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# Status of Work-Related Diseases in Wisconsin: Five Occupational Health Indicators

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## ABSTRACT

Direct and indirect costs of work-related injuries and illnesses in the United States are estimated to cost over $170 billion annually. Wisconsin's costs alone may be as high as $1 billion annually. Considering the magnitude of these costs, it is disconcerting that there is no national surveillance program to track the occupational injuries, illnesses, and hazards responsible. Surveillance is an essential public health function and the foundation for recognizing and then designing and evaluating interventions to reduce the consequences of identified hazards. Wisconsin has a rudimentary occupational injury and illness surveillance program. It has recently been strengthened by receipt of a 3-year fundamental surveillance grant from the National Institute for Occupational Safety and Health (NIOSH). As part of that grant, Wisconsin will begin tracking 19 NIOSH occupational health indicators. In this paper we measured 5 occupational health indicators for Wisconsin: Pneumoconiosis hospitalizations, Pneumoconiosis mortality, Acute work-related pesticide poisonings, Incidence of malignant mesothelioma, and Elevated blood lead levels among adults. Year 2000 baseline results of these 5 occupational disease indicators show that Wisconsin has lower disease rates than the nation for some of the indicators and higher rates for others. Such surveillance data informs the understanding of environmental and other important risk factors for occupational diseases and injuries.


## INTRODUCTION

More than 2.8 million individuals are employed in Wisconsin and 135 million nationally. In 2003, the US Bureau of Labor Statistics estimated that 137,700 Wisconsin workers[1] were injured on the job or became ill as a result of exposure to health hazards at work. Work-related injuries and illnesses result in substantial human and economic costs not only for workers and employers, but also for the country. Wisconsin workers' compensation claims filed in 2004 totaled 36,699, with a compensable cost of almost $238 million.[2] Total Wisconsin direct and indirect costs of work-related injuries and illnesses likely exceed $1 billion annually. Workers' compensation claims for the United States were reported by the National Academy of Social Insurance as approximately $46 billion in 2000.[3] Based on nationally available data, it was estimated that the direct and indirect costs of work-related injuries and illnesses in the United States exceed $170 billion annually.[4]

Work-related injuries and illnesses can be prevented. Successful approaches for making workplaces safer and healthier begin with public health surveillance data. Public health surveillance data are needed to determine the comparative magnitude of work-related injuries and illnesses, identify occupations at greatest risk, and evaluate the effectiveness of prevention programs. Data can also be used to target prevention activities and to identify underappreciated workplace health and safety problems that need further investigation. In Wisconsin and many other states, compiling available data into a statewide occupational illness and injury surveillance system has been problematic. The lack of such a program has hampered advancement of occupational health programs.

To help states establish a fundamental, cost-effective, and efficient means of occupational disease and injury surveillance, the Council of State and Territorial Epidemiologists (CSTE) worked collaboratively with the National Institute for Occupational Safety and Health (NIOSH) and 13 member states to

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develop a set of 19 fundamental occupational health indicators (OHIs) states could utilize to characterize trends in their state and compare their progress to other states and the nation.[5] Wisconsin was one of the partner states. These indicators are listed in Table 1 and constitute a set of surveillance measures based on uniform definitions, collection, and reporting of occupational illness, injury, and risk data. They were selected because of their importance to occupational health and the easy availability of the necessary data in most states. An occupational health indicator is a specific measure of a work-related disease or injury, or a factor associated with occupational health, such as workplace exposures, hazards, or interventions, in a specified population.[5]

In this paper we present the 5 indicators (Indicators 9-13 in Table 1) that are occupational health outcomes that measure the health impact of occupational environmental hazards that contribute to the occurrence of fatal and non-fatal illness in Wisconsin. These indicators will be utilized to track trends in occupational illnesses in the working population in Wisconsin.

**Table 1.** CSTE Occupational Health Indicators

| Employment Demographics Profile Plus |
|---|
| 1. Non-fatal injuries and illnesses reported by employers |
| 2. Work-related hospitalizations |
| 3. Fatal work-related injuries |
| 4. Amputations reported by employers |
| 5. Amputations identified in state workers' compensation systems |
| 6. Hospitalizations for work-related burns |
| 7. Musculoskeletal disorders reported by employers |
| 8. Carpal tunnel syndrome cases identified in state workers' compensation systems |
| 9. Pneumoconiosis hospitalizations |
| 10. Pneumoconiosis mortality |
| 11. Acute work-related pesticide poisonings reported to poison control centers |
| 12. Incidence of malignant mesothelioma |
| 13. Elevated blood lead levels among adults |
| 14. Workers employed in industries with high risk for occupational morbidity |
| 15. Workers employed in occupations with high risk for occupational morbidity |
| 16. Workers in occupations and industries with high risk for occupational mortality |
| 17. Occupational health and safety professionals |
| 18. OSHA enforcement activities |
| 19. Workers' compensation awards |

## DATA COLLECTION METHODS

Indicators constitute a passive surveillance system that utilizes data from data sources collected for administrative and/or billing purposes. Full documentation of all 19 CSTE indicators data collection methods are available on the CSTE Web site.[5] Wisconsin indicators 9-13 are presented in this report.

*Indicator 9-Pneumoconiosis hospitalizations*

The pneumoconiosis is chronic nonmalignant lung diseases caused by the inhalation of mineral dust, nearly always in occupational settings. Wisconsin Hospital Discharge is the data source for this indicator. Hospitalizations with an International Classification of Disease (ICD) diagnosis code of ICD-9-CM 500-505 found in the primary or contributing diagnosis comprise the case counts used to develop this indicator.

*Indicator 10-Pneumoconiosis mortality*

Cause of death is coded by a certified nosologist using current ICD codes. Deaths with an ICD-10 code of J60-J66 or an ICD-9 code of 500-505 as the underlying or a contributing cause of death are used to calculate this indicator. We applied ICD-10 codes (J60-J66) for pneumoconiosis deaths identification for 2001 when the death certificate system switched coding systems from ICD-9 to ICD-10. The ICD-9 or 10 codes used are: "Total pneumoconiosis"=500 and 505, "Coal Worker pneumoconiosis"=500, "Asbestosis"=501, and "Silicosis"=502.

*Indicator 11-Acute work-related pesticide poisonings reported to the Wisconsin Poison Control Center*

Wisconsin Poison Center (WPC) receives calls and reports from throughout Wisconsin. Reports concerning pesticide poisoning form the basis for this indicator. Cases are included for this indicator if the reason for the call was "occupational" or exposure site was "workplace" and the individual exposed to 1 or more of the pesticide generic categories, eg disinfectants, fungicides (non-medicinal), fumigants, herbicides (includes algaecides, defoliants, desiccants, plant growth regulators), insecticides (includes insect growth regulators, molluscicides, nematicides), repellents, and rodenticides.

*Indicator 12-Incidence of malignant mesothelioma*

The Wisconsin Cancer Reporting System (WCRS) collects cancer incidence data on Wisconsin residents newly diagnosed with pre-invasive and invasive cancers. Out-of-state cancer registries provide

**Table 2.** Year 2000 Workforce Demographics (Age 16 and Older), Wisconsin and the United States

| | Wisconsin | US |
|---|---|---|
| Number Employed | 2,831,000 | 135,208,000 |
| | % | % |
| Workforce Unemployed | 3.5 | 4.0 |
| **Gender** | | |
| Male | 53.3 | 53.5 |
| Female | 46.7 | 46.5 |
| **Race** | | |
| Non-Hispanic White | 93.4 | 83.9 |
| Non-Hispanic Black | 4.3 | 11.3 |
| Other | 2.2 | 4.7 |
| Hispanic | 3.4 | 10.7 |
| **Employment** | | |
| Self-employed | 7.9 | 7.3 |
| Employed part-time | 19.2 | 16.9 |
| Worked <40 hours/week | 36.5 | 32.4 |
| Worked 40 hours/week | 30.0 | 37.7 |
| Worked >40 hours/week | 33.5 | 29.9 |

**Table 3.** Distribution of Workforce by Major Industry and Occupation Groupings, Wisconsin and the United States, 2000

| | Wisconsin | US |
|---|---|---|
| Number Employed | 2,831,000 | 135,208,000 |
| **Industry** | % | % |
| Construction | 5.0 | 5.4 |
| Manufacturing: durable goods | 13.8 | 8.8 |
| Manufacturing: nondurable goods | 8.8 | 5.6 |
| Transportation, communication, public utilities | 4.8 | 5.7 |
| Trade | 17.8 | 19.4 |
| Finance, insurance, real estate | 5.4 | 5.8 |
| Services | 21.9 | 25.2 |
| Government | 12.4 | 14.1 |
| Agriculture | 3.0 | 2.4 |
| **Occupation** | % | % |
| Executive, administrative, managerial | 12.5 | 14.6 |
| Professional specialty | 13.7 | 15.6 |
| Technicians and related support | 2.6 | 3.2 |
| Sales | 10.5 | 12.1 |
| Administrative support including clerical | 14.3 | 13.8 |
| Service occupations | 13.1 | 13.5 |
| Precision production, craft, repair | 12.3 | 11.0 |
| Machine operators, assemblers, inspectors | 8.5 | 5.4 |
| Transportation, material moving | 4.2 | 4.1 |
| Handlers, equipment cleaners, helper, laborers | 5.2 | 4.0 |
| Farming, forestry, fishing | 3.1 | 2.5 |

reports on Wisconsin residents diagnosed in their states to the Wisconsin registry under data exchange agreements with WCRS. Registry records are also matched to the Wisconsin resident death file on a yearly basis to identify cases not reported by the regular process. The number of incident malignant mesothelioma cases meeting the ICD-10 histology code of 9050-9053 criteria comprises the cases included in this indicator.

*Indicator 13-Elevated blood lead levels among adults*

Wisconsin State Statute 151 requires all health care professionals to be responsible for reporting, but they can rely on the laboratory they use to send their laboratory reports directly to the state. The state Adult Blood Lead Epidemiology and Surveillance (ABLES) program supported by a contract with NIOSH maintains information on all reports received. The ABLES reports with elevated blood lead levels ≥25µg/dL are utilized to calculate this indicator.

## RESULTS

The CSTE indicators proposal includes the need for an understanding of the overall state workforce descriptive demographic information. Wisconsin and the United States workforce descriptive information for the year 2000 is summarized in Table 2. In 2000, Wisconsin had a 3.54% unemployment rate, which was a little lower than the national rate. Self-employed workers represented 7.9% of the Wisconsin workforce and 1 in 5 workers was employed part-time. Nearly a third of workers worked more than 40 hours per week. The gender composition of the Wisconsin workforce was similar to the United States, with males comprising 53% and females 47%. Ninety-four percent of the workforce was in the age range of 18-64 years and 93% were non-Hispanic white, 4% non-Hispanic black, and about 3% other races.

Table 3 provides a comparison between Wisconsin and the United States by broad industry and occupation categories, and shows that Wisconsin has a higher proportion of the workforce in manufacturing and agricultural industries. In 2000, the Wisconsin workforce contained proportionally more workers than the nation in the following occupations: farming, forestry, fishing; machine operators, assemblers, inspectors; precision production, craft, repair; transportation, material moving; and handlers, equipment cleaners, helper, and laborers.

Table 4 provides the analytic results for Indicators

9-13 for Wisconsin for 2000 and 2001 and presents US figures for comparison.

## DISCUSSION

In 2000, Wisconsin had lower total pneumoconiosis-related age-adjusted hospitalizations and deaths compared to the United States. Morbidity and mortality due to pneumoconioses are known to be underreported both on hospital discharge and on death certificates.[6] Pneumoconiosis is likely to be underrecorded on the death certificate as a cause of death because clinicians don't always recognize it for a number of reasons including the long latency between exposure and onset of symptoms and the non-specificity of symptoms.[7] Due to the long latency period, pneumoconioses diagnosed today are typically the result of exposures from 20 or more years ago.

There are no coalmines in Wisconsin, thus Wisconsin has lower rates of coal workers' pneumoconiosis than the nation. The limited occurrence of coal workers' pneumoconiosis reported in Wisconsin is usually due to exposures experienced elsewhere, although secondary coal handling may account for an occasional report. More likely, former coal miners have moved to Wisconsin to find new non-mining jobs or have moved here to retire.

Wisconsin has higher rates of silicosis than the nation. Wisconsin has many foundries and ceramics companies where silica exposures occurred in the past, as well as industrial processes using silica and sandblasting. This may explain the high rate of silicosis diagnosed in Wisconsin. Further investigation is needed.

The epidemic of asbestos-associated disease seen worldwide[8] has also been seen in Wisconsin.[9] Wisconsin has fewer asbestos product manufacturing companies and sources of occupational asbestos exposure such as shipyards than other states, which may account for the lower asbestosis rates. Wisconsin has yet to document a significant decline in malignant mesothelioma. At best, Wisconsin's malignant mesothelioma rate has leveled off. The WCRS reported 76 and 81 malignant mesothelioma cases in 2000 and 2001, respectively. Surveillance, epidemiology and end results (SEER) data, based on estimates from 13 state SEER registries, estimated the incidence rate of malignant mesothelioma for Wisconsin at 18 per million and for the United States at 10.5 per million.[10] This difference needs to be further investigated as it appears inconsistent with Wisconsin's lower asbestosis hospitalization and death rates. There may be asbestos exposures in Wisconsin that are not sufficient to cause clinically apparent asbestosis but are sufficient to cause malignant mesothelioma. Current asbestosis hospitalizations and mortality, and malignant mesothelioma cases reflect occupational, para-occupational, household, or environmental exposure to asbestos that occurred more than 10 years ago. Latency periods are often 30 or more years, indicating a need to investigate exposures that may have occurred in the 1960s and 1970s. While the current use of asbestos in Wisconsin is limited, many asbestos-containing materials remain in place and need

**Table 4.** Five Occupational Health Indicators of Work-Related Illness, Wisconsin 2000, 2001, Compared to the United States 2000

| | US (2000) | Wis (2000) | Wis (2001) |
|---|---|---|---|
| **Indicator 9: Age-Adjusted* Rates† of Hospitalization from or with Pneumoconiosis** | | | |
| Total pneumoconiosis | 146.8 | 48.8 | 46.2 |
| Coal Workers' pneumoconiosis | 44.9 | 5.4 | 6.9 |
| Asbestosis | 93.5 | 31.0 | 28.1 |
| Silicosis | 5.2 | 13.0 | 10.5 |
| Other and unspecified pneumoconiosis | 4.4 | 0.9 | 1.9 |
| **Indicator 10: Age-Adjusted Rates of Mortality‡ from or with Pneumoconiosis** | | | |
| Total pneumoconiosis | 13.3 | 4.7 | 6.2 |
| Coal Workers' pneumoconiosis | 4.4 | — | — |
| Asbestosis | 6.9 | 2.7 | 4.3 |
| Silicosis | 0.7 | 1.4 | 1.4 |
| Other and unspecified pneumoconiosis | 1.4 | — | — |
| **Indicator 11: Number of Work-Related Pesticide-Associated Poisoning Reported to Poison Control Centers** | | | |
| Cases of pesticide-associated poisoning | 2827 | 41 | 39 |
| **Indicator 12: Number of Cases of Malignant Mesothelioma Reported** | | | |
| Malignant Mesothelioma cases | NA | 76 | 81 |
| Malignant Mesothelioma rate† | 10.5§ | 18 | 19 |
| **Indicator 13: Incidence Rate¶ of Elevated Blood Lead for Persons Age 16 Years or Older** | | | |
| Rate of BLL ≥ 25 µg/dL | 5.5 | 8.3 | 5.5 |
| Rate of BLL ≥ 40 µg/dL | 1.0 | 1.5 | 1.2 |

NA=not available; BLL=blood lead levels
* Age adjusted to 2000 US standard population
† Rate per million population
‡ Rates were not calculated for >5 cases
§ Estimated from 13 Surveillance, Epidemiology, and End Results Program (SEER) cancer registries
¶ Rate per 100,000 workers

to be managed, maintained, or removed. In-place asbestos-containing materials are commonly present in factory settings and in schools and public buildings throughout the state.[11] Tradesmen and general maintenance employees continue to be at increased risk of exposure if training and asbestos management plans are not fully implemented.[12]

WPC reported 41 and 39 work-related pesticide-associated poisoning cases in 2000 and 2001, respectively. In 2000, the incidence rate of pesticide poisonings per 100,000 Wisconsin employed persons was 1.5. Rates among the 13 states in the CSTE report ranged from 0.7 to 9.0 pesticide poisonings per 100,000, compared to 2.1 for the US population.[13] The US Environmental Protection Agency estimates there are 20,000-40,000 work-related pesticide poisonings per year.[14] There is no national pesticide poisoning surveillance system so poison control center (PCC) data is the best available data source that is national in scope. However, calls to state and regional PCCs are estimated to capture only approximately 10% of acute occupational pesticide-related illness cases.[15]

Wisconsin has a higher proportion of agricultural workers than the national average; however our agriculture is not as pesticide intensive as is seen in California, Texas, and Florida. Dairy farming primarily uses herbicides, which are uncommon acute poisons. Further investigation of the 30-40 reports received is warranted to determine the sources of exposure.

In 2000, Wisconsin had higher blood lead level (BLL) incidence rates in both BLL indicator categories (≥25 µg/dL and ≥40 µg/dL) compared to the US population. The differences are somewhat less for 2001. Adult lead exposure and lead poisoning still occur in Wisconsin and can have serious health consequences. Although Wisconsin lead poisoning may be higher than the nation as a whole, Wisconsin ABLES surveillance data supports the conclusion that elevated blood lead rates are declining and that most, but not all, of Wisconsin's traditional lead-using industries have reduced lead use or instituted better exposure controls. Vigilance is needed, especially in new emerging industries and construction/renovation businesses, where workers may not recognize lead exposure or know that even mild symptoms require medical attention and testing.

Wisconsin's Health Plan, *Healthiest Wisconsin 2010,* Environmental and Occupational Health Hazards Health Priority Area Objective 3 goal states: "By December 31, 2010, the incidence of occupational injury, illness, and death will be reduced by 30%."[16] The baseline year for measuring the success in achieving this goal will be the year 2000 data. The occupational indicators will provide a means to measure and track progress.

There are differences in the distribution of race, ethnicity, and employment status between the Wisconsin and US workforce populations as detailed in Tables 2 and 3. Thus we would expect differences in work-related morbidity and mortality as well. Using an internal comparison to measure percent reduction from year to year avoids relying on the national comparison data for measuring success.

There are many factors that can affect the quality and comparability of occupational health indicator data. CSTE cautions against over-interpreting differences when comparing indicator data between states or with the United States. There are likely regional differences in underreporting of occupational injuries and illnesses by employees, physicians, and employers; health care professional recognition and recording of occupational injuries and illnesses in medical records; difficulties for physicians in attributing diseases with long latency to specific exposures and, for some diseases, multi-factorial contributing causes. Some states' administrative data systems may exclude some at-risk populations from being captured by public health surveillance data (eg, self-employed, military). Another limitation of the indicator-based surveillance system is the reliance on existing databases, which were not designed for the purpose of disease surveillance but for administrative and billing purposes. Despite the difficulties, indicators such as the 5 discussed here present considerable promise as the core of a fundamental public health surveillance program and can advance the understanding of the significant impact occupational injury and illness has on Wisconsin's workforce.

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