Surveillance of Traumatic Occupational Fatalities in Alaska—Implications for Prevention

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This paper is based on research conducted by Ms. Schnitzer during graduate studies at the University of Alaska at Anchorage. It was presented under a different title at the 8th International Congress on Circumpolar Health in Whitehorse, Yukon Territory, Canada, May 1990.

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Synopsis

Data on occupational injury fatalities in Alaska for the period 1980–85 were compiled from workers' compensation claims and death certificates. These data yielded 422 unique cases for the 6-year period, for an average annual fatality rate of 36.3 per 100,000 workers. This rate is 5 times higher than the Bureau of Labor Statistics estimate of 7.6 per 100,000 for the United States during the same period.

The four industries with the highest fatality rates were the same for Alaska as for the nation (agriculture-forestry-fishing, construction, mining, and transportation-communication-public utilities). The leading causes of occupational fatalities in Alaska, however, were considerably different than for the United States as a whole. Nationally, motor vehicles and industrial equipment accidents are the leading causes of death. In Alaska, the leading causes of occupational injury mortality are aircraft crashes and drowning.

These findings highlight the benefit of local surveillance in planning prevention strategies.

PRESENTLY, THERE ARE THREE national sources of data on fatal occupational injuries in the United States—the Bureau of Labor Statistics (BLS) annual survey of occupational injury and illness by industry, the National Safety Council (NSC) estimate of deaths in work accidents, and the National Traumatic Occupational Fatality (NTOF) data base established by the National Institute for Occupational Safety and Health (NIOSH). Each of these organizations uses different methods for identifying occupational injury deaths, and their estimates range from less than 4,000 deaths to more than 11,000 deaths in a given year. The accompanying box lists each source with some identifying features and limitations.

Prior to the publication of NTOF data in 1987, no national surveillance system of occupational injury fatalities could provide information on a State-by-State basis. As a result, these national data were not useful for identifying State and local injury patterns. States developing prevention programs addressing fatal occupational injuries, therefore, had to generate their own data.

Four data sources are routinely available for identifying occupational injury deaths at the State level—medical examiner or coroner records, death certificates, workers' compensation claim reports, and Occupational Safety and Health Administration (OSHA) fatality reports. The task of identifying occupational deaths using these data is complicated by the nature of the data sources. That is, each source has coverage limitations, such as the fact that some exclude certain industries or certain types of workers, work-relatedness of the injury may not be identified, or occupation and industry information may either not be collected or may be based on usual, rather than current, occupation and industry, or both. As a result, each data source captures only a certain portion of the total occupational deaths, but when the sources are used in combination, they may capture virtually all occupational fatalities in a given State (*1*). Thus the best injury surveillance systems use data from several sources with each source complementing the others (*2*).

This study enumerates and describes occupational injury mortality in Alaska for the 6-year

period 1980 through 1985 using two of these four existing State data sources. The results are presented and contrasted with national data, and with published data from Maryland and Texas where similar descriptive analyses of occupational injury mortality have been reported in the literature. The findings emphasize the importance of using local or regional surveillance in planning prevention and control programs.

Methods

Numerator data. Data on worker fatalities were obtained from two sources—the first report of injury form from the Alaska Workers' Compensation Division and death certificates for the State of Alaska. Coroners' reports were not included because they are not combined in a central location or computerized, so their use would have necessitated an extensive time and travel commitment. State OSHA files have the lowest yield for identifying unique cases of occupational injury fatalities (*3*) and were also not included because of time and budget constraints.

Copies of the workers' compensation first report of injury forms were obtained from the file on each fatal injury claim for the 6-year study period. All injury deaths to workers ages 14 or older determined by the Workers' Compensation Division to be work-related were included for study.

To obtain death certificate data, in July 1987, all death certificates filed with the State of Alaska for 1980 through 1985 were manually reviewed. Certificates meeting all of the following criteria were copied and included for study: (*a*) age greater than or equal to 14 years, (*b*) International Classification of Disease, 9th Revision (ICD-9) external cause of death "E" code E800-E999, and (*c*) "injury at work" box checked yes. Residents of other States who died in Alaska had death certificates on file and were included if these three criteria were met. Presumptive death certificates (those filed when a death is presumed but a body has not been recovered, as in the case of drowning at sea) do not have an "injury at work" designation, so were not included in the study.

Data were coded, and cases identified by both sources were manually matched by name, sex, date of birth, and date of death, and given identical identification codes. Coded data were entered into two computer files, one for each data source. Data from the two files were then merged to form a master file that consisted of records on all occupational injury deaths in Alaska during the study years found through the two data sources, with duplicate cases counted only once. Data were analyzed using the Statistical Procedures for the Social Sciences (SPSSx) software program.

Identification and Limitations of National Data Sources for Occupational Injury Fatalities

Bureau of Labor Statistics, established in 1971, estimates based on survey of 280,000 employment establishments
- excludes self-employed, small businesses, family owned farms, public sector workers
- provides minimal detail
- based on employer's reporting
- data not examined by State, occupation, or demographic characteristics
- data not case-specific; unit of analysis is employment establishment.

National Safety Council, established in 1912, estimates based on data obtained from various sources
- uses nonprobability sample
- combines multiple sources with few safeguards from including duplicate reports (*9*)
- data not examined by State, occupation, or demographic characteristics
- excludes intentional deaths

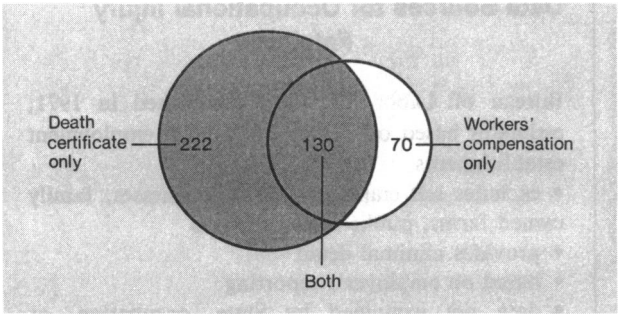
National Institute of Occupational Safety and Health, established in 1980, estimates based on death certificates that meet specific criteria
- potential inconsistencies in designating injury at work may result in underreporting of specific causes of death
- records usual occupation and industry which may differ from occupation and industry at time of injury

Denominator data. Average annual employment estimates for Alaska by industry for 1980 through 1985 were obtained from unpublished raw data of the State Department of Labor and used to calculate rates. Fatality rates by occupation were not calculated, because (*a*) the occupation coding system for workers' compensation records changed during the study period and both coding systems were different from available coded denominator data and (*b*) occupation information on the death certificates was not coded.

Results

A total of 200 workers' compensation cases and 352 death certificates fit the study criteria. By both

Number of fatal occupational injury cases ascertained by data source, Alaska, 1980–85



systems, 130 deaths were identified (see chart). Using both data sources, 422 occupational injury deaths occurring in Alaska during the 6-year period were identified. Of these, 401 involved men (95 percent) and 21 involved women (5 percent). The average age at death was 34.6 years; 163 (38.8 percent) died before their 30th birthday, and 80 percent died before age 45. These data resulted in an average annual occupational injury fatality rate of 36.3 deaths per 100,000 workers.

The four industries with the highest average annual fatality rates per 100,000 workers (table 3) were transportation-communication-public utilities (73.1), mining (53.1), construction (49.1), and agriculture-forestry-fishing (28.1). Of all occupations (table 1), aircraft pilots had the highest proportion of all fatal occupational injuries with 58 deaths (14.1 percent) during the 6-year period. Fishermen had the second highest proportion and sailors or deckhands had the third. When these two occupations were combined, they had 18.7 percent of all the deaths. The category of manager-administrator had the fourth highest proportions with 6.3 percent, and truck drivers were the fifth highest with 4.1 percent of the fatalities.

Aircraft crash was the most common cause of fatal injury, responsible for nearly 32 percent of the deaths (table 2). Drowning ranked second, accounting for more than 19 percent of the deaths, and motor vehicle crashes ranked third at just under 10 percent.

Discussion

Because specific local injury surveillance data are lacking, local injury prevention programs may have to be initiated based on national data. National occupational injury patterns, however, are not necessarily representative of local patterns because of differences in populations, industries, and other factors. Injury surveillance systems developed and implemented at the local level allow for identification of injury-prone sites and occupations, implementation of prevention measures, and subsequent evaluation of these measures (*2*). This point is illustrated when the Alaska findings are compared with national data published by the BLS (*4*), NIOSH (*5*), and NSC (*6*), and with published findings from State-based occupational fatality data from Maryland (*1*) and Texas (*7*).

The average annual occupational injury fatality rate in Alaska based on these data, 36.3 per 100,000 workers, is three to five times higher than the national estimates for the same period of 11.5 per 100,000 (NSC), 7.6 per 100,000 (BLS), and 7.9 per 100,000 (NIOSH). The four industries with the highest occupational injury fatality rates in Alaska were transportation-communication-public utilities, mining, construction, and agriculture-forestry-fishing. These are the same four industries found to have the highest rates for the nation as a whole and for many individual States.

National data on fatality rates by occupation are not reported by the BLS or NSC, but NIOSH has examined occupational fatality data by broad occupational categories and found that fatality rates were highest for transportation workers and farmers (the farmer category includes logging, forestry, and fishing occupations). These broad categories are consistent with the occupational categories aircraft pilot, fisherman, sailor or deckhand, and truck driver found in Alaska. Fatality rates by occupation were determined in both the Maryland and Texas studies. While neither State reported death rates among fishermen, the occupational categories aircraft pilot and truck driver were consistently documented as having high occupation-specific fatality rates. Going one step further, authors of the Maryland study suggested that all people who drive regularly as a part of their work are at increased risk because of their increased exposure to the leading cause of occupational fatality, motor vehicle crashes. In Alaska, this might be extrapolated to include those who fly on business. Aircraft crashes are the leading cause of fatal occupational injury in Alaska.

Thus, overall patterns for occupational injury fatalities in Alaska are similar to those in the United States when examined by broad industry, or even occupation, categories. Importantly, however, the more specific findings on the leading causes of occupational injury death in Alaska are considerably different from the leading causes of fatal occupational injury death found in the United

States as a whole. They reflect some of the unique aspects of work in Alaska.

The leading causes of fatal occupational injury in Alaska were aircraft crashes, responsible for nearly 32 percent of the total deaths, followed by drowning, 19 percent of the deaths, and motor vehicle crashes, responsible for 10 percent. BLS data reveal that highway vehicles account for approximately 27 percent of all fatal occupational incidents in the United States, aircraft crashes account for 3 percent, and drowning occurs so infrequently it is included in the "other" category. In their studies of occupational fatalities, both Texas and Maryland found motor vehicle crashes to be the leading killer, responsible for 22 percent of the deaths in Texas and 25 percent in Maryland. On the other hand, while aircraft crashes were a major killer of workers in Alaska, these crashes were responsible for only 2.5 percent of the worker deaths in Texas and 5 percent of the deaths in Maryland. Drowning, not mentioned in the Texas study, accounted for 3 percent of the occupational deaths in Maryland.

The differences in the leading causes of occupational fatality in Alaska may be partially explained by the physical characteristics of the State. Since more than two-thirds of Alaska is not accessible by land transportation, air and sea travel are a necessity. Thus, as a function of increased exposure, more aircraft crashes and fewer motor vehicle crashes would be expected. Alaska's fatality rate from injuries associated with general aviation is the highest in the United States and is 24 times the average for the nation (*8*). In a 1986 unpublished report by J. P. Middaugh of the Epidemiology Section, Alaska Division of Public Health, the fatality rate of aircraft crashes in Alaska for the 1963–81 period was found to be 21 times greater than the fatality rate associated with motor vehicle crashes in the State.

In addition, Alaska has more than 33,000 miles of shoreline. The seas provide an important method of transportation and support the commercial fishing industry. Fully 66 percent of the drownings found in this study occurred to those working within the fishing industry. Of course, States with no fishing industry and those not using the sea for transportation do not have workers exposed to the risk of drowning to the same extent as some Alaska workers.

Though not directly addressed in this investigation, additional factors that may play a role in the frequency and distribution of occupational injury deaths in Alaska include such things as the remote

Table 1. Top 10 occupations for fatal work-related injury, Alaska, 1980-85

Occupation	*Number*	*Percent*
Aircraft pilot	58	14.1
Fisherman	51	12.4
Sailor, deckhand	26	6.3
Manager, administrator	26	6.3
Truck driver	17	4.1
Military	13	3.2
Student	11	2.6
Engineer	10	2.4
Construction laborer	10	2.4
Lumberman	10	2.4
Other [1]	180	42.6
Total	[2] 412	98.8

[1] Includes 75 additional occupations, each with a frequency less than 10.
[2] Occupation information missing for 10 decedents.

Table 2. Leading causes of fatal occupational injury, Alaska, 1980–85

Cause	*Number*	*Percent*
Aircraft crash	134	31.8
Drowning	82	19.4
Motor vehicle crash	41	9.7
Falls	23	5.5
Homicide	22	5.2
Crushed by machinery	21	5.0
Crushed by nonmotorized equipment	18	4.3
Other [1]	81	19.1
Total	422	100.0

[1] Includes electrocution, explosion, suffocation, and so forth.

ness of worksites that result in increased rescue and transport times following an injury event. Rugged terrain and frequently adverse weather conditions may also contribute to the high fatality rate. Further research is needed to substantiate these and other potential risk factors.

This study highlights the need for future investigation of occupational injury mortality related to air and sea transportation in Alaska. More accurate enumeration of deaths in the commercial fishing industry and the identification of risk factors for these deaths is needed. While fishermen and drownings featured prominently in the findings of this study, these deaths are likely undercounted because presumptive death certificates were not included.

A total of 510 drowning deaths were identified on unintentional fatal submersion injuries in Alaska, 1980–1984, in an unpublished master's thesis by T. Williams in 1987 at the University of Alaska at Anchorage that used death certificate

Table 3. Average annual fatality rates per 100,000 workers for occupational injury, Alaska, 1980-85

Industry	Rate
Transportation-communications-public utilities [1]	73.1
Mining	53.1
Construction	49.1
Agriculture-forestry-fishing	28.1
Manufacturing	27.5
Public administration	14.9
Wholesale trade	9.0
Services	8.4
Finance-insurance-real estate	7.7
Retail trade	6.4

[1] Includes such occupations as pilot, truck driver, and so forth.

data to document drowning in Alaska during the 5-year period. A presumptive death certificate was filed for 143 (28 percent) of these drowning deaths, and 84 decedents (71 percent) with presumptive certificates were listed as fishermen or were aboard a fishing vessel. If, in fact, these 84 drowning deaths were work-related, fisherman and drowning would have far surpassed aircraft pilot and aircraft crash as the leading occupation and cause of occupational fatality in Alaska.

Because of this limitation in the study design and inherent limitations of the data sources such as the fact that Alaska Workers' Compensation Law excludes fishermen and certain other workers, it is likely that some deaths were missed by both data sources. Our identification of 422 deaths should be considered a minimum number of occupational injury deaths for the 6-year period. Despite the study's limitations, this estimate is better than the estimate that would have been obtained using only a single source for casefinding. While death certificates captured 83 percent of the deaths and workers' compensation claim reports identified only 47 percent, workers' compensation claims were the sole reporting source for 17 percent of the deaths and therefore were a useful data source.

Based on this study, suggestions for State-based surveillance of occupational injury deaths in Alaska include the use of a combination of data sources including, at the least, workers' compensation claim reports and death certificates, since they are readily available. In addition, work-related injury deaths filed on presumptive death certificates should be identified and included in the surveillance system, and further emphasis should be placed on the collection of information on occupation and industry for the workers killed (numerator) and the working population at risk (denominator). This information should contain sufficient detail to estimate fatality rates in high risk industry and occupation subgroups.

This study described occupational injury deaths in Alaska by combining data from workers' compensation claim reports and death certificates. The findings reveal that aircraft- and boat-related incidents are responsible for much of Alaska's occupational injury mortality. This finding is in contrast to data reported for the United States and differs from that for two States where motor vehicle crash-related deaths were found to be the leading cause of occupational injury mortality.

This contrast emphasizes the importance of using State-based surveillance for identifying occupational fatalities. The value of State-specific data is that it more accurately identifies the scope and magnitude of the occupational injuries in the particular State. In turn, this specificity allows for targeted risk factor studies on which to base development of specific prevention strategies, and thereby may assist with appropriate allocation of scarce public health resources for prevention. Because Alaska is a State with workers at high risk of dying from occupational injuries, Federal, State, and private efforts are being organized in order to deal effectively with improving the quality of data within the State, identifying the circumstances associated with the causes of these fatalities, and developing and applying new approaches to prevention and intervention in this high-risk setting.

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