DEATH CERTIFICATE-BASED SURVEILLANCE OF SILICOSIS AND ASBESTOSIS IN ILLINOIS

LOUISE WIDEROFF, MSPH • Daniel O. Hryhorczuk, M.D., MPH • Anne Krantz, M.D., MPH, • Janet Holden, Ph.D.

Cook County Hospital Division of Occupational Medicine, Chicago, Illinois, USA

INTRODUCTION

Surveillance is fundamental to the prevention and control of pneumoconioses. In the U.S., pneumoconiosis reporting systems have been proposed and also piloted by several state health departments.[1,2] The pneumoconioses are considered good target diseases for nascent occupational disease surveillance systems because they are of known etiologies, are almost always related to workplace exposures, are relatively easy to diagnose, and are preventable.

Sources of data in occupational disease surveillance include workplace surveys, laboratory logs, hospital discharge records, employee health records, disability files, physician reports and death certificates.[3,4] Death certificates are limited by inaccuracies in diagnosis and certification of the cause of death, and by misclassification of the decedent's occupation. They are not early indicators of outbreaks for diseases of long latency or duration and are not suitable for studying nonfatal conditions.[5]

Nevertheless, death certificates are a vast and easily accessed data source. Other states have used them to quantify pneumoconiosis mortality and to describe the demographic and geographic distribution of cases.[6] Follow-back investigations of cases may lead to the detection of exposure sites. This study explores the usefulness of death certificates as a surveillance tool for silicosis and asbestosis in the state of Illinois.

METHODS

Computerized death records from the Illinois Department of Public Health were obtained for the years 1969 to 1984. Cases were identified by International Classification of Disease (ICD) codes 5150 and 5152 of the eighth Revision, and codes 501 and 502 of the Ninth. The study diseases were coded as the underlying or contributing cause of death, although prior to 1979, four-digit codes precluded the differentiation of the pneumoconioses as contributing causes on Illinois death tapes. Additional variables abstracted from the tapes were sex, race, age and year of death, and the geographical subunit county of residence.

Crude state and county-specific mortality rates were calculated by year and also for the five-year period 1980–1984. The calculation of rates was limited to white males because of sparse data for other sex-race groups. Population estimates were used in the denominators for all years except 1980, when census data were available.[7,8] Denominators included individuals age 35 and over, since persons below this age were not believed to be at risk of pneumoconiosis mortality.

Correlations between observed geographical patterns of mortality and associated industries were explored. An annual statewide manufacturer's directory was used to identify asbestos products plants in the counties where asbestosis cases resided.[9] Silicosis death rates were superimposed on maps showing the location of industries and mineral deposits associated with silica dust exposure.[10] The industrial data spanned a period of thirty years to account for past exposures and to ascertain the current status of specific worksites and industries.

RESULTS

There were 76 silicosis cases reported by underlying and contributing cause of death from 1979–1984 (ICD-9). White males constituted 78% of the total, black males 20% and white females 2%. The mean age of death was 68 years with a range of 28 to 89 years. An additional 55 silicosis cases were identified by underlying cause of death from 1969 to 1978 (ICD-8). Of these, 87% were white males, 11% black males and 2% white females. Their mean age of death was 69 years and the range was 34 to 88 years.

The five-year state silicosis mortality rate for white males, which included underlying and contributing causes of death in the numerator, was 0.5/100,000. A rate of 40.2/100,000/5 years—based on 4 deaths in the numerator—was found in Alexander County, at the southwestern tip of Illinois. In Figure 1, the five-year rates overlay a section of a map showing siliceous mineral deposits in this area. In addition to a crude rate over 40 times the state rate, Alexander County cases died at an average age which was 13 years younger than the mean for Illinois white male silicotics (57.2 vs. 70.5 years).

For white males throughout Illinois, silicosis was more likely to be listed as an underlying rather than contributing cause of death in younger cases. Of the 22 who died younger than 70.5 years of age, 14 (64%) had silicosis certified as the underlying cause, compared to 18 out of 37 (49%) in the 70.5 or above age group.

There were 53 asbestosis cases reported during the ICD-9 period from 1979 to 1984, of which 83% were white males,

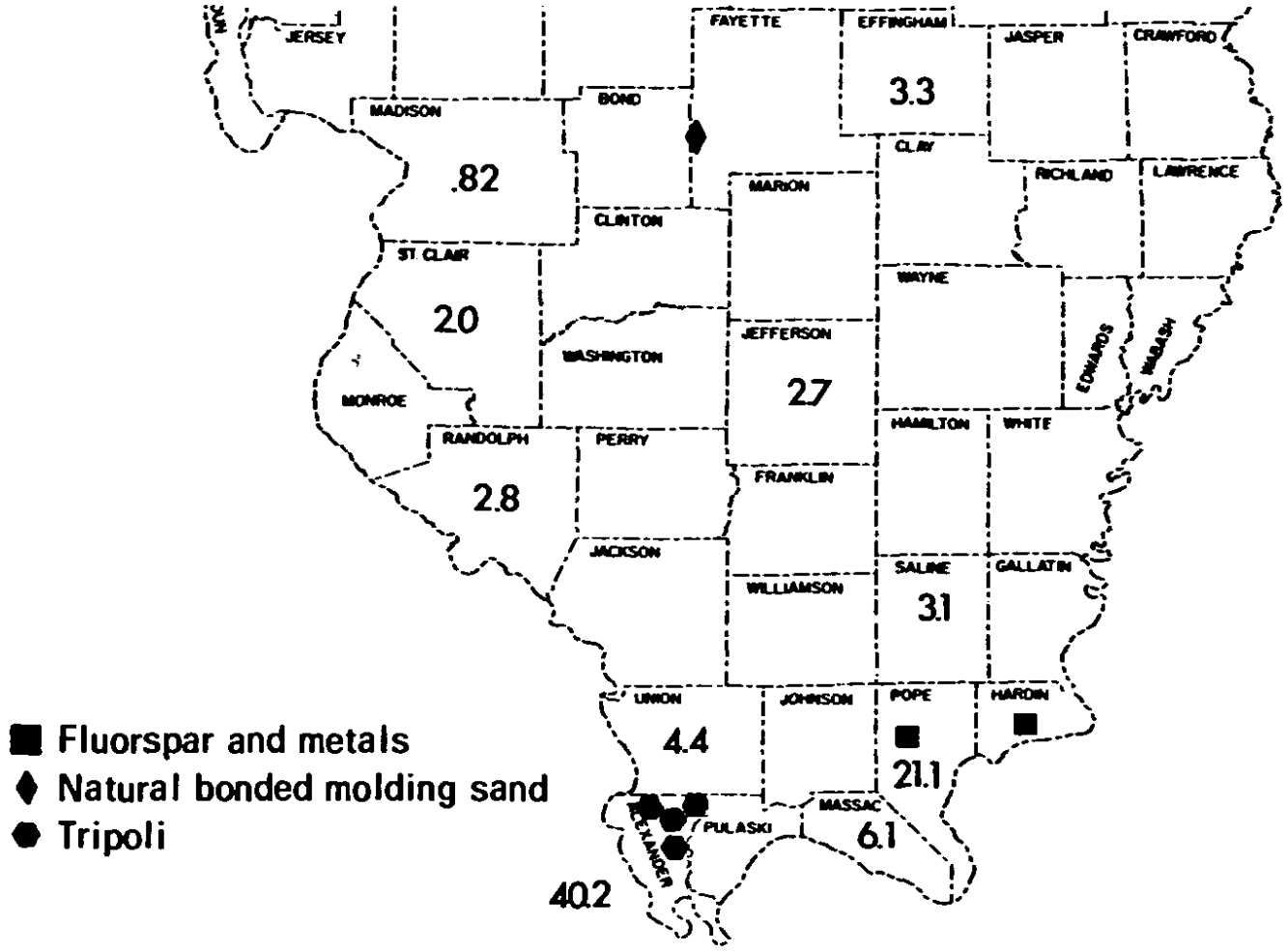

Figure 1. Siliceous mineral deposits and five-year silicosis mortality in southern Illinois.

6% black males and 11% white females. The mean age of death was 66 years and cases ranged from 44 to 84 years. There were 22 cases during the ICD-8 period from 1969–1978 with asbestosis coded as the underlying cause of death. White males were 77% of the total, black males 5% and white females 18%. The mean age was 63 years, with a range of 42 to 81 years.

The Illinois asbestosis mortality rate for white males was 0.41/100,000 per 5 years. Asbestosis deaths were reported in 11 out of 102 Illinois counties, 4 of which consistently had annual rates above zero: Cook, Lake, McLean and Madison. The five-year rates per 100,000 in these counties were 0.28, 3.0, 6.1 and 1.2, respectively.

DISCUSSION

The results of this study demonstrate that death certificate-based surveillance in Illinois is useful for identifying point sources of exposure in areas where pneumoconiosis deaths occur. The extraordinarily high silicosis mortality rates in Alexander County are a striking example of this.

As the map in Figure 1 indicates, Alexander County is a center of tripoli production, a mineral from which microcristalline silica is obtained for use as a filler and abrasive. Two tripoli mines and mills were surveyed by the National Institute for Occupational Safety and Health in 1979, following six years of high dust levels in air sampled by the Mine Safety and Health Administration. The survey documents simple silicosis in 26% of the 61 participants and progressive massive fibrosis in 11%.[11] The mean duration of exposure for the former group was 7.7 years with a 1–9 year range, and 7.1 years for the latter, with a range of 2.5–14 years.

Our study reviewed Illinois death certificate data back to 1969. The first death we identified in Alexander County occurred in 1969, 10 years prior to the morbidity survey. Five more deaths with silicosis as the underlying cause occurred in Alexander and adjacent counties before the survey. Thus, an annual review of Illinois death records would have alerted authorities to this serious outbreak years earlier. Prompt intervention to correct exposures could have reduced the number of Illinois workers dying from pneumoconiosis.

Probable point sources of asbestos exposure were identified in the four counties with high concentrations of asbestosis deaths. In the 1955 edition of the manufacturer's directory, Cook County listed nine asbestos products plants employing about 2500 workers. Lake County had one major plant with 2200 workers and McLean had a single plant with 200. Madison County listed a small asbestos products plant in the 1965 edition. Possible asbestos containing products plants were located in these counties as well. As of 1987, only one of the identified plants was still listed and not as an asbestos products operation.

Cases who died at an early age may be indicative of recent high exposures. We were surprised that silica dust exposures severe enough to result in early death were still occurring, as evidenced by 3 cases of black males who died at ages 28, 33 and 34 between 1974 and 1980. This indicates that in the calculation of silicosis mortality rates, the 35-year cutoff in the denominators may not always be applicable. Another aspect of our rates is that they are not age-adjusted to the U.S. population, since national age specific pneumoconiosis mortality rates based on multiple causes of death are not readily available. It is unlikely that large differences in crude rates, such as those seen in this study, can be attributed to the confounding effects of age.

Death certificates have proven to be an important component of pneumoconiosis surveillance in Illinois. We have identified Illinois counties of high risk for silicosis and asbestosis mortality together with potential point sources of exposure. Follow-back studies are now underway to verify exposures on a case-by-case basis. While mortality is not generally a timely surveillance measure for the pneumoconioses, the experience in Alexander County demonstrates that death certificates can be used to detect outbreaks that result in high mortality or early death. The clustering of cases over time in a given geographical area, and an age of death markedly below the mean would clearly be cause for further investigation.

REFERENCES

1. Mullan, R.J.: A Proposal for State-Based Reporting of the Pneumoconioses and Mesothelioma. *Conference of State and Territorial Epidemiologists*. Center for Disease Control, Minneapolis, Mn. (June, 1984).
2. Baker, E.: *Comprehensive Plan for Surveillance of Occupational Illness and Injury in the United States*. National Institute for Occupational Safety and Health, Centers for Disease Control. Atlanta (1986).
3. Mullan, R.J.: Options for State-Based Reporting of Occupational Diseases. *Conference of State and Territorial Epidemiologists*. Center for Disease Control, Madison, Wi. (June, 1985).
4. Halperin, W., Frazier, T.: Surveillance for the Effects of Workplace Exposure. *Ann. Rev. Public Health*. 6:419-432 (1985).
5. Dubrow, R., Sestito, J., Lalicb, N., Burnett, C., Salg, J.: Death Certificate-Based Occupational Mortality Surveillance in the United States. *Am. J. Ind. Med.* 11:329-342 (1987).
6. Schwartz, E.: Use of Death Certificates for Surveillance of Work-Related Illnesses-New Hampshire. *MMWR* 35:537-540 (1986).
7. *County Estimates by Age, Sex and Race Prepared for the National Cancer Institute*. Populations Estimates Branch, Population Division, Bureau of the Census. Washington D.C. (1987).
8. *Illinois Population Estimates*. Div. of Health Information and Evaluation, Illinois Dept. of Public Health. Springfield (1981-1984).
9. *State Industrial Directory*. 1955, 1965, 1987 Eds. Illinois Manufacturers' News, Inc. Chicago (1955, 1965, 1987).
10. Malhotra, R., Smith, P.: *Directory of Illinois Mineral Producers, 1974*. Illinois State Geological Survey IMN 64. Urbana (1976).
11. Banks, D., Morring, K., Boehlecke, B., Althouse, R., Merchant, J.: Silicosis in Silica Flour Workers. *Am. Rev. Respir. Dis.* 124:445-450 (1981).

Proceedings of the VIIth International Pneumoconioses Conference *Part*
Transactions de la VIIe Conférence Internationale sur les Pneumoconioses *Tome*
Transaciones de la VIIa Conferencia Internacional sobre las Neumoconiosis *Parte*

II

Pittsburgh, Pennsylvania, USA—August 23–26, 1988
Pittsburgh, Pennsylvanie, Etats-Unis—23–26 aout 1988
Pittsburgh, Pennsylvania EE. UU—23–26 de agosto de 1988

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

CDC
CENTERS FOR DISEASE CONTROL

Sponsors

International Labour Office (ILO)
National Institute for Occupational Safety and Health (NIOSH)
Mine Safety and Health Administration (MSHA)
Occupational Safety and Health Administration (OSHA)
Bureau of Mines (BOM)

November 1990

DISCLAIMER

Sponsorship of this conference and these proceedings by the sponsoring organizations does not constitute endorsement of the views expressed or recommendation for the use of any commercial product, commodity, or service mentioned.

The opinions and conclusions expressed herein are those of the authors and not the sponsoring organizations.

DHHS (NIOSH) Publication No. 90-108 Part II