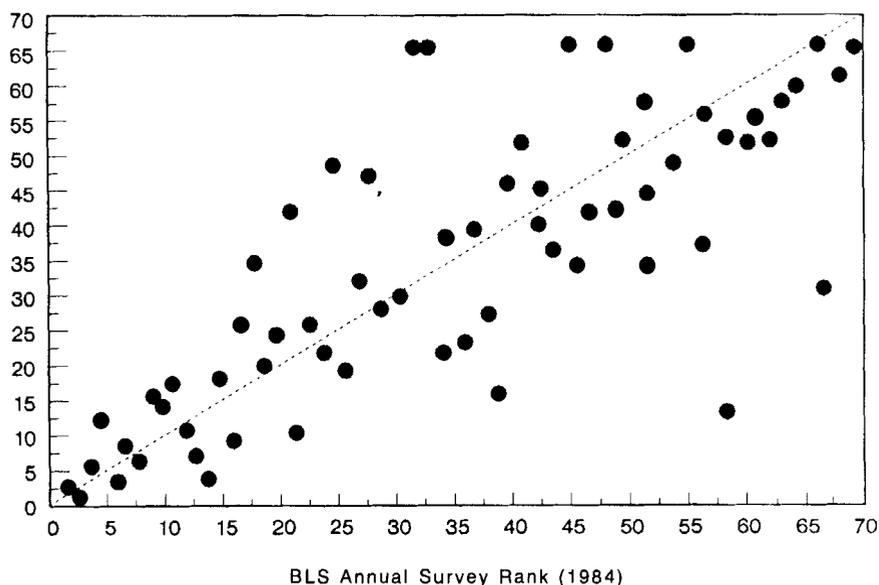


Fig. 1. Comparison of occupational skin disease hazard rankings for Ohio industries (1980-1984), based on Workers' Compensation claims rates for private sector SICs, with hazard rankings for U.S. industries, based on incidence rates for private sector SICs in the 1984 Bureau of Labor Statistics Annual Survey of Occupational Injuries and Illnesses. Spearman rank correlation coefficient = 0.79, p = 0.0001.

TABLE II. Distribution of Risk Among Ohio Companies Filing Workers' Compensation Claims (WCC) for Occupational Skin Diseases by Standard Industrial Classification (SIC) and Number of Filed WCC, 1980-1984*

Insurance plan	SIC	No. of companies filing WCC		Totals
		≥ 6 claims ^a	< 6 claims	
Ohio insured (OI)	High risk ^b	37 ^c	1,354	1,391
	Low risk	8	843	851
Self-insured (SI)	High risk ^b	48 ^c	217	265
	Low risk	9	94	103
Totals		102	2,508	2,610

*Sensitivity = 5%; specificity = 98.2%; positive predictive value = 83.3%.

^aCompanies filing ≥ 6 total WCC (all companies) or ≥ 3 WCC with at least seven lost workdays (SI companies only) during the study period. Totals include 31 self-insured companies which satisfied this latter criterion.

^bSICs with average annual claims rates above the overall yearly Ohio state average of 2.4 per 10,000 employees.

^cMantel-Haenszel chi square = 18.1, p<0.001; a test for homogeneity did not reveal significant differences between proportions based on type of insurance plan.

Annual Survey are based on OSHA 200 Log entries, which include disease cases requiring only first aid treatment as well as medical treatment by a physician. Underestimation of the numbers of employees covered by state workers' compensation

TABLE III. Number of High-Risk Ohio Companies Filing Workers' Compensation Claims (WCC) for Occupational Skin Diseases Involving Either Same Occupation or Causal Agent, 1980-1984*

Insurance plan ^a	Same occupation or cause		Totals
	Yes ^b	No	
State insured (OI)	32	13	45
Self insured (SI)	33	24	57
Totals	65	37	102

*High-risk companies were those filing ≥ 6 total WCC (all companies) or ≥ 3 WCC with at least eight lost workdays (SI companies only) during the five year study period.

^aDifferences between insurance plans were not statistically significant (chi square = 1.9, $p < 0.17$).

^b50% or more of claims filed by the reporting company involved either the same occupation or causal agent.

insurance, indirectly obtained from other sources (e.g., estimates based on coverage under state unemployment compensation law), may lead to falsely high rate estimates, particularly in agricultural industries. In contrast, the denominators used to calculate incidence rates in the BLS Annual Survey are obtained directly from participating companies during the survey year. Thus, incidence rates based on WCC are derived from probable underestimations of both the actual number of occupational skin disease cases and the total number of covered employees. Although the accuracy of the rate estimates based on WCC or the Annual Survey may be debated, the excellent agreement obtained between industry hazard rankings based on Ohio WCC rates and the BLS Annual Survey incidence rates suggests that cutaneous hazard rankings based on WCC rates are reliable indicators of relative risk.

In this study, we identified 102 Ohio companies which filed six or more WCC for occupational skin diseases. Eighty-three percent of these were in industries with above-average annual rates of disease. Almost two-thirds of these 102 high-risk companies filed WCC which involved either the same occupation or the same causal agent in at least half of the claims. The following three examples illustrate these findings.

Example 1

Company X, an agricultural crop grower (SIC 01), filed 14 claims for occupational skin diseases. Twelve claims were filed by general field workers; all claims implicated food products and vegetation as the principal causal agents. Review of individual claims revealed that exposure to parsley was associated with ten of these cases.

Example 2

Company Y, a manufacturer of automobile trimmings and hood ornaments (SIC 34), filed 17 claims for occupational skin diseases. Ten claims were filed by assemblers; all claims implicated exposure to chemicals as the principal causal agents. Review of individual claims indicated that all 17 cases were associated with exposure to a casting resin, subsequently identified by Company Y as a polyurethane resin applied as a transparent, weather-resistant coating to automobile trimmings and hood ornaments.

Example 3

Company Z, a manufacturer of nonelectrical machinery and mechanical parts (SIC 35), filed 16 claims for occupational skin diseases. Thirteen claims were filed by metalworking machine operators; 13 implicated cutting fluids or chemicals as the principal causal agents. Review of individual claims implicated exposure to machine coolant in 11 cases, five of which specified a particular trade name coolant.

Our study has demonstrated that WCC may be used to identify high-risk companies and industries of employment for occupational skin diseases, and has further demonstrated that the majority of those companies filing six or more WCC implicate either the same occupation or causal agent. Thus, primary identification of high-risk companies, followed by secondary targeting of the most frequently implicated occupations or causal agents within these companies, may be a feasible surveillance method upon which active prevention strategies could be developed. In the absence of company-specific rates, calculation of SIC rates also provides a rational basis for targeting other companies at high risk, but which may not file high numbers of WCC due to smaller employment sizes. Actual field studies will be necessary to confirm the validity of this approach.

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