apy for all patients with gonorrhea include doxycycline for possible coexistent chlamydia. Removing the chlamydia test criterion from the definition of excellent quality increases membership in this category from two to six patients. Finally, the low level of public health reporting and the underuse of syphilis serology testing is particularly important since contact tracing is crucial to prevent further spread of disease.[2] In the study population, 3% of the syphilis serology tests were positive.

A goal of public health policy is to encourage poor patients with sexually transmitted diseases to seek care. We have shown that when such patients did seek care at one outpatient clinic, significant deficiencies existed in the documentation of well-established process-of-care criteria. If our results are generalizable, then the goals of public health policy should be broadened to include improving the quality of care provided to patients with sexually transmitted diseases. □

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References

1. Aral SO, Holmes KK. Epidemiology of sexual behavior and sexually transmitted diseases. In: Holmes KK, Mardh P, Sparling PF, et al., eds. *Sexually Transmitted Diseases*. New York, NY: McGraw-Hill; 1990:19–22.
2. Cates W, Meheus A. Strategies for development of sexually transmitted diseases control programs. In: Holmes KK, Mardh P, Sparling PF, et al., eds. *Sexually Transmitted Diseases*. New York, NY: McGraw-Hill; 1990:1023–1029.

Surveillance of Sentinel Occupational Mortality in the District of Columbia: 1980 to 1987

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ABSTRACT

Epidemiological surveillance of sentinel occupationally related deaths commonly relies on computerized analyses of mortality data obtained from vital statistics records. A computer search of death records in the District of Columbia for the period 1980 to 1987 identified 15 cases that noted asbestosis, silicosis, coal worker's pneumoconiosis, or primary cancer of the pleura/mesothelioma as the underlying cause of death. A manual review of the death certificates for the same period identified three times as many cases (n = 48) with any mention of these conditions. Problems with performing surveillance of these events using death certificates include the lack of sufficient information to identify mesotheliomas and the failure to code and computerize all contributing causes of death. (*Am J Public Health*. 1991;82:117–119)

Introduction

Occupational disease surveillance can be used to plan, implement, and evaluate public health interventions that are designed to prevent or control work-related morbidity and mortality. The simplest surveillance systems have been based on the concept of "sentinel health events," as described by Rutstein et al. and others.[1,2]

An ongoing surveillance system may serve to (1) identify occupational or community cohorts that may benefit from medical screening, counseling, or epidemiological follow-up; (2) identify industries, particular companies, or neighborhoods that may require industrial hygiene evaluation, engineering controls, or hazardous waste remediation; (3) measure the impact of selected work-related exposures on the mortality of a population; and (4) provide an evaluation tool to determine the impact of regulatory measures.[1] As of 1988, 40 states and the District of Columbia have initiated efforts to code the decedent's industry and occupation on death certificates.[3]

We report the results of a pilot population-based surveillance project performed in the Washington, DC metropolitan area, which includes the nation's capital and surrounding areas of Maryland and Virginia. The estimated population of this metropolitan area is 3.25 million persons, 28% of whom are Black.[4] The District itself is home to 639 000 residents, 70% of whom are Black and 19% of whom live below the poverty level. The entire metropolitan area includes 1.5 million workers, 36% of whom work in the District,[5] while the District population itself includes 295 100 workers, 70% of whom work within its borders.[5]

Methods

A manual review of all death certificates maintained by the District of Columbia's Division of Vital Statistics and Research for the period 1980 to 1987

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TABLE 1—Sentinel Occupationally Related Deaths by Race, Sex, and Age at Death: District of Columbia, 1980–1987 Automated and Manual Search of Death Records[a]

Cause of Death	Race-Sex Group	Number of Cases	Mean Age, y	Range, y
Mesothelioma	Black males	11	67	
	White males	11	67	
	Black females	3	73	
	White females	9	63	
	Group total =	34 (9)	66	34–88
Asbestosis	Black males	3	62	
	White females	1	84	
	Group total =	4 (1)	69	53–84
Silicosis	Black males	3	59	
	White males	3	80	
	Group total =	6 (3)	67	40–80
Anthracosis	Black males	1	71	
	White males	3	85	
	Group total =	4 (2)	82	71–100
Total Number		48 (15)	68	34–100

[a]Numbers in parentheses denote the number of cases identified by automated search.

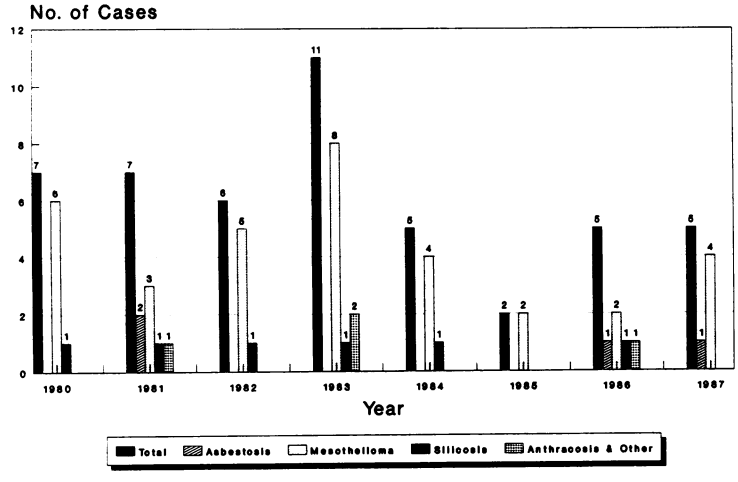

FIGURE 1—Trends in selected sentinel deaths in the District of Columbia, 1980–1987.

(n = 70 537) was performed to identify certificates that had any mention of silicosis,[3] asbestosis,[1] coal worker's pneumoconiosis,[2] or mesothelioma or cancer of the pleura.[9] These four health events that were occupationally related (SHE-Os) (Sentinel Health Event—Occupational) were considered to be almost certainly attributed to occupational or environmental exposure. Additionally, a computerized search using codes from the *International Classification of Diseases,* 9th revision *(ICD-9)*,[6] was made for all certificates on which the underlying cause of death was listed as *ICD-9* 163.9 (cancer of the pleura), 500 (coal worker's pneumoconiosis), 501 (asbestosis), 502 (silicosis), or 505 (pneumoconiosis—unspecified). Abstracted data included the decedent's age, sex, race, cause of death, usual place of residence, and usual occupation. Statistical testing of mean ages at death for various race and sex groupings was performed using the *t* test.

Results

The manual search identified 48 SHE-Os, with an average age at death of 68 years (range 34 to 100 years) (Table 1). Males accounted for 35 of the deaths (73%); females accounted for 13 of the deaths (27%), with an average age at death of 69 and 67 years respectively. When delineated by race and sex, Black males accounted for 18 of the deaths (38%), with an average age at death of 65 years. Seventeen deaths (35%) occurred among White males, with an average age at death of 72 years ($t = 1.65$, $P = 0.11$).

Figure 1 describes the number of sentinel deaths that occurred each year, delineated by cause of death. Mesothelioma was recorded on 34 death certificates, with an average age at death of 66 years (range 34 to 88). The occurrence of mesothelioma deaths fluctuated during the period, peaking in 1983. Five of the occupations listed on these death certificates were in the construction trades. Other occupational statements (e.g., housewife, cab driver) may indicate exposure earlier in the decedent's career, including military service, summer or part-time jobs, "carry-home" exposure, or environmental exposure. Two mesothelioma deaths occurred among barbers.

Asbestosis was listed as the cause of death on four death certificates, and silicosis was recorded on six. Five of the occupations listed on these death certificates were in either construction or mining. Anthracosis, or coal worker's pneumoconiosis, was recorded as the cause of death on four death certificates. Only one of the decedents was noted to be a miner.

The computerized search using the *ICD-9* codes listed above identified 15 deaths for the period 1980 to 1987. This number was substantially fewer than the 48 found in the manual search for the same period.

Discussion

Death certificates offer a readily accessible uniform data source for surveillance of occupationally related diseases. The limitations of death certificates are well known and include misclassification

of cause-of-death data as well as often sketchy or incomplete occupational history statements.[7,8] The usefulness of death records is further limited when only a singular underlying cause of death is coded and computerized. The lack of access to computerized multiple cause-of-death files precludes the ability of automated searches to identify cases in which sentinel occupationally related conditions may have been a contributing cause of death. In this study, the computerized review of death certificates coded with a singular underlying cause of death missed over two thirds of the SHE-Os identified by a manual search that considered all listed contributing causes of death.

In addition, conditions such as intrathoracic mesotheliomas are often difficult to identify through death certificates because they are not coded with sufficient morphological information to delineate them from lung cancers or cancers of the pleura. Peritoneal mesotheliomas are harder to identify through death certificates because they may be coded as carcinomatosis, disseminated cancer, or other nonspecific malignancies.[9] Finally, the method by which certifiers complete death certificates compounds the difficulty in identifying occupationally related deaths.[7,10]

The actual number of occupationally caused deaths is likely to be much higher than even that determined by the manual review. We limited our analysis to four sentinel causes of death that are exclusively occupational or environmental in origin. We did not include deaths due to other sentinel occupationally related cancers, such as lung cancer, bladder cancer, oropharyngeal cancer, gastrointestinal cancer, and leukemia, for which nonoccupational contributing factors may predominate. For example, estimates based on industrially exposed cohorts suggest that, for every mesothelioma death, there may be many additional asbestosis cases and asbestos-related lung cancer deaths.[11,12]

Several interesting points may be raised concerning the distribution of work-related deaths in the metropolitan Washington area. First, Blacks accounted for 44% of the deaths while accounting for only 24% of the work force in the metropolitan area and 36% of the work force in the District.[5] Also, the average age at death for Black males tended to be lower than that of White males, suggesting that Blacks in the Washington metropolitan area experience increased exposure in the workplace, face decreased access to health care once symptoms arise, or have a disproportionate number in occupations with the potential for exposure to occupational hazards.

Second, women accounted for more than 25% of all asbestos-related deaths, including one of the four asbestosis deaths. These points are of particular concern, given that death certificate coding is less accurate for minorities than for Whites[13] and that less attention is paid to obtaining occupational histories from female patients than from male patients.[14]

The third finding of interest is that construction workers represented 15% of all SHE-Os while representing only about 8% of the metropolitan area work force. Nationwide, the construction industry ranks third in the rate of work-related fatalities, surpassed by only mining and agriculture. Despite potential risks from health and safety hazards that are commonly encountered in the building and construction trades, the industry remains poorly regulated by the Occupational Safety and Health Administration and is often exempt from many federal standards.

The Washington metropolitan area work force has traditionally been considered "nonindustrial" because of the large proportion of governmental and office workers; hence, it has been deemed free from industrially related diseases. The findings of this pilot project suggest that work-related diseases do occur in areas with a relative absence of what is generally considered to be "heavy industry." Further, these data suggest the need for increased prevention and control efforts, particularly among the construction trades in the District of Columbia metropolitan area. □

References

1. Baker EL, Honchar PA, Fine LJ. Surveillance in occupational illness and injury: concepts and content. *Am J Public Health.* 1989;79(suppl):9–11.
2. Rutstein DD, Mullan RJ, Frazier TM, Halperin WE, Melius JM, Sestito JP. Sentinel health events (occupational): a basis for physician recognition and public health surveillance. *Am J Public Health.* 1983;73(9): 1054–1062.
3. Melius JM, Sestito JP, Seligman PJ. Occupational disease surveillance with existing data sources. *Am J Public Health.* 1989;79(suppl):46–52.
4. US Dept of Commerce, Bureau of Census. *County and City Data Book–1983: A Statistical Abstract* (suppl). 10th ed. Washington, DC: 1983.
5. US Dept of Commerce, Bureau of the Census. *1980 Census of Population and Housing, Census Tracts: Washington, DC-MD-VA,* Sections 1 and 2. July 1983.
6. World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.* 9th rev. Geneva, Switzerland: World Health Organization; 1975.
7. Percy C, Stanek E, Gloeckler L. Accuracy of cancer death certificates and its effect on cancer mortality statistics. *Am J Public Health.* 1981;71:242–250.
8. Swanson GM, Schwartz AG, Burrows RW. An assessment of occupation and industry data from death certificates and hospital medical records for population-based cancer surveillance. *Am J Public Health.* 1984;74:464–467.
9. Antman K, Aisner J. *Asbestos-Related Malignancies.* New York, NY: Grune and Stratton; 1987:33.
10. Kircher T, Anderson RE. Cause of death, proper completion of the death certificate. *JAMA.* 1987;258:349–352.
11. Lilienfeld DE, Mandel JS, Coin P, Schuman LM. Projection of asbestos-related diseases in the United States, 1985–2009, I: cancer. *Br J Ind Med.* 1988;45:283–291.
12. Selikoff IJ, Hammond EC, Seidman H. *Mortality Experience of Insulation Workers in the United States and Canada.* New York, NY: Academy of Science; 1979; 330.
13. Becker TM, Wiggins CL, Key CR, Samet JM. Symptoms, signs, and ill-defined conditions: a leading cause of death among minorities. *Am J Epidemiol.* 1990;131(4):664–668.
14. Sokas RK, Diserens D, Johnston MA. Integrating occupational health into the internal medicine clerkship using problem-based learning. *J Gen Intern Med.* 1991;6:450–454.