

Implications for the use of E codes of the International Classification of Diseases and narrative data in identifying tractor-related deaths in agriculture, United States, 1980-1986

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According to data from the National Traumatic Occupational Fatalities (NTOF) surveillance system of the National Institute for Occupational Safety and Health (NIOSH), the agriculture, forestry and fishing industry had an occupational injury fatality rate of 20.3 deaths per 100 000 workers in 1980 to 1986, a rate 2.7 times higher than the rate of 7.5 per 100 000 workers for all industries combined in the United States for the same time period. The leading cause of death in this industry was machine-related incidents, coded according to the International Classification of Diseases, ninth revision (ICD-9), external cause of death (E codes) as E919, accounting for 35% of the fatalities. Other studies have also noted machinery-related incidents as the leading cause of injury death for agriculture (1-4). More specifically, tractors have been acknowledged as a substantial source of occupational and nonoccupational farm deaths (1, 2, 4-6). Deaths related to farm tractors used across all industrial sectors have also been examined (7). The ICD-9 E code for machinery-related incidents (E919) does not, however, allow the identification of tractor-related deaths specifically. The four-digit external cause of death code E919.0 denotes deaths involving agricultural machines, with no further delineation of tractors or other types of agricultural machinery. In addition, if a tractor enters a public roadway and becomes involved in an injury-producing incident, the ICD-9 coding guidelines dictate that the event be coded according to a motor vehicle rubric. Thus it is not possible to identify separately all tractor-related deaths using E codes. However, narrative data maintained on the NIOSH NTOF automated file allow identification of tractor-related deaths with the use of key word searches and manual reviews of the cause of death and injury description fields from the death certificate. These narrative sections of the certificate are keyed into the NTOF automated file.

Methods

The NTOF surveillance system is a census of occupational injury deaths in the United States that is based on data from death certificates (8). Data collection began with deaths that occurred in 1980 and is maintained as an ongoing NIOSH surveillance project. Death certificates are collected from the 50 states, New York City, and the District of Columbia for all persons 16 years or older who died from an external cause of death and for whom the certifier noted a positive response to the "injury at work?" item on the certificate. There are, however, no standardized guidelines for physicians regarding the completion of the "injury at work?" item on the death certificate. The numbers presented therefore should be regarded as the minimum number of these events occurring in the United States for the period analyzed, 1980 through 1986.

Cases were defined for this analysis if the industry of employment, classified according to the *Standard Industrial Classification Manual*, was agriculture, forestry and fishing. A key word search was then performed on the injury-description and cause-of-death fields to identify any deaths in the agriculture, forestry and fishing industry which involved a tractor. We then reviewed all of the tractor deaths to determine the nature of the tractor fatality (eg, a tractor rollover versus a tractor run over). The key words employed included "rollover," "tip over," "upset," "run over," and "power takeoff." In addition, some cases listed "tractor accident" as both the underlying cause of death and the injury description, and these cases were simply noted as "tractor accidents," not specified.

Results

Tractors were recorded on the death certificates as being involved in 1349 (25%) occupational injury fatalities in the agriculture, forestry and fishing industry from 1980 to 1986, an average of 193 deaths per year. Tractor-related incidents occurred in all but five states (Alaska, Connecticut, Delaware, Hawaii, and Rhode Island) and the District of Columbia. Farmers accounted for 89% of the deaths and 99% were men.

Of the 1349 events identified, 84% were coded to the ICD-9 rubric E919.0, agriculture machinery-related accidents. Another 10% was coded to motor

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Table 1. Tractor-related deaths in agriculture by the International Classification of Diseases (ninth revision), external cause of death (ICD-9 E code).

Description	ICD-9 E code	Number	Percent
Agricultural machinery	E919.0	1139	84.4
Motor vehicle traffic	E810—E819	136	10.1
Struck by falling object	E916	14	1.0
Motor vehicle nontraffic	E820—E825	11	0.8
Other machinery	E919.1—E919.9	11	0.8
Other	-	38	2.8
Total		1349	99.9

Table 2. Tractor-related deaths in agriculture by type of event and percentage coded to ICD-9 E919.0,^a 1980—1986.

Type of event	Number	Percent coded to ICD-9 E919.0 ^a
Rollover	647	90
Run over	174	90
"Tractor accident," not specified	99	95
Power take off	32	100
Other	397	70

^a ICD-9 E919.0 in the code of the International Classification of Diseases (ninth revision), external cause of death, representing machine-related incidents.

vehicle traffic categories. The remaining cases were coded to a myriad of E code rubrics, including struck by falling object (E916), and motor vehicle nontraffic (E820—E825) (table 1).

A key word search and manual review of the 1349 tractor-related incidents revealed that 48% of the deaths were the result of tractor rollovers. Run over incidents accounted for another 13%, while a power takeoff shaft or drive was mentioned in 2% of the cases. The term "tractor accident" was the sole description of 7% of the cases. Table 2 depicts the number of tractor-related deaths and the proportion of cases coded to the ICD-9 code for agriculture machinery-related deaths (E919.0) by type of incident.

Discussion

The detection of machinery-related incidents as the leading cause of death from occupational injury in the agriculture, forestry and fishing industry could be accomplished solely with cause-of-death data coded according to the ICD-9. The identification of tractors as a substantial portion of the machinery-related incidents and the subsequent characterization of the events involving tractors is, however, possible only with the use of the narrative data contained on the death certificate. Fifteen percent of the tractor cases would have been missed if narrative data had not been available and utilized for analyzing this problem in the agricul-

ture, forestry and fishing industry. The rate of tractor deaths per 100 000 workers, as identified through key words and manual search, was 5.2. If only coded data had been available, a rate of 4.4 per 100 000 workers would have been generated for all agriculture machinery-related deaths (ie, tractors and all other agriculture machines) in the agriculture, forestry and fishing industry.

Furthermore, the number of tractor-related deaths resulting from rollover events, as opposed to other causes, could not be fully described from the coded data. Even the narrative data lacked sufficient detail to characterize adequately 7% of the cases identified for this analysis. Other cases in which the word "tractor" was not specifically listed on the death certificate may also have been missed, and it is not possible to estimate this undercounting. Of the tractor-related deaths found, some may have been misclassified to the undetermined category rather than to rollover, run over, or power takeoff due to a conservative interpretation of the narrative descriptions.

The availability of automated narrative data in the NTOF file provides the opportunity for key word and manual searches to identify problems more specific than the coded data allow. The ability to do this kind of search is the primary advantage in using these data over other sources of occupational injury information. In addition, the availability and use of narrative data improve the ability of occupational injury researchers to describe problems in enough detail to begin to assess possibilities for prevention.

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