

Fatal Occupational Injuries in the United States, 1980 Through 1985

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The National Traumatic Occupational Fatality surveillance project was designed to gather demographic, employment, and injury information from death certificates for all deaths due to injuries at work in the United States. Approximately 7000 workers have died each year during the 6-year period from 1980 through 1985: 94% were men, and 6% were women. Unintentional injuries caused the deaths of 83% of the men and 50% of the women. Eleven percent of the men and 39% of the women died from homicide. While the greatest number of deaths occurred in the group aged 20 through 34 years, fatality rates were highest among those aged 70 years and older. Expressed as deaths per 100 000 workers, annual fatality rates for black workers (7.7) were slightly higher than for white workers (6.5). The four industrial groups with the highest fatality rates were mining (31.9); transportation, communication, and public utilities (25.4); construction (24.0); and agriculture, forestry, and fishing (20.7). From 1980 through 1985 the annual traumatic occupational fatality rate fell 23%.

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THIS REPORT describes US traumatic occupational fatalities for the 6-year period from 1980 through 1985. Information about fatally injured workers is presented at the national and state levels, by occupation and industry, as well as by general demographic characteristics. While this report does not test hypotheses about why specific states or industries have greater numbers or higher rates of traumatic occupational fatalities, it does provide valuable descriptive information that will be useful in planning future injury research. The findings suggest where occupational injury prevention programs need to be directed and provide a basis for measuring their successes or failures.

METHODS

To secure definitive national data on fatal work injuries, the Division of Safety Research of the National Institute for Occupational Safety and Health initiated its National Traumatic Occupational Fatality (NTOF) surveillance project. Death certificates were chosen as a source of information for this surveillance because they are available for all

workers who are killed, regardless of their employment characteristics. Unlike data from other sources, such as workers' compensation claims or Occupational Safety and Health Administration fatality files, death certificate data are not limited by state of residence, occupation, industry, size of firm, or other employment characteristics. Death certificates contain information on the types of fatal injuries and on the demographic characteristics of those workers who were killed. Death certificate forms do not differ significantly from one reporting unit to another because they are designed according to a standard US recommended format. Because the NTOF project's information is obtained from all US vital statistics reporting units, national rates can be calculated.¹

There are 52 separate vital statistics reporting units in the United States—one within each of the state governments, New York City, and the District of Columbia. Each reporting unit is responsible for registering deaths that occur within their jurisdiction. The reporting units submit to the NTOF project copies of death certificates filed under their jurisdictions that meet the following criteria: (1) age at death—16 years or older, (2) an "external" cause of death derived from the *International Classification of Diseases, Ninth Edition* within the range of codes E800 through E999, reported as immediate,

underlying, or contributory, and (3) a positive response to the "injury at work" item on the certificate.

Information from these certificates for the 6 years (1980 through 1985) has been entered into a computer file at the National Institute for Occupational Safety and Health. Industry and occupation information was coded from the narrative entries on the certificates via software developed at the National Institute for Occupational Safety and Health for the NTOF project. Employment data were grouped into major industry and occupation divisions equivalent to those of the denominator data used in computing fatality rates. The 1972 Standard Industrial Classification system,² which is equivalent to the 1970 Bureau of the Census industry classification,³ was used to classify usual industry of employment. Usual occupation of employment was coded according to the Bureau of the Census' 1980 Occupational Classification System.⁴

Death certificates that either lacked industry or occupation information or had entries such as "housewife" or "student" and "self-employed" were coded into a "not classified" group. Workers whose industry of employment was unknown or unclassifiable (13% of all workers who were killed) were not included in the numerators used to calculate fatality rates for industry groups. Similarly, those whose occupation was not coded (20% of all workers who were killed) were not included in the numerators used to calculate fatality rates for occupational groups.

The denominator data used to calculate occupational fatality rates provided a common national basis for interstate comparisons. Because no single source of employment data supplied information on both the geographic location (state) and demographic characteristics of the workers, several sources of denominator data were used to calculate the various rates presented in this report. Fatality rates for demographic characteristics (age, sex, and race) and occupation were computed using Bureau of Labor Statistics' annual average employment data for denominators.⁵

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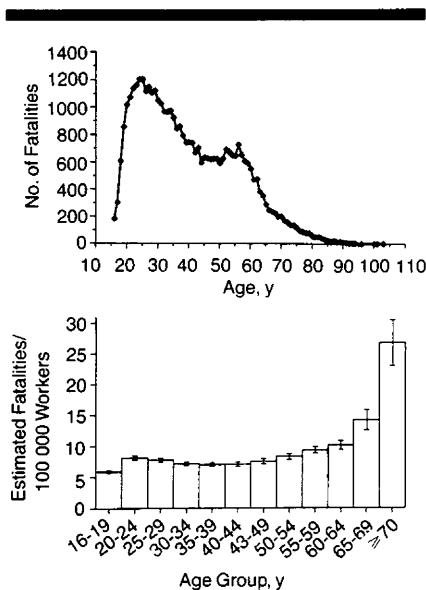


Fig 1.—Number of traumatic occupational deaths (top) and rates per 100 000 workers (bottom) by age: United States, 1980 through 1985. Fatality rates are displayed with 95% confidence intervals.

These denominators were based on monthly random samples of 60 000 households across the United States. Because these employment values were estimates, 95% confidence intervals for these rates were also calculated.⁶

The Bureau of the Census' County Business Patterns data for 1980 through 1985 were used as denominators to calculate state- and industry-specific rates.⁷ However, the County Business Patterns' data included neither agricultural production (Standard Industrial Classification 01 and 02) nor public administration (Standard Industrial Classification 91 through 97) employment. Employment data for agriculture were derived from the Bureau of the Census' 1982 Census of Agricul-

ture,⁸ while public administration employment came from the Bureau of Labor Statistics' annual average employment data for 1980 through 1985.⁵ The denominators included only civilian labor, so rates could not be calculated for military deaths. Industry fatality rates based on County Business Patterns and the Census of Agriculture were not subject to sampling error, so confidence intervals were not calculated for these rates. Unless otherwise stated, the fatality rates are annual rates presented as deaths per 100 000 workers.

Since fatal injuries often occur to young workers, occupational injury deaths are responsible for more years of potential life lost than occupational disease deaths.⁹ Assuming a retirement age of 65 years, employment-years of potential life lost for each fatal case was calculated by subtracting the victim's age at the time of death from 65 years.¹⁰

RESULTS

The NTOF surveillance data identified about 7000 workers who died from injury each year from 1980 through 1985. On average, 157 765 years of potential life were lost each year. The overall rate of years of potential life lost was 199 years per 100 000 workers. The 6-year fatality rate for all industry sectors combined was 7.8 per 100 000 workers.

Of the workers who died, 94% were men and 6% were women. The 6-year fatality rate for men (11.1) was more than 12 times greater than that for women (0.9). Unintentional injuries accounted for 81% of the deaths, while 13% of all deaths were homicides and 3% were suicides. The manner of death differed by sex: 11% of men died from homicide compared with 39% of women.

Of the fatally injured workers, 86% were white (which included 5% Hispanics), 11% were black, and 3% were classified as "other races" such as Asians

and Pacific Islanders (1.5%) and American Indians, Aleuts, and Eskimos (0.5%). Fatality rates by race were slightly higher for blacks (7.7) and for other races (7.6) than for whites (6.5 per 100 000 workers). The greatest number of deaths occurred among workers in the group aged 20 to 34 years; however, the highest fatality rate was for workers aged 70 years or older (Fig 1).

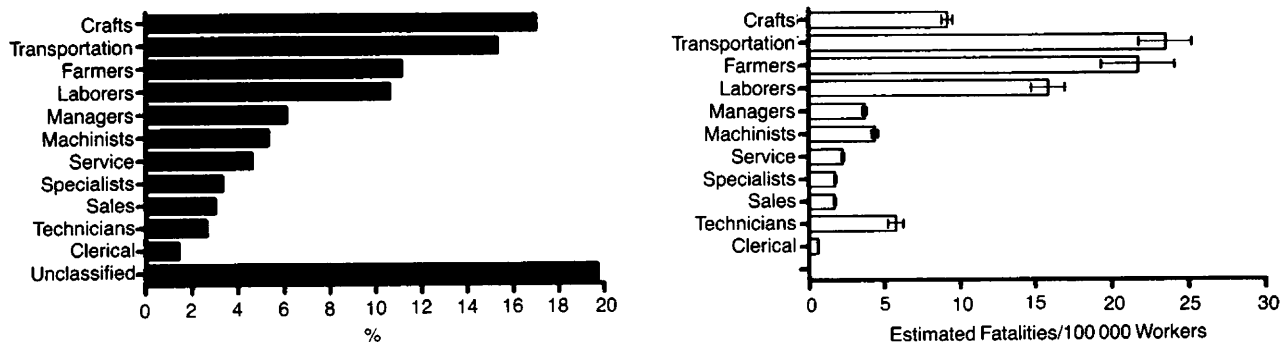
Alaska and Wyoming had the highest fatality rates (34.2 and 33.5, respectively), while Connecticut and Massachusetts had the lowest (1.6 and 2.4, respectively). Alaska had the highest rate of years of potential life lost (996 per 100 000 workers) and Connecticut had the lowest (40 per 100 000 workers).¹¹ Note that these rates are based on the state in which the death occurred rather than the worker's state of residence.

Occupation and Industry

The occupation categories with the greatest proportions of deaths were craftsmen and kindred workers (17.0%), transportation operatives (15.3%), and farmers (11.1%). Clerical workers accounted for the smallest proportion of deaths (1.4%). The three occupation categories with the highest fatality rates were transportation operatives (23.5), farmers (21.7), and nonfarm laborers (15.8) (Fig 2).

The four industry categories with the greatest proportion of deaths were transportation, communication, and public utilities (17.5%); construction (14.9%); manufacturing (12.8%); and agriculture, forestry, and fishing (11.0%). The industry categories with the lowest proportion of fatalities were finance, insurance, and real estate (1.0%) and wholesale trade (0.8%). Fatality rates per 100 000 workers were highest in mining (31.9); transportation, communication, and public utilities (25.4); construction (24.0); and agriculture, forestry, and fishing (20.7) (Fig 3).

Fig 2.—Distribution of traumatic occupational fatalities by occupation (left) and rates per 100 000 workers (right): United States, 1980 through 1985. Due to lack of comparable employment data, rates for unclassified occupations could not be calculated. Fatality rates are displayed with 95% confidence intervals.



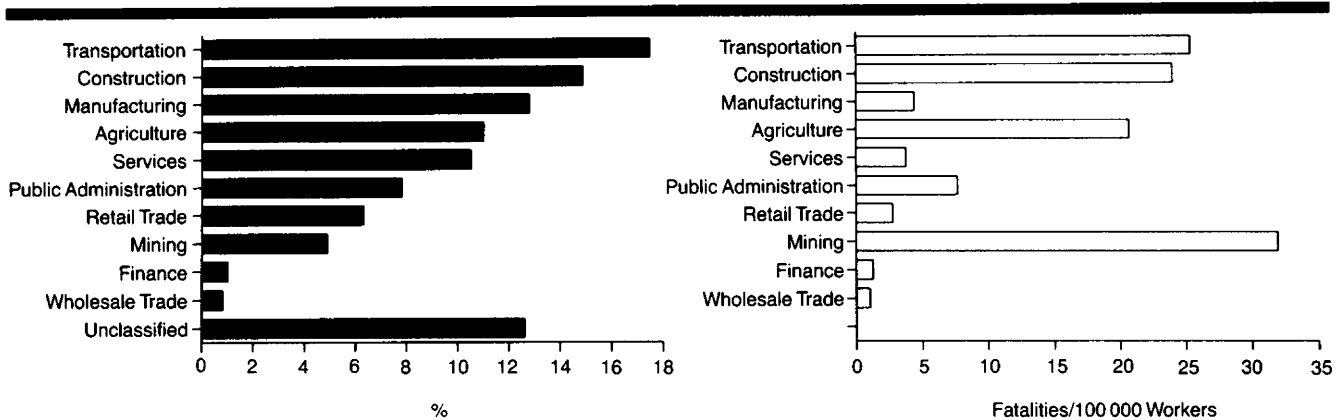


Fig 3. — Distribution of traumatic occupational fatalities by major industry division (left) and rates per 100 000 workers (right): United States, 1980 through 1985. Due to lack of comparable employment data, rates for unclassified occupations could not be calculated.

Mortality Trends

The reported number of occupational injury deaths that occurred in the United States decreased steadily from about 7700 in 1980 to 6100 in 1983, then increased slightly to 6400 in 1985. Because of suspected underreporting, these numbers are probably lower bounds for the actual numbers of traumatic occupational fatalities that occurred during these years.

Fatality rates decreased each year from 1980 through 1985 (Fig 4). The overall drop from 9.1 in 1980 to 7.0 in 1985 represents a 23.1% decrease over the 6 years. The rates by industry fit two distinct groups. In the first group are mining; transportation, communication, and public utilities; construction; and agriculture, forestry, and fishing, each with an annual death rate above 17.0. All remaining industries fall in the second group, each with death rates below the national average of 7.8.

While the fatality rates declined for each industrial division from 1980 through 1985, the NTOF project data do not identify causes for the decline. Numerous factors—such as economic conditions, employment trends, changes in reporting by states, increased prevention efforts, and changes in the composition of labor force—could have contributed to the decline.

COMMENT

The NTOF surveillance project's results are subject to limitations inherent in the use of death certificate information for mortality surveillance. Data accuracy and the ability of the states to identify and retrieve those death certificates that qualify for inclusion in the NTOF surveillance system are the two

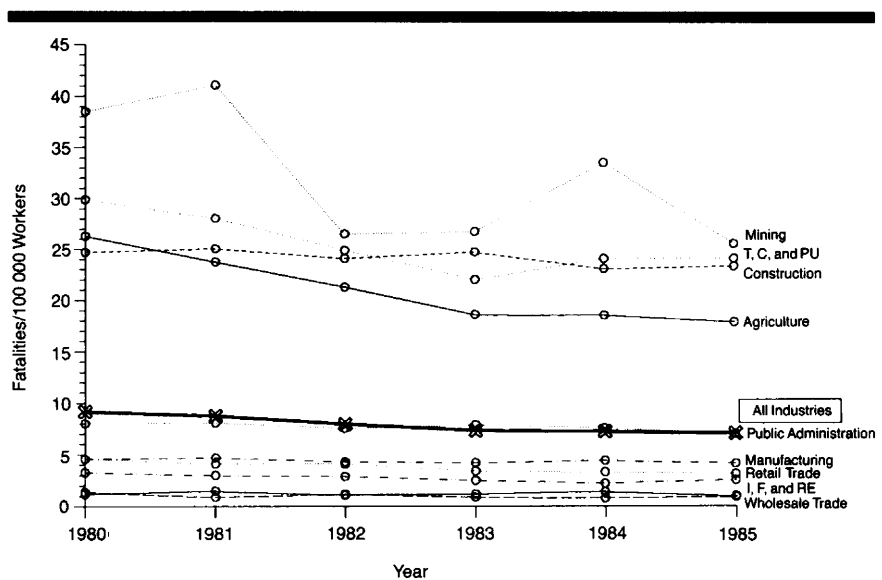


Fig 4. — Annual traumatic occupational fatality rates per 100 000 workers for major industries: United States, 1980 through 1985. T indicates transportation; C, communication; PU, public utilities; I, insurance; F, finance; and RE, real estate.

primary factors that contribute to these limitations. The accuracy of death certificate information affects both case ascertainment and the quality of information.

Typically, certifiers receive little formal training in filling out death certificates, especially "nonstandard" elements that are not reported to the National Center for Health Statistics. Two of the three criteria elements used to select death certificates for the NTOF project, age and the external cause of death, are nationally standardized, automated, and subjected to quality control procedures by the National Center for Health Statistics. When compared with autopsy reports, death certificate information on traumatic or

external causes of death has been shown to have a positive predictive value of 97% and 80% sensitivity.¹² In contrast, the injury at work item is not currently reported to the National Center for Health Statistics, and national guidelines for its completion are not explicit. State vital statistics reporting units independently decide when to include an injury at work item on the form, how certifiers are to interpret that item, and how the item is used in the automated state mortality files.

Almost all vital statistics reporting units use death certificate forms with an injury at work item; however, a few reporting units have specialized forms that lack this item. Although these specialized forms are not commonly used to

report traumatic deaths, they do lead to minor underreporting of traumatic workplace deaths.

State reporting policies for certifiers affect identification of intentional injury deaths. Homicide and suicide data were not available from three reporting units in which the certifiers did not complete the injury at work item for intentional injury cases. These states have changed their policies so this will be less of a problem in the future. However, homicides and suicides are underreported in the NTOF project's data.

Nearly half of the states enter the injury at work item directly into automated mortality files so death certificates that qualify for the NTOF project can be easily identified. Other states use the item to identify only work-related, unintentional injury deaths. Homicides, suicides, and deaths whose causes are unknown or pending determination are not classified as work related in these automated state mortality files. In these states, each death certificate for individuals aged 16 years and older, with the manner of death recorded as intentional, unknown, or undetermined, must be manually reviewed. Death certificates with the injury at work item marked "yes" are then submitted to the NTOF project's database. This screening is performed by a broad range of individuals and is a potential source of underreporting.

Underreporting of work-related fatalities due to incorrect marking of the injury at work item on death certificates, as estimated for several states, has ranged between 12% and 33%.¹³⁻¹⁶ The validity of response to this item varies substantially among states, and the degree of underreporting nationwide is not known.

Once information from death certificates that meet the NTOF project's case criteria has been entered into the database, inaccurate or insufficient employment information may result in misclassification and consequently bias findings. Death certificates record "usual" occupation and industry, which may differ from the occupation and industry in which the worker was engaged at the time of injury. The common analytic practice of using usual employment as a proxy for current industry and occupation is a recognized limitation of death certificate surveillance. Several studies have compared death certificate entries for usual occupation and industry with other sources of information on current occupation and industry such as workers' compensation records or cohort work histories. As recorded on death certificates, 64% to 74% of the usual occupation entries have

been found to agree with current occupation.¹³⁻¹⁹ Between 60% and 76% of the usual and current industry entries have been found to agree.¹³⁻¹⁹ At the same time, recent studies suggest that the death certificate employment information may more accurately reflect current than usual employment.¹⁷⁻¹⁹

Employment information often lacks the specificity necessary to be coded into standardized categories and is also subject to the limitations of the coding software. The large number of housewives, students, and those who are self-employed reported by certifiers cannot be classified into employment categories. This suggests that substantial numbers of individuals in some occupations and industries may be missed. In the NTOF project's analysis, the proportions of death certificates with missing or uncodable employment data (20% for occupation and 13% for industry) were similar to findings of previous studies.^{20,21}

Despite these limitations, death certificates are useful for surveillance of fatal work-related injuries because of their overall standardization and availability, the high quality of the data, and the completeness of ascertainment relative to other nationally available data sources.^{13,14,22}

Analyses of the NTOF project's data have identified groups at elevated risk of work-related fatal injuries and have drawn attention to the premature loss of life that occurs as the result of occupational injuries. Although the numbers of work-related deaths reported by different national data sources varies, all consistently support the NTOF project's findings that those employed in the four industries with the highest fatality rate (mining; transportation, communication, and public utilities; construction; and agriculture) are at highest risk.²³⁻²⁵ The NTOF project's data, along with other sources of information, have been used to target high-risk industries for further study and to prioritize the development of intervention strategies.

Occupational injuries represent a substantial subset of injuries from all causes. Prevention and intervention techniques developed within the workplace may also help reduce injuries outside work. The NTOF surveillance project is designed to lead to studies of injury etiology and to the development, testing, and implementation of suitable prevention and control efforts. The information presented herein is intended to help physicians, along with other health and safety professionals, direct prevention efforts to those workers who are most likely to suffer fatal occupational injuries.

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