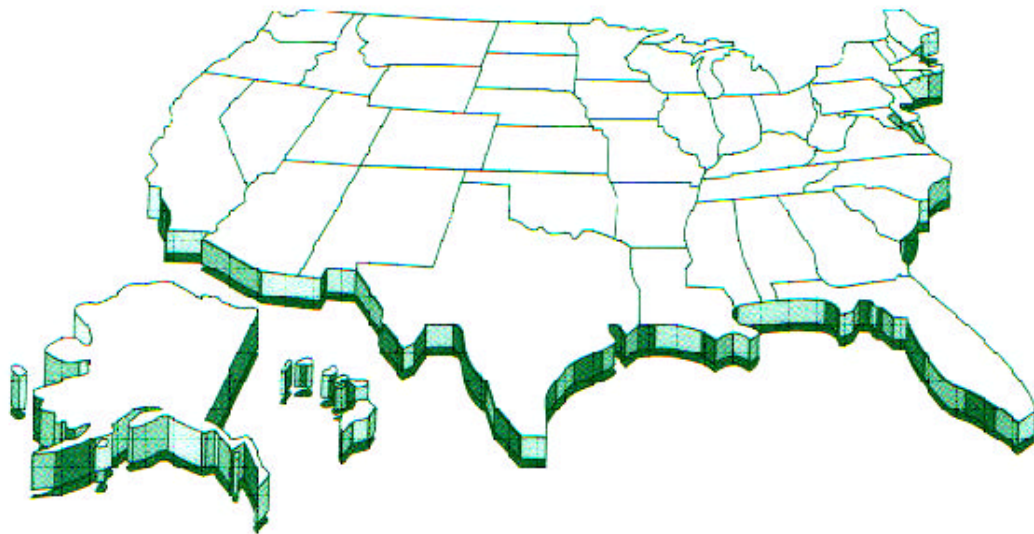




# Atlas of Respiratory Disease Mortality, United States: 1982-1993



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



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National Institute for Occupational Safety and Health

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## PREFACE

This *Atlas of Respiratory Disease Mortality, United States: 1982-1993* presents maps showing geographic distributions (by health service area) of mortality associated with selected respiratory conditions that together represent nearly all respiratory diseases. For categories of traditional occupational lung diseases mapped in this atlas (i.e., the pneumoconioses, including coal workers' pneumoconiosis, asbestosis, silicosis, byssinosis, and other and unspecified pneumoconioses), nearly all cases are attributable to hazardous occupational exposure. NIOSH has previously published maps showing geographic distributions (by county) of pneumoconiosis mortality in the United States [NIOSH 1996].\* For other respiratory disease categories mapped in this atlas, cases frequently occur in the absence of hazardous occupational exposure, and smaller proportions of cases--much smaller for some disease categories--are therefore considered attributable to occupational exposure. Nevertheless, for each of the disease categories mapped in this atlas, occupational causes have been documented. The author hopes that the geographic patterns of respiratory mortality presented in this atlas will stimulate and aid further study of occupational etiologies of a variety of respiratory diseases, not just those traditionally referred to as occupational lung diseases.

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\*National Institute for Occupational Safety and Health. Work-Related Lung Disease Surveillance Report, 1996. DHHS (NIOSH) Publication No. 96-134.

## **ACKNOWLEDGMENTS**

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## **DATA AND METHODS**

### **Mortality Data**

Multiple cause of death tapes with Federal Information Processing Standard codes that identify minor civil divisions have been available to the public since 1982 from the National Center for Health Statistics (NCHS). While each tape holds all death registrations in the United States for a given year, each death record contains International Classification of Diseases 9<sup>th</sup> Revision (ICD-9) codes for up to 20 diseases listed on the death certificate, along with place of residence and demographic characteristics.

Beginning in 1987, the public use tapes do not contain geographic identifiers for decedents who were one of less than 3 individuals with any specified cause of death in a geographic area smaller than a state. Therefore, customized tapes with county codes for each death were obtained from NCHS for 1987 and subsequent years.

For this atlas, data for 1982 through 1993 were used, restricting decedents to U.S. residents 15 years of age and older. Seventeen disease categories were selected for mapping (Table 1). For each condition of interest, the number of deaths (with the condition as either underlying or contributing cause) was tabulated by four age groups: 15-34; 35-54; 55-74; and 75 years and older. For aggregate conditions (e.g., COPD), a death with codes for two or more diagnoses (e.g., bronchitis and emphysema) was counted as one.

### **Population Data**

The U.S. population by county as of January 1, 1988 (the midpoint of the study period) was calculated using 1987 and 1988 records from the Bureau of the Census. Health service area (HSA) populations were aggregated from these county populations by age and used as denominators for death rates.

### **Geographic Unit**

The basic geographic unit in this atlas is the HSA as defined based on travel patterns between counties by Medicare beneficiaries for

routine hospital care (Makuc, 1991).<sup>\*\*</sup> A total of 3,141 counties configure 805 HSAs (Appendices I and II). To process the NCHS mortality data for this atlas, the county of residence for each decedent was converted to one of the 805 HSAs.

### **Age-Adjusted Death Rates**

An age-adjusted death rate for each HSA from each condition of interest was calculated using the 1980 U.S. population as standard [Bureau of the Census].<sup>\*\*\*</sup> The age-specific rates by HSA were computed by dividing the average annual number of deaths for each age group by the corresponding population as of January 1, 1988. Then those rates were applied to the standard population resulting in the expected number of deaths. The sum of expected deaths for each HSA was divided by the total standard population and the resulting quotient was multiplied by 1,000,000 to produce the age-adjusted rates. Therefore, the rates are per year over the 12-year period.

### **Mortality Rate Ratio**

To compare the age-adjusted death rates of HSAs to the U.S. rate, a mortality rate ratio method was used: for each of the 17 disease categories, the age-adjusted death rate for each HSA was divided by the U.S. rate.

### **Graphical Display**

To define ranges for mapping age-adjusted death rates, the rates were ordered and then categorized to five groups from the highest to the lowest according to the following distribution: 10 per cent, 20 per cent, 40 per cent, 20 per cent, and 10 per cent, respectively. For some conditions, there were considerable numbers of HSAs without any deaths recorded for the study period.

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<sup>\*\*</sup>Makuc DM, Haglund B, Ingram DD, et al. [1991]. Health service areas for the United States. National Center for Health Statistics. Vital Health Statistics 2 (112).

<sup>\*\*\*</sup>Bureau of the Census [1981]. Census of population and housing, 1980: county population by age, sex, race, and Spanish origin. (Preliminary OMB-consistent modified race), Washington, D.C.

On rate ratio maps, HSAs with lower than or equal to the U.S. age-adjusted death rate have been assigned to the lowest category. HSAs with higher than U.S. rate were categorized into quartiles of the mortality distribution.

Double-hatched marks indicate that there were less than 20 deaths for the study period in that HSA. Rates and ratios for these hatched HSAs should be interpreted with caution.\*\*\*

For a better visibility, a second New York City HSA map has been scaled as a larger than actual polygon outside of the city.

Atlas GIS version 3\*\*\*\* has been used with HSA boundary layers and maps developed by NCHS to generate all maps in this atlas.

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\*\*\* Vital Statistics of the United States, 1992. Volume II - Mortality, Part A. DHHS PHS, 1992.

\*\*\*\* A product of Strategic Mapping, Inc., Santa Clara, CA, 1995.

## RESPIRATORY DISEASE CATEGORIES

Table 1 shows the respiratory disease categories selected for mapping in this atlas, corresponding ICD-9 rubrics and codes, and annual average number of deaths and U.S. rates for 1982-1993.

**Table 1. Respiratory Disease Categories: Average Annual Number of Deaths and Age-Adjusted Death Rates, U.S. Residents 15 Years of Age and Older, 1982-1993.**

<b>Cause of Death Category</b>	<b>ICD-9 Rubric(s)</b>	<b>ICD-9 Code(s)</b>	<b>Annual Number of Deaths</b>	<b>Annual Rate per Million Population</b>
Tuberculosis	Pulmonary tuberculosis Other respiratory tuberculosis	011 012	3,256	16.3
Sarcoidosis	Sarcoidosis	135	770	3.9
Lung cancer	Malignant neoplasm of trachea, bronchus, and lung	162	142,945	733.9
Pleural malignancy	Malignant neoplasm of pleura	163	513	2.6
Pneumonia	Viral pneumonia Pneumococcal pneumonia Other bacterial pneumonia Pneumonia due to other specified organisms Pneumonia in infectious diseases classified elsewhere Bronchopneumonia Pneumonia, organism unspecified	480 481 482 483 484 485 486	184,670	897.1
Chronic obstructive pulmonary disease	Bronchitis, not specified as acute or chronic Chronic bronchitis Emphysema Bronchiectasis Chronic airway obstruction, not elsewhere classified	490 491 492 494 496	175,822	878.0

**Table 1. Respiratory Disease Categories: Average Annual Number of Deaths and Age-Adjusted Death Rates, U.S. Residents 15 Years of Age and Older, 1982 - 1993 (continued).**

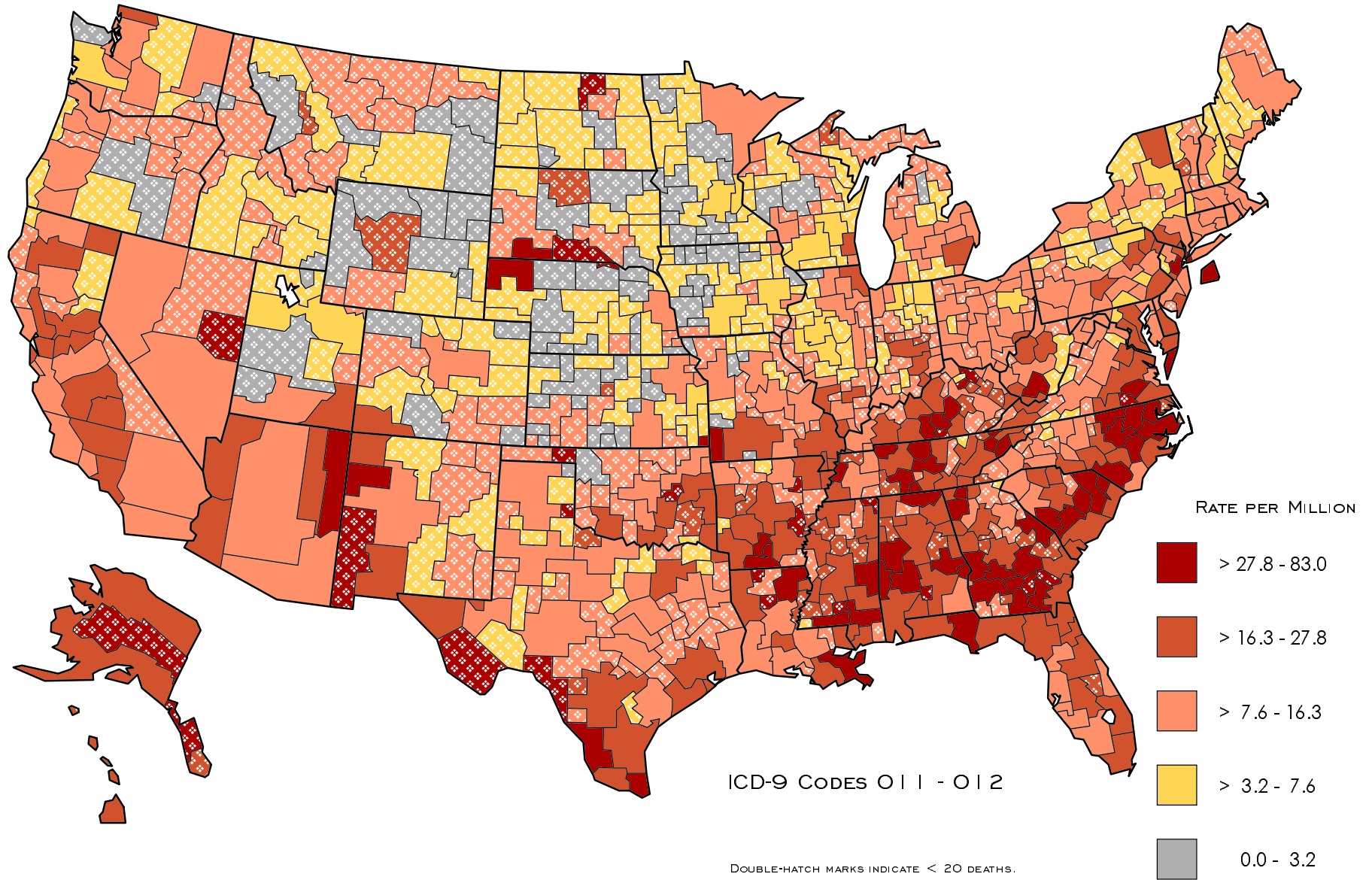
<b>Cause of Death Category</b>	<b>ICD-9 Rubric(s)</b>	<b>ICD-9 Code(s)</b>	<b>Annual Number of Deaths</b>	<b>Annual Rate per Million Population</b>
Asthma	Asthma	493	9,394	47.0
Hypersensitivity pneumonitis	Extrinsic allergic pneumonitis	495	29	0.1
Coal workers' pneumoconiosis	Coal workers' pneumoconiosis	500	2,261	11.2
Asbestosis	Asbestosis	501	733	3.7
Silicosis	Pneumoconiosis due to other silica or silicates	502	323	1.6
Other/unspecified pneumoconioses	Pneumoconiosis due to other inorganic dust Pneumoconiosis, unspecified	503 505	315	1.6
Byssinosis	Pneumonopathy due to inhalation of other dust	504	14	0.05
Toxic inhalation injury	Respiratory conditions due to chemical fumes and vapors	506	34	0.2
Pulmonary fibrosis	Postinflammatory pulmonary fibrosis	515	9,108	45.1
Other alveolar/interstitial diseases	Other alveolar and parietoalveolar pneumonopathy	516	1,136	5.7
Pulmonary eosinophilia	Pulmonary eosinophilia	518.3	651	3.2



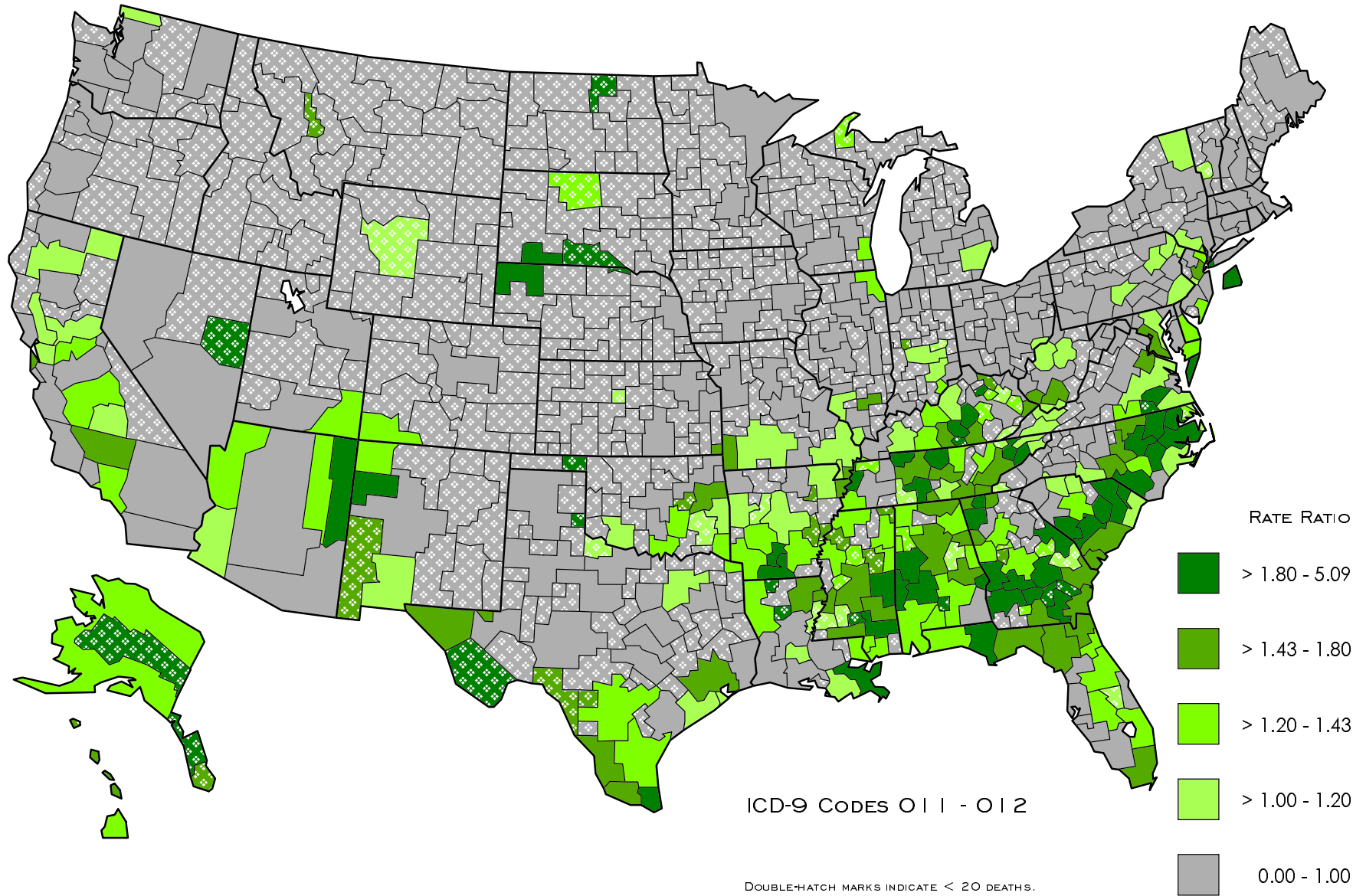
Mortality Maps  
and  
Disease Descriptions



TUBERCULOSIS  
AGE-ADJUSTED DEATH RATES BY HSA  
U.S. RESIDENTS 15 YEARS OF AGE AND OLDER, 1982-1993



TUBERCULOSIS  
DEATH RATES OF EACH HSA COMPARED WITH U.S. RATE  
U.S. RESIDENTS 15 YEARS OF AGE AND OLDER, 1982-1993



## **Tuberculosis (ICD-9 Codes 011-012)**

Pulmonary (ICD-9 code 011) and other respiratory (ICD-9 code 012) tuberculosis is caused by infection with *Mycobacterium tuberculosis*. Infected individuals produce airborne particles that contain tubercle bacilli when coughing, sneezing, and vocalizing. Primary tuberculosis infection, acquired by inhalation of infectious particles small enough (approximately 1-5 diameter) to be deposited in an alveolus [Hopewell 1988], usually requires prolonged exposure in proximity to an individual with active respiratory tuberculosis. In the United States, most active cases of pulmonary tuberculosis are the result of reactivation of previously quiescent infection, sometimes many years after primary infection has occurred.

Various risk factors for tuberculosis have been identified that either influence the likelihood of tuberculosis or serve as markers of increased risk: HIV infection and other forms of immunosuppression, malnutrition, gastrectomy, lower socioeconomic status, homelessness, and imprisonment [Markowitz 1994]. The relative risk of tuberculosis for nonwhites compared to whites has increased from 2.9 in 1953 to over 5.0 in 1992. From 1985 to 1992, the tuberculosis incidence rate increased 37.8 in black non-Hispanics, whereas it decreased by 11 percent among whites. In 1992, the minority population with the highest incidence of tuberculosis was Asian/Pacific Islanders with 46.6 cases per 100,000 population [Braden et al. 1996].

Tuberculosis has been recognized as an occupational hazard. Occupations identified at increased risk of tuberculosis have been classified as: 1) occupations (e.g., migrant farm work) that attract workers otherwise at high risk of tuberculosis; 2) occupations associated with silicosis (e.g., mining, sandblasting, and foundry work) that increases susceptibility to organisms; and 3) occupations that increase the chance of exposure (e.g., health care workers)[Bowden and McDiarmid 1994]. Among health care workers, nurses have the highest risk, 2 to 3 times that of physicians [Sepkowitz and Schluger 1996]. The increased risk of tuberculosis in health care workers has been well documented [Markowitz, 1994]. Proportionate mortality analyses have further confirmed an apparent increased risk of occupational exposure among health care workers and silica-exposed workers [NIOSH 1995].

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