

## National Surveillance of Occupational Fatalities in Agriculture

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Agriculture is one of the most hazardous industries in the United States. Although estimates vary, all reporting agencies show agriculture having an occupational fatality rate three to five times higher than that of the general private sector. The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research's National Traumatic Occupational Fatalities (NTOF) data base monitors occupational fatal injuries in all industries in the United States through death certificates. Uniform case-selection criteria are applied nationwide. NTOF shows that for the years 1980 through 1985, agriculture had a work-related fatality rate of 20.7 deaths per 100,000 workers compared with 7.9 deaths per 100,000 workers for the private sector U.S. work force. Age-specific rates indicate that the risk of a fatal occupational injury increases with age for agricultural workers. Workers over 64 years old have an average annual rate of 55.7 deaths per 100,000 workers. Other uses of the surveillance system, as well as its limitations, are discussed.

**Key words:** agriculture, mortality, NTOF, NIESS

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### INTRODUCTION

The surveillance of occupational injuries is a major part of determining the needs to improve the overall safety of the nation's workforce. The purpose of a consistent, uniform surveillance system covering the entire United States is threefold: First, surveillance allows quantifying the magnitude and secular trends of the target health event: occupational injuries. Second, surveillance at the national level allows public health professionals to measure and monitor how the United States is doing as a whole in preventing and reducing traumatic injuries. Finally, such surveillance systems can allow regional or even state specific problems to be pinpointed and addressed.

General surveillance systems tailored toward the work-related injury experience in the United States presently exist [U.S. Consumer Products Safety Commission, 1981-1987; U.S. Department of Labor, 1977-1986; U.S. Department of Labor, 1972-1986]. However, none of these systems provide complete coverage of occupational fatalities for every industrial sector in the United States. The agricultural

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industry is the least adequately covered of all. To fill this gap, the National Institute for Occupation Safety and Health (NIOSH) created the National Traumatic Occupational Fatalities (NTOF) data base [Centers for Disease Control, 1980–1985].

## FUNCTION OF NTOF

The NTOF provides, for the first time, a uniform work-related fatal injury surveillance system that provides coverage of all industrial sectors, including agriculture. The NTOF is a census of traumatic occupational fatalities from all 50 states and the District of Columbia. The data base consists of death certificates collected from each vital statistics reporting unit. Each certificate must meet the following criteria: 1) the victim was 16 years of age or older at the time of death; 2) the response to the “injury at work” item on the certificate was positive; and 3) the cause of death was “external” as classified by the International Classification of Disease, 9th Edition (ICD-9), E-codes E800 to E999 [U.S. Department of Health and Human Services, 1980]. Death certificates are on file for the years 1980 to 1986, with complete information available through 1985. The collection of death certificates will continue until all suitable certificates are on file through 1990.

The NTOF includes the following information: industry and occupation codes; age, sex, and race of the victim; state and county of death; state and county of residence; an injury description field; immediate, contributory, and underlying cause of death fields; whether the death was homicide, suicide, or accidental; and the time and location of death.

The NTOF is useful for mortality surveillance in agriculture because of the industry and occupation coding in the data base [Office of Management and Budget, 1972; U.S. Department of Commerce, 1970]. Industry coding permits the selection of only those fatalities to workers in the “agriculture” industrial division. Occupation coding allows the determination of high-risk occupations in agriculture. An advantage of the NTOF is its comprehensiveness because it has no specific exclusions of certain groups of workers, unlike Occupational Safety and Health Administration (OSHA)-based surveillance systems. This is especially important when considering agriculture, because only agricultural establishments with 11 or more employees are subject to OSHA jurisdiction. Thus, OSHA covers less than 11% of the farming operations and only 49% of the hired farm labor force.

## MORTALITY RATES

NIOSH researchers use the NTOF to calculate national work-related mortality rates. An analysis of the death certificate files for the years 1980 to 1985 indicated that agriculture had the fourth highest occupational mortality rate of the nine recognized industrial divisions in the United States [Centers for Disease Control, 1988]. The mean annual rate was 20.7 deaths per 100,000 agricultural workers, compared with 7.9 deaths per 100,000 for the general private sector workforce. The mortality rate includes all segments of the agricultural industry (agricultural production, agricultural services, forestry, and fishing). Figure 1 provides the annual mortality rate for the entire agricultural industry for the years 1980 to 1985.

Figure 2 shows the 1980 to 1985 annual mortality rates for the major subdivisions that are most closely associated with farming operations in the United States,

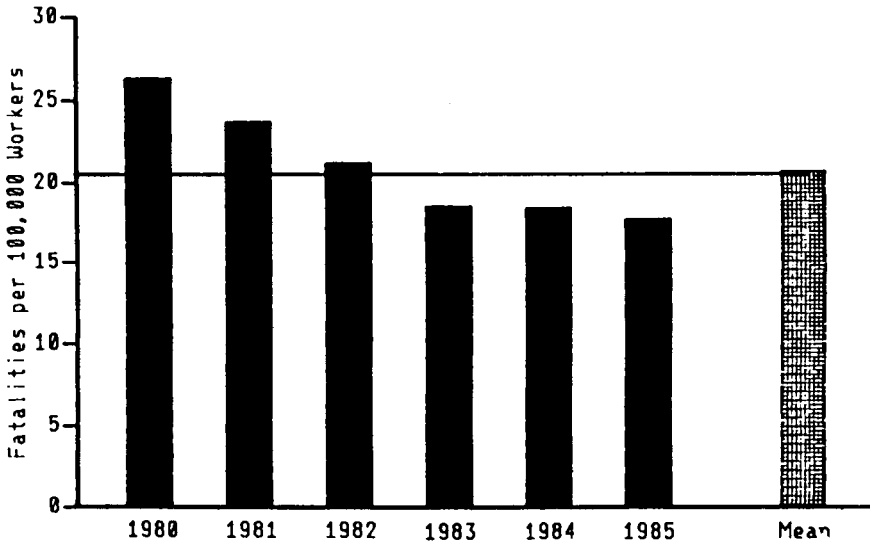


Fig. 1. Annual fatality rates per 100,000 workers for the agricultural industry, 1980-1985 [Centers for Disease Control, 1980-1985].

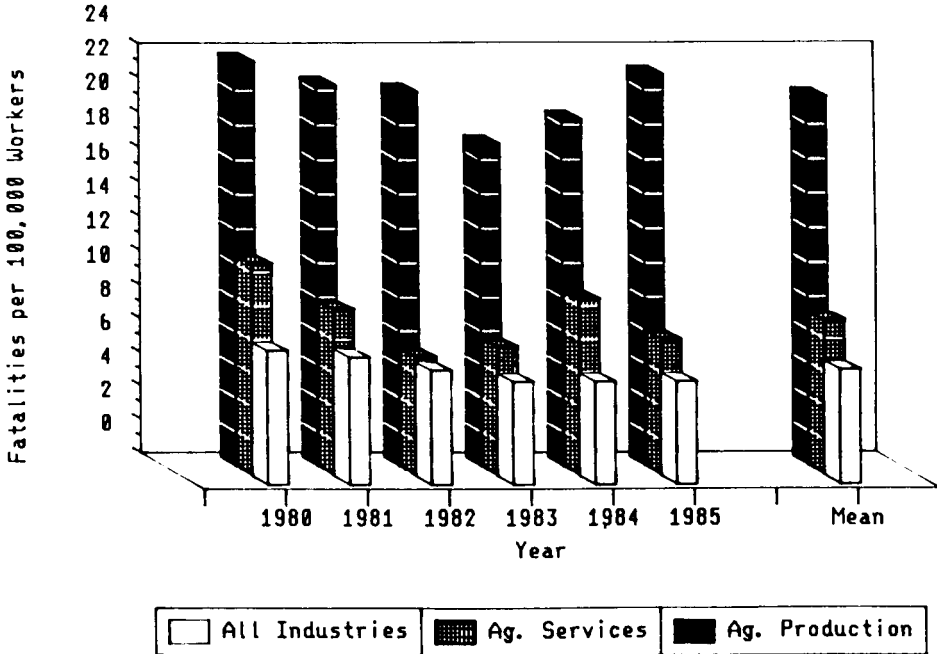


Fig. 2. Fatality rates per 100,000 workers for all industries, agricultural services, and agricultural production, 1980-1985 [Centers for Disease Control, 1980-1985].

i.e., agricultural production and agricultural services. Excluded are the forestry and commercial fishing subdivisions. Also included are the overall mortality rates for all industries during the same period. It is clear that agricultural production has the

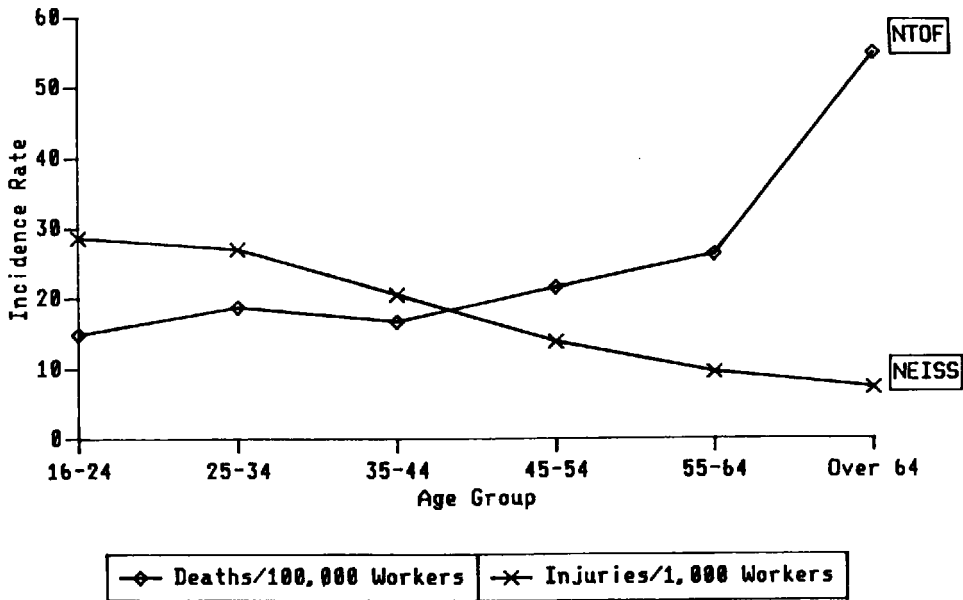


Fig. 3. Mortality and injury rates for the agricultural industry [Centers for Disease Control, 1980–1985; U.S. Consumer Products Safety Commission, May 1981–April 1987].

highest rate, being more than three times the rate for all industries combined. The rate in agricultural services is higher than the “all industries” rate, but the difference is not as large as with agricultural production.

An interesting pattern that can be seen here is the steady decrease in the mortality rate for all industries over the 6 years of data, whereas agricultural production shows a steady increase in mortality rates in 1984 and 1985. The possible explanation for this pattern may be linked to economic factors. The years 1980 to 1983 were times of decreasing net income and production for the agricultural industry, followed by a turnaround in 1984 extending through 1985 [Joint Committee, Council of Economic Advisors, 1988]. Thus, the better economic factors and the increased mortality trends coincide. This pattern has been observed in previous studies.

The NTOF also allows for the calculation of mortality rates by age groups. This information is provided in Figure 3 for the entire agricultural division. Also presented in Figure 3 are injury incidence rates per 1,000 workers by age, as determined from hospital emergency room reports for the years 1982 to 1986 [U.S. Consumer Products Safety Commission, 1981–1987]. The emergency room data are from the Consumer Products Safety Commission’s National Electronic Injury Surveillance System (NEISS) and are based on a probability sample of emergency rooms across the United States. Injuries to agricultural workers correspond to those injuries that occurred on a farm.

The two rates show clear patterns with respect to age, with these patterns being opposite in direction. The general injury incidence steadily decreases with age. This pattern is consistent with previous studies [Root, 1981; Keyserling, 1983; Surry, 1969]. In contrast, the mortality rate increases with age, moving up slowly from a rate

of 14.9 deaths per 100,000 workers for the 16- to 24-year-old group to 26.4 deaths per 100,000 workers for the 55- to 64-year-old group. The mortality rate then roughly doubles for workers over 64 years of age (55.7 deaths per 100,000 workers). Similar age-specific mortality patterns have been reported for accidental deaths in agriculture in individual states [Murphy, 1985; Purschwitz and Field, 1986; Schnieder, 1987].

Other surveillance factors the NTOF provides are homicide and suicide cases, state-level information and rates, major sources of traumatic fatalities, and information on sex and race characteristics [Centers for Disease Control, 1988].

## LIMITATIONS

The NTOF, although broad in both its scope and in the worker population it covers, has certain limitations. A major limitation is the lack of coverage of juvenile workers under the age of 16 years. Furthermore, whereas many forms of numerator classifications and counts are easily calculated, finding appropriate denominator information is a continuing problem, especially at the state level. The reporting of usual occupation and industry also presents unresolved issues, especially where individuals are only part-time farmers.

Another concern is whether the NTOF includes all traumatic occupational fatalities. A key in certificate collection is the correct marking of the "injury at work" item on the certificates. How consistently this item is filled out is unknown. This issue is especially problematic in the agricultural production industrial subdivision (farms) where the work site, home, and recreation areas are often at the same location. Traffic fatalities associated with work activities may also be underreported in NTOF because of the "injury at work" issue. Finally, the NTOF does not include chronic or occupational disease fatalities. NIOSH researchers are presently working on these concerns.

Even with these limitations, the NTOF provides a uniform system that allows for the general surveillance of traumatic occupational fatalities for all industrial divisions in the United States, including agriculture. The state-level analyses can provide state public health professionals useful data for targeting their most pressing problems; these also provide a gauge of how their needs compare with those of neighboring states and the nation.

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