Occupational Lead Poisoning in Ohio: Surveillance Using Workers' Compensation Data

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Abstract: To determine the utility of workers' compensation (WC) data in a system for the surveillance of occupational lead poisoning, we reviewed workers' compensation claims for lead poisoning in Ohio. For the period 1979 through 1983, 92 (81 per cent) of the 114 claims attributed to lead met our case definition of lead poisoning. The likelihood that a company had a case of lead poisoning was strongly correlated with the number of claims against the company. Thirty companies accounted for the 92 cases; two companies accounted for 49 per cent of these. Inspection by the Occupational Safety and Health Administration (OSHA) occurred at 14 of these companies, all of which were cited for violations of the OSHA lead standard. Comparison of the Standard Industrial Classification (SIC) codes for the 14 companies inspected by OSHA with the 15 companies not inspected by OSHA revealed that OSHA inspected battery manufacturers, non-ferrous foundries, secondary smelters, and primary lead smelters, but not bridge painters, manufacturers of electronic components, mechanical power transmission equipment, pumps, and paints, nor a sheriff's office where firing range slugs were remelted to make new bullets. Neither the number of cases of lead poisoning at a company nor the size of a company was related to the likelihood of being inspected by OSHA. Claims for WC appear to be a useful adjunct to an occupational lead poisoning surveillance system; their usefulness should be compared to that of other systems such as laboratory reports of elevated blood lead levels in adults. (*Am J Public Health* 1986; 76:1299–1302.)

Introduction

One of the goals for the United States Public Health Service is that "by 1990, occupational heavy metal poisoning (lead, arsenic, zinc) should be virtually eliminated (baseline data unavailable)."[1] The Occupational Safety and Health Administration (OSHA) lead standard[2] clearly defines permissible exposure levels, guidelines for the periodicity of environmental and biologic monitoring, and guidelines for medical removal of workers with excessive blood lead levels. However, no surveillance system exists for assessing the degree to which occupational lead poisoning is being controlled.

To assess the usefulness of using workers' compensation (WC) claims as a component of an occupational disease surveillance system, occupational lead poisoning claims filed in Ohio were examined and compared to OSHA records for lead inspections for the period 1979 through 1983.

WC claims have been used as a source of epidemiologic data for occupational back injuries,[3] and to identify problem areas and determine program priorities in a state occupational health program.[4] The use of WC claims as a surveillance data source is not without limitations. WC claims for occupational diseases may not be filed due to the lack of recognition by physicians[5] or lack of knowledge about workplace exposures by workers. In addition, the worker may not be covered by a state compensation plan, may not miss a sufficient number of workdays to qualify for a disability claim, may continue working at a reassigned job while recuperating, or may receive and/or seek compensation for lost time and medical expenses from sources other than workers' compensation. US Department of Labor (DOL) data indicate that only 5 per cent of workers severely disabled by occupational diseases receive workers' compensation benefits.[6] A National Institute for Occupational Safety and Health survey of industry in the State of Washington demonstrated that only 3 per cent of occupational diseases identified resulted in WC claims.[7] In a cohort with illnesses caused by asbestos or deaths from asbestos-related disease between 1967 and 1976, only 29 per cent filed claims for WC disability benefits.[8] Even if a claim is filed, 60 per cent of all occupational disease awards are initially denied, compared to only 10 per cent for injuries.[6]

For occupational lead poisoning, an additional disincentive to the filing of WC claims for this condition may be the OSHA lead standard itself. The lead standard provides that employers pay full wages for lost workdays resulting from medical removal from the job as a result of an elevated blood lead (PbB) level, or allows employers to reassign workers with elevated blood lead levels to areas of non-exposure until their lead level falls below 40 ug/dl; these provisions discourage filing of WC claims for this condition.

Despite these limitations, WC systems remain a primary source of occupational illness data in the absence of other established reporting sources. Our study examined the potential role of workers' compensation data in contributing to a surveillance system for occupational lead poisoning.

Methods

The Bureau of Workers' Compensation and the Industrial Commission of Ohio (ICO) are legislatively mandated sister agencies responsible for the record-keeping, adjudication, and compensation of work-related injuries and illnesses. The Ohio Workers' Compensation Law, established in 1913, requires employers to provide coverage for their employees through the state plan, or to submit evidence that they meet the criteria for self-insurance. An employer who is self-insured pays compensation benefits directly to the employee, bypassing the state system.

As of December 1984, there were 238,579 private employers in Ohio. Of this number, 871 companies (0.4 per cent) met the criteria for self-insurance. However, these 871 companies accounted for approximately 30 per cent of the Ohio workforce.*

For an occupational disease claim to be coded by the ICO, one or more lost work days must occur. Starting in 1983, all occupational disease claims are coded, regardless of

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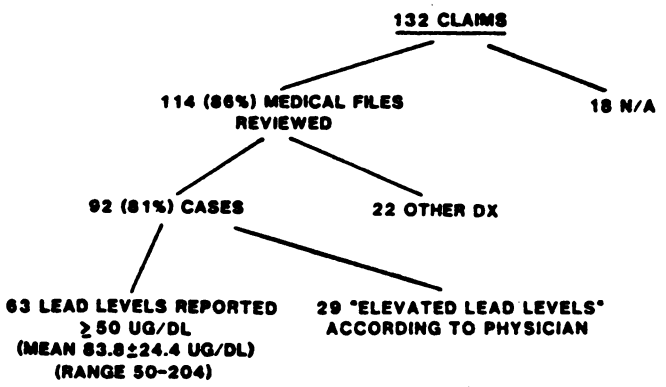

FIGURE 1—Lead Poisoning Review of Workers' Compensation Claims, Ohio, 1979–83

whether lost work days are incurred or not. For self-insured companies, injury or disease claims must be filed with the Bureau of Workers' Compensation if seven or more lost work days have occurred as a result of a particular event. All of these claims would be coded by the ICO. The impact of these different reporting requirements is addressed in the results section.

Claims are coded for personal identifiers, demographic information, company, occupation, industry, agent, nature of injury or illness, part of body, work days lost, and history of previous claim. This information is stored on computer tape.

WC claims filed for lead poisoning during the five-year period from 1979 through 1983 were examined with the cooperation of the ICO. For each claim filed during this period, the accompanying medical file was sought and, when available, was reviewed for medical evidence of lead poisoning. A claim was considered a valid case of lead poisoning if documentation existed for a PbB greater than 50 ug/dl (the level requiring medical removal in the OSHA standard[2]) or a physician's statement of an "elevated blood level." The presence or absence of signs and/or symptoms of lead poisoning was not considered as a criterion for inclusion as a case.

For those companies where cases of lead poisoning were validated, OSHA files were reviewed from the four Ohio area offices in Cincinnati, Toledo, Columbus, and Cleveland. Information was sought on inspections, violations related to the lead standard, and lead exposure monitoring. Information on the Standard Industrial Classification (SIC) and number of employees for each company was obtained from the 1985 Ohio Industrial Directory.[9]

Results

Review of Claims for Occupational Lead Poisoning

From 1979 through 1983, 132 claims were filed in Ohio for lead poisoning. Of these, medical files were available for review on 114 (86 per cent). Ninety-two (81 per cent) of these 114 files were considered cases of lead poisoning (Figure 1). For the 63 cases with reported PbB levels, the mean level was 83.8 ± 24.4 ug/dl with a range of 50 to 204 ug/dl.

The distribution of claims and cases of lead poisoning is shown by year (Table 1). The peaks in 1979 and 1980 are accounted for by two companies with 21 claims in 1979 and 19 claims in 1980; the absence of claims from these two companies in subsequent reporting years accounted for the fewer claims in 1981 through 1983. Claims were predominantly among men (97 per cent). The mean age of claimants

TABLE 1—Occupational Lead Poisoning Claims and Cases by Year, Ohio, 1979–83

Year	# Claims	# Claims Reviewed*	# Cases***	% Cases/ Claims Reviewed
1979	39**	37	32	86
1980	41**	39	31	79
1981	17	14	12	86
1982	19	15	12	80
1983	16	9	5	56
Total	132	114	92	81

*Medical file accompanying claim available for review for documentation of lead poisoning.
**Two companies accounted for 21 claims in 1979 and 19 claims in 1980.
***Blood lead level greater than or equal to 50 μg/dl or a physician's statement reporting an elevated blood lead.

was 38 years (range 19–72), and the average number of workdays lost was 37.4 days per claim (range 1–210).

The number of WC claims of lead poisoning made against a particular company predicts the likelihood of a company having a real lead poisoning problem. Of the 48 companies with one claim each, 18 of them (37 per cent) had lead cases. In contrast, six (75 per cent) of the eight companies with two claims had cases, while 100 per cent of the six companies with three or more claims had cases.

The 92 cases of lead poisoning were accounted for by 30 companies. One company accounted for 31 cases (34 per cent), another for 14 cases (15 per cent), with the remainder of the companies reporting between one and six cases during the 1979–83 period. Twenty-nine of these 30 companies were scattered throughout Ohio; one was in West Virginia. Of these 29 companies, three (10 per cent) were self-insured, accounting for 37 (40 per cent) of the cases. From the available data, the impact of the differences in the reporting requirement for self-insured companies cannot be determined. Larger companies tend to be self-insured and are the ones most likely to have medical surveillance and industrial hygiene programs.

OSHA Inspections

To determine whether or not these 30 companies identified through the review of WC claims had previously been inspected by OSHA, information was gathered concerning initial inspections, citations, and follow-up inspections. Of these 30 companies, 29 operated in Ohio and one was out-of-state. The one out-of-state company accounted for one case of lead poisoning. OSHA conducted lead-related inspections at 14 of the 29 Ohio companies. These 14 companies accounted for 55 (60 per cent) of the 91 cases of lead poisoning. Citations related to violations of the lead standard were issued in all 14 instances where OSHA inspections occurred.

The number of cases of lead poisoning at a company does not appear to be associated with whether or not a company received an OSHA inspection. Of the 18 companies with one case of lead poisoning, eight (44 per cent) were inspected by OSHA. Two of the five companies with two cases were inspected, and four of six companies with three or more cases were inspected by OSHA.

Comparison of the SIC codes for the 14 companies inspected by OSHA for lead with the 15 companies not inspected by OSHA (Table 2) revealed that OSHA inspected battery manufacturers, non-ferrous foundries, secondary smelters, and primary lead smelters, but not bridge painters,

TABLE 2—Ohio* Companies with Cases of Lead Poisoning SIC Codes vs OSHA Inspections

Standard Industrial Classification	# of Companies	# OSHA Inspected
Non-ferrous foundries (brass, bronze, copper, copper base alloy)	8	5
Secondary smelting and refining of non-ferrrous metal	3	3
Primary batteries, dry and wet storage batteries	3	3
Primary smelting and refining of lead	1	1
Inorganic pigments	1	1
Special industrial machining	1	1
Bridge, tunnel, and elevated highway construction	2	0
Mechanical power transmission equipment	2	0
Paints, varnishes, lacquers, enamels	1	0
Pumps and pumping equipment	1	0
Rubber and plastics, hose and belting	1	0
Electronic components	1	0
Cold rolled steel	1	0
Sheriff's office	1	0
Aluminum sheet, plate, and foil	1	0
TOTAL	28*	14

*One company was out-of-state. No SIC code was available for one company.

manufacturers of electronic components, mechanical power transmission equipment, pumps, and paints, nor a sheriff's office where firing range slugs were remelted to make new bullets.

The size of a company as determined by the number of employees did not correlate with the likelihood of an OSHA inspection (Table 3). For companies inspected, the mean number of employees was 93.8 ± 74.5 with a range of 13 to 275 employees. For companies with lead cases not inspected by OSHA, the mean number of employees was 236.2 ± 310.4 with a range of 5 to 850. We have no information concerning companies inspected by OSHA for lead compliance in Ohio but not represented among the 30 companies with WC claims.

Discussion

To help eliminate occupational lead poisoning, an active surveillance and intervention system, in addition to OSHA's current general schedule and complaint visitations, is needed to identify workplaces where excessive lead exposure continues to occur. A surveillance system using WC claims for lead poisoning can target limited resources for the control of this condition to those industries and plants most likely to generate cases of lead poisoning. WC claims for occupational lead poisoning are a good source of actual cases of lead poisoning. The predictive value positive for claims of lead poisoning is 0.81

TABLE 3—OSHA Inspections by Size of Company

Number of Employees	Inspected by OSHA	Total
Less than 10	0	1
10–99	8	11
100–499	5	9
500 or more	0	2
TOTALS	13	23*

*Information not available on the size of six companies.

in this study, with 81 per cent of claims reviewed accurately classifying a worker as having occupational lead poisoning. As would be expected, companies with multiple claims for lead poisoning have the greatest chance of having a verifiable case of lead poisoning and a real lead problem.

The targeting of plants for follow-back may be further refined by identifying those companies already known to regulatory and public health authorities. A comparison with OSHA files allows for the identification of companies with lead problems. In addition, reviewing OSHA files provides valuable information on the outcomes of inspections (violations observed, citations, exposure monitoring results, record reviews, etc.) and the results of follow-up inspections conducted by OSHA.

In our study, OSHA had inspected, through its general schedule and complaint visitations, 14 (48 per cent) of the 29 worksites. All 14 of these companies were among SIC codes listed in the OSHA lead standard[2] as known heavy users of lead, and were among SIC's targeted as OSHA priorities for health-related inspections.** Given the wide variety of industrial uses for both inorganic and organic lead, it is unreasonable to presume that OSHA can completely predict all categories of industry that might have excessive lead exposure and which particular plants will be at risk for lead poisoning. With knowledge of plants and SIC's identified through WC surveillance previously unknown to OSHA, it would be possible to begin to fill the gaps in preventing lead poisoning. Neither the number of cases of lead poisoning at a company nor the size of the company predicted the likelihood of an OSHA inspection. Since the WC system identifies companies of all sizes, and is able to provide data on the number of cases per company, a WC system may complement the routine OSHA inspection scheme.

We know of no mechanism in any state for sharing WC data with OSHA, although some workers' compensation systems (notably Colorado) do share claims reports with the state health departments. WC systems in 34 states routinely report aggregate data on occupational illnesses and injuries to the Bureau of Labor Statistics, which provides data to OSHA, but without company identifiers. WC systems have functioned primarily as insurers, with industrial hygiene and safety engineering assistance available upon request. They have used increased premiums as an incentive for improving the experience of companies with high rates of claims.

A means of determining the sensitivity of WC claims to identify plants at risk would be to compare WC data against other sources of occupational lead reporting. Laboratory reports of elevated lead levels in adults are one such source. The OSHA lead standard requires employers to conduct periodic air exposure monitoring for lead and to have employees' blood lead levels determined at least every six months for exposures above the "action level" of 30 ug/m^3 averaged over an eight-hour period for more than 30 days per year.[2] Employers or clinics contracted by employers must submit these blood lead samples to OSHA/Centers for Disease Control-approved and proficiency-tested laboratories.[10] The laboratories' only obligation is to report the result of the test to the physician or clinic that ordered the test. At present, no public health or regulatory agency receives these reports in Ohio.

There are states—in particular, New York—that mandate the reporting of these blood lead levels to the State

**Personal communication, Office of Health Compliance Assistance, Occupational Safety and Health Administration.

Department of Public Health.[11] For the period December 1981 through November 1982, the New York Department of Public Health, through its heavy metal registry, received 547 reports of occupationally-related blood leads greater than 40 ug/dl in adults.[12] Of these 547 workers, 218 (40 per cent) had blood lead concentrations greater than 50 ug/dl, the level requiring OSHA-mandated medical removal. How many of these 218 individuals were known to the WC system in New York, or how many of the companies in which these workers were employed were known to OSHA, is currently being determined for the period of 1981 through 1984. This information will allow for a more accurate estimate of the sensitivity of WC claims in New York in identifying companies with continuing lead problems in comparison to their laboratory-based heavy metal reporting system and in comparison to OSHA lead inspections.

There is currently no means of assessing the success of preventing occupational lead poisoning. A surveillance system is necessary to help monitor our progress toward achieving the 1990 objective of eliminating occupational heavy metal poisoning, as well as identifying cases and companies appropriate for industrial hygiene and/or medical intervention. WC data may be of value in contributing to a comprehensive system of lead surveillance which would also include data from OSHA inspections and approved laboratories. Hazardous exposures to lead are neither homogeneous nor ubiquitous throughout industry. In order to prevent occupational disease in the workplace, it is essential that methodologies be used to identify workplaces that present hazards, and limit the expenditure of resources on workplaces where hazards do not exist or are adequately controlled.

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