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Changing Patterns of Pneumoconiosis Mortality — United States, 1968–2000

Pneumoconioses are caused by the inhalation and deposition of mineral dusts in the lungs, resulting in pulmonary fibrosis and other parenchymal changes. Many persons with early pneumoconiosis are asymptomatic, but advanced disease often is accompanied by disability and premature death. Known pneumoconioses include coal workers' pneumoconiosis (CWP), silicosis, asbestosis, mixed dust pneumoconiosis, graphitosis, and talcosis. No effective treatment for these diseases is available (*1*). This report describes the temporal patterns of pneumoconiosis mortality during 1968–2000, which indicates an overall decrease in pneumoconiosis mortality. However, asbestosis increased steadily and is now the most frequently recorded pneumoconiosis on death certificates. Increased awareness of this trend is needed among health-care providers, employers, workers, and public health agencies.

The National Institute for Occupational Safety and Health (NIOSH) maintains a mortality surveillance system for respiratory diseases of occupational interest (*2*). The data are drawn from annual National Center for Health Statistics (NCHS) multiple-cause-of-death mortality files, which include all deaths in the United States since 1968. For this report, pneumoconiosis deaths were identified during 1968–2000, the most recent year for which complete data are available, and include any death certificates for which an *International Classification of Diseases* (ICD) code* for CWP, silicosis, asbestosis, or unspecified/other pneumoconiosis was listed as either the underlying or contributing cause of death. Age-adjusted death rates (per million population per year) for periods of interest were calculated by using the mid-year population as a denominator. Age standardization was performed by using the 2000 U.S. Census population.

During 1968–2000, pneumoconiosis was recorded on 124,846 death certificates. Comparing 1968–1981 with 1982–2000, death rates among males declined 36% for CWP and approximately 70% for both silicosis and unspecified/other pneumoconiosis, but increased nearly 400% for asbestosis. For both sexes, the decline was smaller among non-Hispanic blacks (26%) than among non-Hispanic whites (40%) for CWP but similar or greater for silicosis and unspecified/other pneumoconiosis, whereas the death rates for asbestosis increased 448% among blacks versus 342% among whites. Death rates among females were substantially lower than among males and, except for asbestosis, indicated decreases among both non-Hispanic whites and blacks. Asbestosis death rates increased among those aged ≥45 years; otherwise, death rates for the various pneumoconioses decreased regardless of age category.

The number of asbestosis deaths increased from 77 deaths (annual age-adjusted death rate: 0.54 per million population) in 1968 to 1,493 deaths (6.88 per million) in 2000; deaths for all other pneumoconioses decreased (Figure 1). CWP was the most frequently recorded pneumoconiosis from 1968 until 1998, when it was surpassed by asbestosis. Silicosis mortality declined steadily and, since 1993, was the least recorded category of pneumoconiosis. The geographic distributions of mortality for each type of pneumoconiosis for the 1968–1981 and 1982–2000 periods indicate that asbestosis increased substantially throughout the United States, particularly in the coastal states, where asbestos was used frequently in shipbuilding (Figure 2); CWP and the other pneumoconioses, which

*ICDA-8 (1968–1978), ICD-9 (1979–1998), and ICD-10 (1999–2000) (*2*).

INSIDE

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tend to occur in the mining and industrial regions of the country, had either little change or a decline during the two study periods.

Information from death certificates regarding usual occupation and industry was available for deaths in selected states only for 1985–1999 (*2*) (Tables 1 and 2). During this period, ship and boat building/repairing was replaced by nonmetallic mineral/stone products as the industry with the highest proportionate mortality ratio (PMR) for asbestosis. In addition, explosives worker replaced mining machine operators as those whose occupation had the highest PMR for other/unspecified pneumoconiosis.

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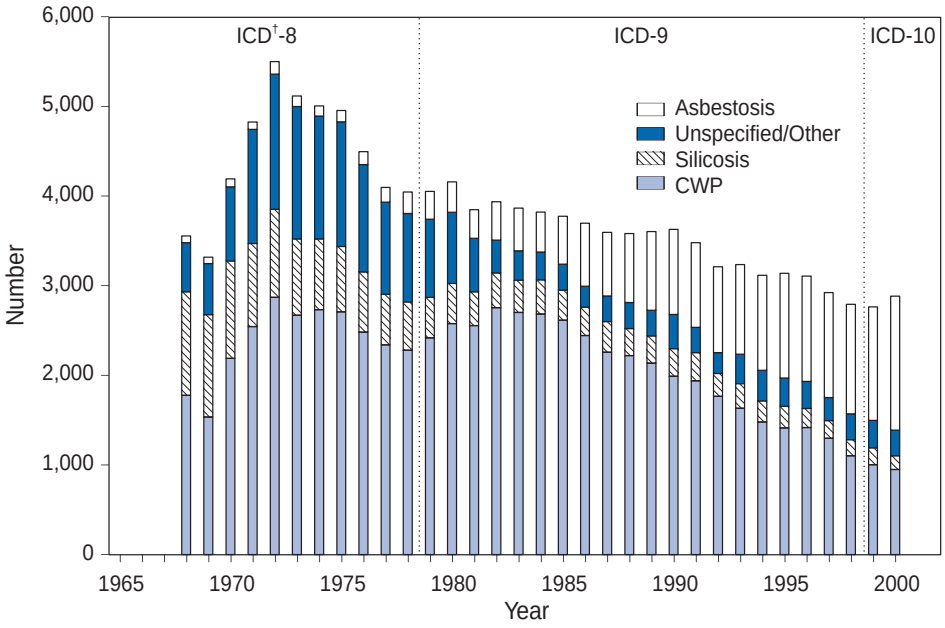
Editorial Note: The decline in overall pneumoconiosis mortality is attributed to reductions in CWP, silicosis, and other/unspecified pneumoconiosis mortality. The overall decline in CWP mortality follows the general reduction in the coal mining workforce since the 1920s. The Federal Coal Mine Health and Safety Act of 1969 introduced lower dust limits in the mining environment to protect the health of the nation's coal miners (*3*). Resulting lower dust levels have contributed to major reductions in disease among actively employed coal miners (*4*); however, the full impact of dust control on CWP mortality is not yet known. As with coal mining, the number of workers exposed to hazardous silica dust has declined through the loss of jobs in heavy industry. In addition, dust limits for silica in the United States also have been reduced steadily for approximately 30 years (*5*). Both job losses and reductions in exposures have contributed to the decline in silicosis mortality.

Asbestosis is the only major pneumoconiosis to demonstrate increased mortality. Because asbestosis mortality peaks 40–45 years after initial occupational exposure to asbestos (*6*), this upward trend reflects past exposure to asbestos fibers. Asbestos consumption increased substantially during and after World War II, with a peak in 1975 followed by a steep decrease beginning in the 1980s (*7*). Given the temporal pattern of usage and latency and survival considerations, asbestosis-related mortality is expected to increase for at least another decade. Asbestos-containing materials that continue to be used in some workplaces and remain in buildings represent a potential risk.

The findings in this report are subject to at least five limitations. First, occupation and industry codes that meet NCHS quality criteria are available only for certain states and for certain years. Thus, PMRs only reflect the industrial and occupational profiles of those states in those years. Second, these

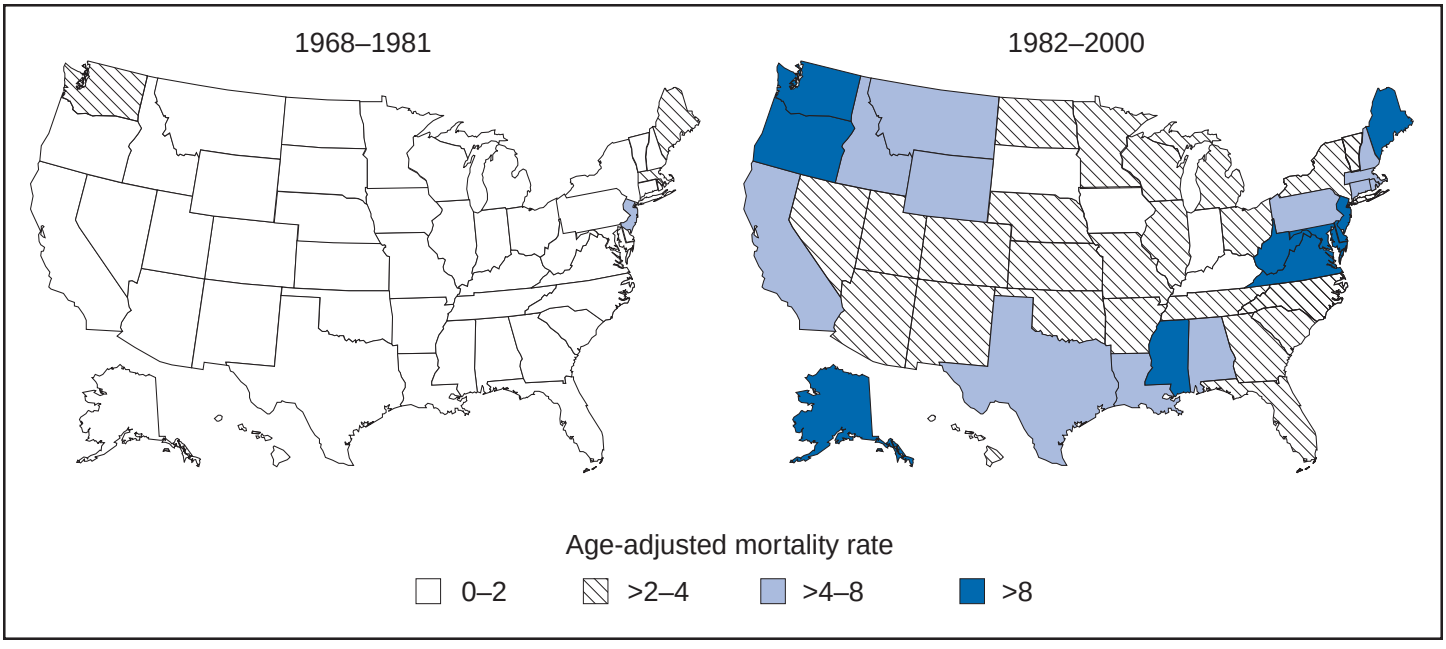
FIGURE 1. Number of deaths with any death certificate mention of asbestosis, coal workers' pneumoconiosis (CWP), silicosis, and unspecified/other pneumoconiosis among persons aged ≥15 years, by year — United States, 1968–2000*



* Because more than one type of pneumoconiosis might be reported on a death certificate as an underlying or contributing cause of death, the sum of individual types can exceed the overall, any-mention total. Thus, the total height of stacked bars slightly exceeds the total number of pneumoconiosis deaths.
† *International Classification of Diseases Revision.*

codes represent only the usual industry and occupation as entered on each death certificate, which is not always the industry and occupation in which the decedent's causative exposure occurred. Third, the state of residence at death is not always the state in which the decedent's causative exposure occurred, especially given the typically long latency and chronic course of the pneumoconioses. Fourth, slight differences exist in the ICD coding for asbestosis between the 9th and 10th revisions. In the 10th revision, the rubric for code J61 is "pneumoconiosis due to asbestos and other mineral fibers," whereas the rubric for the 8th and 9th revisions was simply "asbestosis." The overall effect of this change is unclear but might have resulted in an increase in the number of cases between the 9th and 10th revisions (i.e., between 1998 and 1999). Because occupational fiber exposures were predominantly to asbestos, the net effect of this change probably is small; the trend of increasing asbestosis deaths

FIGURE 2. Mortality rates* for asbestosis, by state — United States, 1968–1981 and 1982–2000



* Per 1,000,000 population.

TABLE 1. Highest proportionate mortality ratio (PMR) among U.S. residents aged ≥15 years, by industry, occupation, and type of pneumoconiosis — selected states, 1985–1992

Pneumoconiosis type	Industry (CIC*)	PMR†	(95% CI§)	Occupation (COC¶)	PMR	(95% CI)
CWP**	Coal mining (041)	51.3	(49.5–53.1)	Mining machine operators (616)	49.6	(47.9–51.5)
Asbestosis	Ship/Boat building/repairing (360)	24.2	(20.7–28.2)	Insulation workers (593)	152.1	(125.7–184.2)
Silicosis	Metal mining (040)	37.9	(30.1–47.8)	Metal/Plastic processing machine operators (725)	93.9	(46.9–167.9)
Other/Unspecified	Coal mining (041)	31.1	(28.4–34.1)	Explosives workers (615)	38.0	(12.3–88.7)

* Census Industry Code. Based on decedents' usual industry.
† Based on any mention of pneumoconiosis on death certificates and adjusted for age, sex, and race. PMR is defined as the observed number of deaths with the condition of interest in a specified industry/occupation, divided by the expected number of deaths with that condition (*2*).
§ Confidence interval.
¶ Census Occupation Code. Based on decedents' usual occupation.
** Coal workers' pneumoconiosis.

TABLE 2. Highest proportionate mortality ratio (PMR) among U.S. residents aged ≥15 years, by industry, occupation, and type of pneumoconiosis — selected states, 1993–1999

Pneumoconiosis type	Industry (CIC*)	PMR†	(95% CI§)	Occupation (COC¶)	PMR	(95% CI)
CWP**	Coal mining (041)	54.7	(52.6–56.9)	Mining machine operators (616)	52.8	(50.7–55.1)
Asbestosis	Nonmetallic mineral/stone products (262)	14.0	(10.2–18.8)	Insulation workers (593)	70.9	(54.9–91.7)
Silicosis	Metal mining (040)	41.7	(31.6–55.1)	Metal/Plastic processing machine operators (725)	83.3	(27.0–194.7)
Other/Unspecified	Coal mining (041)	44.8	(41.0–48.9)	Mining machine operators (616)	43.4	(39.6–47.6)

* Census Industry Code. Based on decedents' usual industry.
† Based on any mention of pneumoconiosis on death certificates and adjusted for age, sex, and race. PMR is defined as the observed number of deaths with the condition of interest in a specified industry/occupation, divided by the expected number of deaths with that condition (*2*).
§ Confidence interval.
¶ Census Occupation Code. Based on decedents' usual occupation.
** Coal workers' pneumoconiosis.

(Figure 1) indicates no evidence of any substantial change during 1998–1999. Finally, as with any data based solely on death certificate information, cause of death information is subject to potential errors associated with disease diagnosis, recording, and coding. For example, this information can be impacted by temporal changes in public and medical awareness and practice. In the years after the Farmington, West Virginia, mine disaster in 1968, the nation's attention focused on hardships suffered by coal miners, with a possible attendant rise in recording of CWP on death certificates. More recently, focus on asbestosis has increased, with a marked increase in asbestos-related litigation (*8*). This trend also has raised awareness of asbestosis, likely leading to its more frequent diagnosis and recording on death certificates. In addition, new technologies such as computed tomography are used increasingly, resulting in increased diagnostic sensitivity for pneumoconiotic diseases.

Despite these limitations, the national mortality data offer substantial benefits: they are national in scope, well documented, and readily available. These data are used to provide historical perspective on pneumoconiosis mortality and, given sufficient time lag, can be used to assess the effectiveness of preventive measures. They also can provide useful information on pneumoconiosis by location, industry, and occupation, suggesting ways in which to target preventive intervention and disease-management resources.

Considerable progress has been made toward elimination of the pneumoconioses. Nevertheless, certain pneumoconioses considered to be nearly eliminated are still occurring and causing deaths, even among young workers in the United States (*9,10*). Pneumoconioses are preventable, and efforts to eliminate these diseases should continue.

Acknowledgments

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Acute Hemorrhagic Conjunctivitis Outbreak Caused by Coxsackievirus A24 — Puerto Rico, 2003

Acute hemorrhagic conjunctivitis (AHC) is an epidemic form of highly contagious conjunctivitis and is characterized by sudden onset of painful, swollen, red eyes, with conjunctival hemorrhaging and excessive tearing. Since 1981, when AHC was first detected in the Western Hemisphere (*1*), three major epidemics had occurred until 2003, all affecting the Caribbean. During August–October 2003, a fourth epidemic occurred in Puerto Rico (2000 population: 3.8 million). This report summarizes the outbreak investigation conducted by the Puerto Rico Department of Health (PRDOH), which documented an estimated 490,000 persons with illness, including >51,000 cases reported by physicians; demonstrated laboratory evidence of Coxsackievirus A24 (CA24); and determined that school-aged children (i.e., aged 5–18 years) and those living in crowded urban areas were at highest risk. To control outbreaks of AHC, prevention methods (e.g., frequent hand washing and avoidance of sharing towels and bedding) should be targeted to groups at highest risk, and information should be disseminated after the first report of AHC in the area.

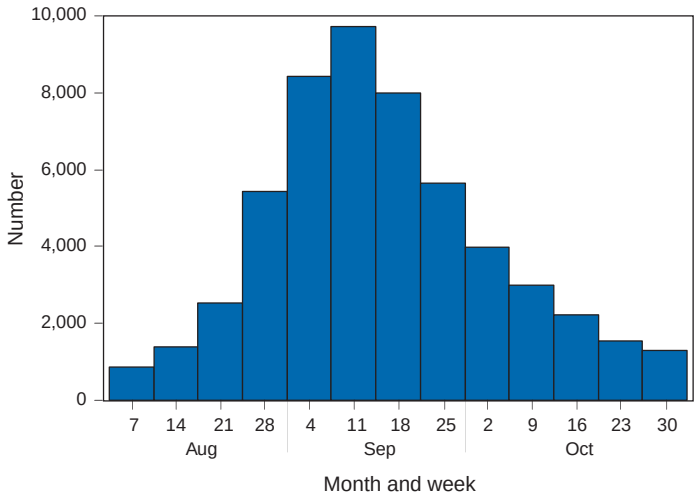
For surveillance purposes, PRDOH defines a case of AHC as physician-diagnosed conjunctivitis. To monitor the level of conjunctivitis, all health-care providers in Puerto Rico are contacted weekly to determine case counts of conjunctivitis treated during the week; providers typically report an average of 500 cases. However, in August 2003, reports of conjunctivitis increased weekly to a peak of nearly 10,000 during mid-September; reports returned to baseline in late October (Figure). During August–October 2003, health-care providers reported 51,850 cases of conjunctivitis.

Conjunctival swabs were obtained from a convenience sample of affected persons from five regions. The samples were sent to CDC, where, after testing negative for bacteria, they were tested for the presence of enterovirus RNA by using a 5-prime nontranslated region reverse transcriptase polymerase chain reaction (RT-PCR) assay. For positive specimens, the enterovirus was further characterized by RT-PCR amplification of the VP1 region of the virus and genetic sequencing and then identified as CA24 by comparison with reference sequences (*2,3*). Of 26 conjunctival swabs tested, 20 (77%) were positive for enterovirus; of these, 19 were identified as CA24 by VP1 sequencing. The remaining six conjunctival swabs were negative for enterovirus.

To further assess disease burden, identify persons at high risk, and estimate economic impact associated with this outbreak, PRDOH contacted approximately 340 households by calling randomly selected listed telephone numbers. One adult in each household was asked about the number and ages of household members with conjunctivitis. Adults also were asked about their workdays lost and use of medical services.

A total of 300 (88%) households participated in the survey, representing 902 household members; 114 (13%) reported having conjunctivitis during the outbreak period. The median age of household members was 21 years (range: 1–83 years). The attack rate was higher among school-aged children than among persons aged ≥19 years (24% versus 10%, respectively) (relative risk [RR] = 2.42; 95% confidence

FIGURE. Number* of reported cases of acute hemorrhagic conjunctivitis, by month and week of report — Puerto Rico, August 7–October 30, 2003



* N = 51,850.