Silicosis Surveillance— Michigan, New Jersey, Ohio, and Wisconsin, 1987–1990

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Summary

Problem/Condition: Improved surveillance for silicosis is needed to target interventions to prevent this occupational lung disease caused by the inhalation of crystalline silica dust.

Reporting Period Covered: 1987–1990.

Description of Systems: State-based silicosis surveillance and intervention programs have been developed in Michigan, New Jersey, Ohio, and Wisconsin as part of the Sentinel Event Notification System for Occupational Risks (SENSOR) Program, initiated in 1987 by the National Institute for Occupational Safety and Health (NIOSH).

Results: From 1987 through 1990, the SENSOR program confirmed a total of 430 cases of silicosis reported from these four states. Overall, approximately 60% of these cases were in workers employed in primary metal industries, although the types of industries in which cases occurred varied by state. Some cases were attributable to relatively recent exposure, including new cases in seven persons first exposed since 1980 in New Jersey. Silicosis case reports have prompted measurement of respirable silica concentrations at 25 Michigan work sites, and 14 (56%) of these sites were found to have levels that exceeded the legally permissible exposure level.

Interpretation: The silicosis surveillance and intervention strategies piloted by state health departments in the NIOSH-funded SENSOR Program have demonstrated the feasibility and effectiveness of identifying specific silica-using work sites that need preventive intervention.

Actions Taken: On the basis of initial experience in these four states, NIOSH developed guidelines for state-based silicosis surveillance and awarded SENSOR cooperative agreements to three additional states where the applicability of these surveillance methods will be further evaluated.

INTRODUCTION

In 1987, 10 states were awarded 5-year cooperative agreements by CDC's National Institute for Occupational Safety and Health (NIOSH) to develop and implement surveillance systems for selected occupational conditions under the Sentinel Event Notification System for Occupational Risks (SENSOR) Program (*1*). The purpose of the SENSOR Program is to develop and implement case-based surveillance and preventive follow-up activities for selected occupational diseases and injuries (*1*). One of the diseases selected for SENSOR activities is silicosis, a fibrotic lung disease caused by inhalation of respirable crystalline silica dust. Although some cases occur after only a few years, most cases of silicosis occur after ≥20 years of occupational exposure. This report summarizes data from silicosis surveillance in the Michigan, New Jersey, Ohio, and Wisconsin SENSOR programs, solicited by state health departments during the period 1987–1990.

METHODS

Surveillance

Case Report Ascertainment

All four states have relied, at least in part, on reporting of silicosis by physicians for case ascertainment. In Ohio, physicians have been required by law to report this condition since 1953, but not until 1989 were occupational disease reports actively solicited. In Michigan, known or suspected work-related illnesses have been reportable by health professionals since 1978, but active solicitation of reports did not begin until 1988. In New Jersey, although physician reporting had been encouraged since 1983, mandated reporting by physicians did not begin until 1990. In Wisconsin, occupational disease reporting continues to be voluntary.

Other means of case ascertainment have varied by state. New Jersey and Michigan have complemented physician reports with cases identified by review of death certificates and hospital discharge data, as well as with selected follow-up investigations of workplaces where workers with index cases had been exposed to silica. Hospital discharge data account for three-fourths of all reports in each of these two states. In addition, Michigan has reviewed records of workers' compensation awards available from the Michigan Department of Labor. Ohio relies entirely on physician reports, but has actively solicited case reports from individual physicians of decedents identified initially through review of death certificate data. Wisconsin has complemented

physician reporting with ascertainment of cases through review of workers' compensation records, a procedure that accounts for half the confirmed cases in that state.

Case Confirmation

All four states collect demographic, work history, and medical information about each reported silicosis case from a combination of the initial case ascertainment source, review of medical records, and interview of cases and/or family members. Case confirmation requires a) a history of occupational exposure to silica and a chest radiograph classified by a "B" reader* as category 1/0 or greater profusion of small rounded opacities or b) a lung tissue biopsy indicating silicosis (*2*).

Preventive Intervention

Follow-up and prevention efforts, which vary among the participating states, include some or all of the following activities: a) checking with employer or examining other databases to determine if the workplace remains in operation; b) educational outreach regarding the health hazards of silica exposure to workers with silicosis, employees, employers, and physicians; c) workplace evaluations, including review of workplace industrial hygiene measurements and employee records, and silica air monitoring by SENSOR or Occupational Safety and Health Administration (OSHA) industrial hygienists; and d) referral to appropriate regulatory agencies if excessive exposures or hazardous work situations are found.

RESULTS

Epidemiology

From 1987 through 1990, the SENSOR program has confirmed a total of 430 cases of silicosis (Tables 1 and 2). By state, the average year of first occupational exposure to silica dust for workers with cases ranged from 1943 in Michigan to 1961 in Wisconsin. However, in all three states collecting information on year of first exposure (Michigan, New Jersey, and Wisconsin) there were workers with cases whose first exposure was after 1969 (n=23). This total includes seven new cases in New Jersey first exposed after 1980. The average duration of exposure for all confirmed cases was 26 years; 39 (10%) of confirmed cases had <10 years of occupational silica exposure, and 106 (27%) had <20 years.

Overall, approximately 60% of the persons affected by silicosis worked in primary metal industries (Table 2). This industry, which includes foundries, accounted for at least 70% of the confirmed cases in Michigan and Wisconsin. Stone, clay, glass, and concrete products (including ceramics) industries were the predominant source of exposure among the New Jersey cases. In Ohio, no single industry was predominant.

Workplace Follow-up

Detailed information on follow-up efforts in Michigan are illustrative of the potential effectiveness of state-based preventive interventions. The 249 cases of silicosis in

*"B" readers are physicians certified by NIOSH as proficient in classifying chest radiographs for pneumoconioses using the International Labour Office Classification for Radiographs of Pneumoconioses (*3*).

TABLE 1. Case-ascertainment sources for confirmed silicosis cases — Michigan, New Jersey, Ohio, and Wisconsin, Sentinel Events Notification System for Occupational Risks (SENSOR) programs, 1987–1990

	Michigan		New Jersey		Ohio*		Wisconsin		Total	
Source	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**
Hospital discharge records	190	(76.3)	66	(74.2)	—†		—		**256**	**(59.5)**
Death certificates	25	(10.0)	1	(1.1)	—		—		**26**	**(6.0)**
Worker's compensation claims	17	(6.8)	—		—		25	(50.0)	**42**	**(9.8)**
Physician	14	(5.6)	3§	(3.4)	42	(100.0)	23	(46.0)	**82**	**(19.1)**
Other	3	(1.2)	19	(21.3)	—		2	(4.0)	**24**	**(5.6)**
Totals	**249**	**(100.0)**	**89**	**(100.0)**	**42**	**(100.0)**	**50**	**(100.0)**	**430**	**(100.0)**

*All cases in Ohio are reported by physicians, but some reports are actively solicited by the health department on the basis of death certificate review.
†State does not use this data source for surveillance of silicosis cases.
§One of these three cases was also ascertained from hospital discharge data.

TABLE 2. Industry reported as source of silica exposure for silicosis cases — Michigan, New Jersey, Ohio, and Wisconsin, Sentinel Events Notification System for Occupational Risks (SENSOR) programs, 1987–1990

	Michigan		New Jersey		Ohio		Wisconsin		Total	
Industry (SIC* code)	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**
Manufacturing										
Primary metal industries (33)	195	(78.3)	15	(16.9)	8	(19.0)	35	(70.0)	253	(58.8)
Stone, clay, glass, and concrete products (32)	16	(6.4)	44	(49.4)	9	(21.0)	1	(2.0)	70	(16.3)
Miscellaneous (22,26,27,28,30,34,35,36,37,38)	17	(6.8)	12	(13.5)	10	(24.0)	6	(12.0)	45	(10.5)
Mining (10–14)	10	(4.0)	9	(10.1)	1	(2.4)	2	(4.0)	22	(5.1)
Construction (15–17)	4	(1.6)	7	(7.9)	0	—	0	—	11	(2.6)
Transportation and communication (42,46,47,48,49)	3	(1.2)	1	(1.1)	0	—	0	—	4	(0.9)
Services (73,76,77,80)	1	(0.4)	0	—	0	—	1	(2.0)	2	(0.5)
Trade (50,59)	0	—	1	(1.1)	0	—	0	—	1	(0.2)
Undetermined	3	(1.2)	0	—	14	(33.3)	5	(10.0)	22	(5.1)
Totals	**249**	**(100.0)**	**89**	**(100.0)**	**42**	**(100.0)**	**50**	**(100.0)**	**430**	**(100.0)**

*Standard industrial classification.

Michigan were associated with 144 silica-using workplaces. Sixty-one (42.4%) of these workplaces were no longer operating at the time of follow-up, 19 (13.2%) were located out of state, 11 (7.6%) no longer used silica, two (1.4%) involved multiple locations in the building trade, and four (2.8%) were unknown. The remaining 47 workplaces were targeted for follow-up inspection. Airborne silica concentrations measured at the first 25 worksites inspected exceeded the legally permissible exposure level at 14 (56%) and the NIOSH-recommended exposure limit at 17 (68%).

DISCUSSION

Silicosis is a chronic, nonmalignant lung disease caused by the inhalation of respirable crystalline silica dust. Despite longstanding knowledge about its cause, this preventable occupational lung disease continues to account for more than 300 deaths each year in the United States (*4*). Surveillance of silicosis has revealed neither the true burden nor the continuing risk of the disease (*5,6*), and prevention of silicosis will require improved surveillance in all 50 states (*7*). The findings in this report indicate that the silicosis surveillance strategies piloted by state health departments in the NIOSH-funded SENSOR Program are both feasible and useful. In these four states, the SENSOR Program has identified both large numbers of silicosis cases and high-risk workplaces and industries for targeting interventions and, by identifying cases resulting from relatively recent exposures, has clearly documented that silicosis is an ongoing problem.

SENSOR silicosis surveillance has identified multiple complementary sources for case ascertainment. Michigan and New Jersey have demonstrated that hospital discharge data, while underestimating the total number of patients with silicosis (*8*), can readily identify a considerable number of silicosis cases (*9,10*). Michigan, New Jersey, and Ohio have demonstrated that review of death certificate data can identify additional cases of silicosis.

Mandated case reporting by physicians, although incomplete, appears to provide the most timely case ascertainment, identifying more recently diagnosed cases. All four states have conducted outreach to certain specialty groups, primarily pulmonologists and occupational medicine specialists, to increase physician reporting of silicosis cases. Although Michigan and New Jersey have encouraged adoption of a national system for reporting aggregated readings by NIOSH-certified "B" readers (*11*), Michigan and Wisconsin have already begun providing pneumoconiosis classification of chest radiographs by "B" readers free of charge to physicians, companies, and individuals in those states. The utility and success of these targeting efforts have not been evaluated with regard to preventing silicosis and other pneumoconioses.

Although the surveillance data from each state tend to reflect the primary silica-using industries of that state, the data also have served to identify less-recognized occupational risks. For example, SENSOR surveillance has identified silicosis among workers employed in the dental supplies industry, a group that is not generally recognized as being at high risk for silicosis (*12*).

SENSOR data indicate that, despite a generally long latency period for this disease, follow-up of silicosis cases can help public health authorities identify ongoing hazardous exposures (*10*). The efficacy of such follow-up is illustrated by the findings of inspections in Michigan. Moreover, all states have found that workplace follow-up of a documented case often provides the employer particularly strong motivation to

control exposures through primary prevention strategies, such as material substitution and engineering controls. Thus, the case-based approach complements the usual industrywide approach to occupational hazard control (*9*).

The data initially reported to the SENSOR programs in Michigan, New Jersey, Ohio, and Wisconsin suggest that the SENSOR methods for case-based silicosis surveillance systems can be successfully implemented by state health departments, particularly in those states with mandated reporting requirements and/or state access to hospital discharge data (*6*). Based on the pioneering efforts of these four states, NIOSH has developed guidelines for state-based silicosis surveillance. New SENSOR cooperative agreements have been awarded to the four states that piloted these methods, as well as to three additional states—Illinois, North Carolina, and Texas—where the methods will be field tested to ascertain their applicability beyond the four original states. Based on the field-test results, a model surveillance system will be developed for implementation in all states interested in the prevention of silicosis.

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