ALASKA'S MODEL PROGRAM FOR OCCUPATIONAL INJURY PREVENTION: APPLYING SURVEILLANCE FOR EFFECTIVE PUBLIC HEALTH PRACTICE

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ABSTRACT

Background: NIOSH established its Alaska Field Station in Anchorage, Alaska, in 1991, after identifying Alaska as America's highest-risk state for traumatic worker fatalities. Since then, NIOSH established comprehensive occupational injury surveillance in Alaska, and formed and facilitated interagency working groups (of state and federal agencies) and industry, labor, and professional organizations to address major factors leading to occupational death and injury in the state.

Study design: Descriptive epidemiologic study of registry surveillance data obtained via direct on-site investigation of incidents and data-sharing with jurisdictional agencies.

Methods: We established a surveillance system, obtaining information via data-sharing with jurisdictional agencies and from direct on-site investigation of incidents. Also, we collaborate with state and regional government agencies, industry, workers, and non-governmental organizations to develop interventions.

Results: During 1991-1999, Alaska experienced a 50-percent overall decline in work-related deaths, including a substantial decline in commercial fishing deaths, and a very sharp decline in helicopter logging related deaths. These efforts have lead to major national and international government-industry collaborative efforts in improving the safety of helicopter lift operations, and a concomitant improvement in fishing industry mortality rates among workers fishing Alaskan seas.

Conclusions: Using surveillance data as information for action, these collaborative efforts have contributed to reducing Alaska's high occupational fatality rate. This reduction has been most clearly demonstrated in the rapidly expanding helicopter logging industry. The application of surveillance data also has played an important supportive role in the substantial progress made in reducing the mortality rate in Alaska's commercial fishing industry – historically, Alaska's (and America's) most dangerous industry, and the worst killer of Alaskan workers. Results suggest that extending Alaska's approach to occupational injury surveillance and prevention to

other parts of the country, and application of these strategies to the entire spectrum of occupational injury hazards, could have a broad impact on reducing occupational injuries. *(Int J Circumpolar Health 2001; 60:714-723)*

Key words: *Surveillance, occupational injury, helicopter logging, commercial fishing*

Public health surveillance has been defined as the ongoing systematic collection, analysis, interpretation, and dissemination of health data. More succinctly, it has been defined as "information for action."[1] The following three-part approach illustrates the effective application of this approach to a pressing public health problem in America's northernmost state. At least three distinct though intertwined lessons may be derived from this experience in Alaska: 1) Physical environment and remote location can create a hostile working environment, but by careful study and planning these characteristic hazards can be mitigated; 2) Surveillance data can be usefully applied in preventing injuries; and 3) Solutions to local problems may be useful elsewhere.

BACKGROUND

During the 1980s, it became apparent that Alaska had the highest occupational fatality rate of any state (34.8/100,000/yr., for the 10-year period 1980 –1989, 5 times higher than the U.S. average of 7.0/100,000/yr).[2] This high mortality rate for Alaskan workers was not necessarily attributable to northern locale, weather conditions, or the prominence of resource harvest industries (fishing, petroleum, logging) and non-roadway transportation. The Nordic Nations share many similar conditions but have occupational injury mortality rates substantially lower than the U.S. overall, let alone Alaska. For example, Norway, which has a similar industrial makeup to Alaska, with commercial fishing, petroleum, tourism, logging, and small-aircraft aviation all prominent as industries, experienced an occupational injury mortality rate of 3.8/100,000/year for 1980 through 1989, below that observed for the US, and much lower than that for Alaska.[3]

To address the urgent problem of work-related fatalities, the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Safety Research (CDC/NIOSH/DSR), established the Alaska Field Station (AFS) in Anchorage, in May 1991, to develop effective

surveillance and prevention programs for occupational injuries and to coordinate the local efforts of a wide variety of agencies in preventing these events. Program activities are conducted in collaboration with the Alaska Department of Health and Social Services (AKDHSS), Alaska Department of Labor (AKDOL), U.S. Coast Guard (USCG), National Transportation Safety Board (NTSB), Federal Aviation Administration (FAA), Occupational Safety and Health Administration (OSHA), industry, labor organizations, communications media, health-care providers, universities and community colleges, and private sector individuals and organizations that are interested in public health. Since October 1991, NIOSH/DSR has also funded and closely collaborated with the Fatality Assessment & Control Evaluation (FACE) program in the AKDHSS Section of Epidemiology.

The major research questions we have addressed are 1) How many severe fatal and nonfatal occupational injuries occur in Alaska? 2) In which Alaskan industries and occupations do they occur? 3) What risk factors are identifiable for these events? 4) Which of these risk factors can be eliminated or mitigated? 5) How can this most effectively be accomplished?

The objectives of our program are 1) To characterize and reduce occupational risks in workplaces and industries by using epidemiologic surveillance and analytic methods and engineering hazard and task analysis techniques; 2) To establish and refine statewide occupational injury and fatality surveillance systems; 3) To conduct prevention-oriented research addressing high-risk operations and populations (for example, commercial fishing, air transport, and logging); 4) To use the on-site location as a "living laboratory" for conducting state-of-the-art injury surveillance, intervention trials, and demonstration projects; and 5) To promote worker injury prevention technology transfer to and from Alaska.

METHODS AND APPROACH TO THE PROBLEM

To detect and work toward preventing acute traumatic occupational injuries, AFS's program development followed a set of principles rooted in the public health surveillance cycle and the universal ethical and medical principles of compassion, respect and empathy for all parties involved, now known as the "Alaska Model for Occupational Injury Surveillance and Prevention."3 This model has evolved to include:

- Developing an accurate understanding of the problem by establishing effective and timely surveillance systems, obtaining information via data-sharing with

jurisdictional agencies and from direct investigation of incidents, and tailoring available methodology to local needs;
- Developing working relationships among local, state, regional, and federal government agencies, workers, industry and labor organizations, and non-governmental organizations;
- Applying a hierarchical approach to prioritize injury events: multiple and single fatalities, severely disabling injuries, and hospitalized injury; then, addressing less severe injuries and hazards, as resources permit; and
- Planning, with a concentration on the technical, geographical, environmental, political, and cultural features of local and regional injury problems, programs designed specifically to fit those problems, rather than using a "one size fits all" approach.

The style and imagery of this approach may prove useful elsewhere. We often employ a "mirror" metaphor, wherein injury surveillance data reflect the status of health in the community. The negotiating and rhetorical techniques used in our working group meetings range from relatively dry presentations of statistical and geographic data to rather heated discussions in which collaborators are exhorted to quickly make changes to hazardous working conditions. Expressions of urgency are carefully titrated to the agencies' or industries' enthusiasm for the technical assistance that we provide.

We designed and implemented a comprehensive surveillance system for occupational injuries, the Alaska Occupational Injury Surveillance System (AOISS). AOISS compiles risk factor information and permits quantitative epidemiologic analyses to be used for sound public health and prevention planning (details of which are published elsewhere).

Implementing the ambitious goals of the AFS program with very limited personnel and resources was quite challenging. Strong working relationships were established during the early 1990's among the many other federal, state, municipal, and non-governmental agencies that are engaged in detecting, investigating and/or preventing occupational injuries and fatalities. These relationships were formalized within the Alaska Interagency Working Group for the Prevention of Occupational Injuries. Working Group members include the Alaska Department of Labor, the Alaska Department of Health and Social Services, the National Transportation Safety Board, the U. S. Coast Guard, the Federal Aviation Administration, the U. S. Forest Service, the Occupational Safety and Health Administration, non-governmental organizations

(NGOs), industry, labor, and professional associations. This network has since served to foster injury surveillance, a broader understanding of occupational injuries in the state, and opportunities to effectively influence the immediate response to emerging occupational injury problems. Included in this group are the jurisdictional agencies overseeing the highest-risk industries in Alaska.

These collaborations in Alaska emphasize non-regulatory, collaborative responses in intervention strategies. Industry and workers are invited to be full partners in planning and executing interventions and providing ongoing surveillance data as a mirror for successes and/or failures. Recommendations for new rule-making are used only as a last resort. The working groups also have explored other ways to motivate corporate management by discussing possible voluntary work standards with insurers, and by assisting in discussions of possible insurance rate discounts for companies subscribing to more rigorous voluntary standards.

OVERVIEW OF ALASKAN WORK-RELATED FATALITIES

During 1990-1999, there were 648 acute traumatic occupational injury fatalities in Alaska. The major circumstances of death for workers during this 10-year period were drowning (219), aircraft crash (192), being crushed (53), homicide/suicide (47), motor vehicle crashes (29), and falls (26).

Overall, occupational injury fatalities decreased significantly ($p<0.001$) during the 1990's (from 82 in 1990 to 42 in 1999, a decrease of 49 percent), with the bulk of improvement occurring among fishermen and loggers (see Figure 1). While drowning was the most common cause of death during 1990-1994, in the years 1995-1999, aircraft crashes had become the most common cause of death for Alaskan workers (see Figure 2). The details of this progress are published elsewhere.[1] This decrement in total fatalities experienced by Alaskan workers has been much sharper than the more modest decrease (approximately 10%) seen for the U. S. as a whole (from 5,384 deaths or 4.6/100,000 in 1990 to 5,285 or 4.1/100,000/year in 1997). Indeed, much of the decrement observed nationally in the Agriculture, Forestry, and Fishery Industry division nationally during this interval is as a direct result of the decreases in the frequency of deaths in Alaska's fishing industry.

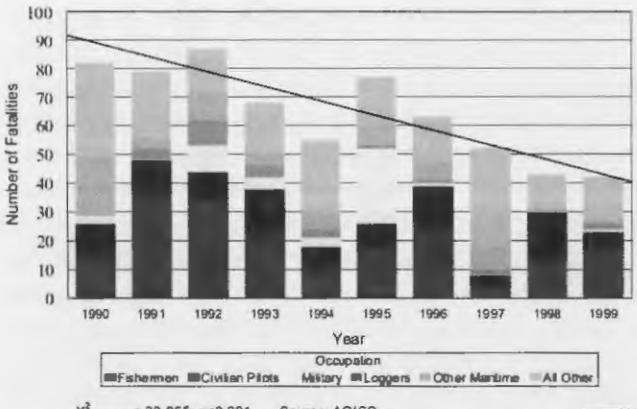

Fig. 1. Occupational Fatalities, Alaska, 1990-1999, n=648.

HELICOPTER LOGGING

The first major test of the "Alaska Model" approach came during the establishment of the Alaska Occupational Injury Surveillance System (AOISS) in 1992. Because of increasing and changing environmental restrictions on road building in Alaska's national forests in the late 1980's, helicopters emerged as a major transportation mode for moving cut logs in the state by the early 1990's. Amid the rapid growth of this new industry in Alaska, between January 1, 1992 and June 30, 1993, there were six helicopter crashes, with nine fatal (including four pilots) and ten severe nonfatal injuries, out of only 25 helicopters flying in helicopter logging operations. These events led to an extraordinarily high annual crash rate of 16 percent, and a catastrophic pilot fatality rate of 5,000/100,000/year. Investigation revealed that all crashes involved improper operational and/or maintenance practices. [8]

After the occurrence of two serious helicopter logging crashes during one week in May 1993, we began a series of urgent consultations, culminating in convening an emergency session of the Alaska Interagency Working Group for the Prevention of Occupational Traumatic Injuries in early July, 1993. There were tangible outcomes:

1. All parties had rough agreement on what had happened in these events;

2. The US Forest Service knew the timber sale locations, and AKDOL knew the ramp (maintenance) and hangar locations, and both agencies were willing to share this information with FAA (which had only the [out of state] chief pilot/headquarter's location for each operation [due to a peculiarity of Federal CFR Part 133, the regulation for aerial lift-load operations]), and to collaborate and share costs in making

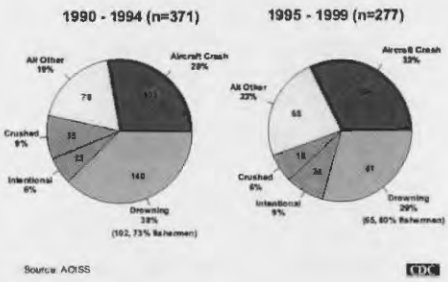

Fig. 2. Proportion of Occupational Fatalities in Alaska, 1990-1999.

site visits to each in the ensuing weeks; and

3. The Working Group arrived at preliminary consensus recommendations.

By late July 1993, all helicopter logging sites and ramps in the state had been visited by the jurisdictional agencies, with a number of these operations being curtailed or entirely shut down for irregularities. Since that intervention and the implementation of the Working Group's recommendations during July 1993, there were no additional helicopter logging crashes or fatalities in Alaska until July of 1996, when a single crash did occur, with one fatality (see Figure 3). There have been no more crashes or fatalities through the year 2000, despite continued growth of helicopter logging in Alaska.

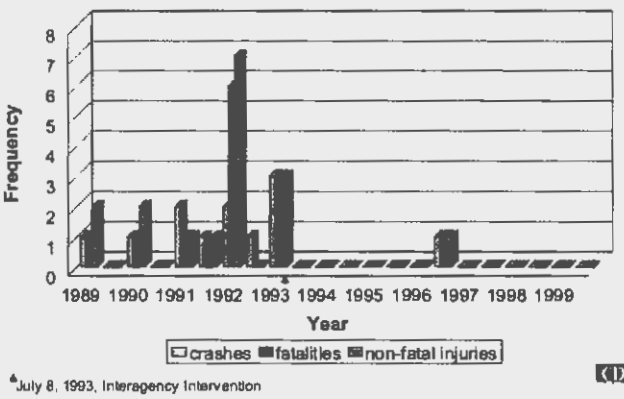

Fig. 3. Crashes, Fatalities, and Non-Fatal Injuries in Alaska Helicopter Logging Operations, 1989-1999 (By 6-Month Intervals).

Building on Alaska's leadership in this area, a Helicopter Logging Safety Committee was formed under the auspices of the Helicopter Association International (HAI), "*...to help promote the safe use of helicopters in all aspects of the helicopter logging industry.*" The committee has established its own "Helicopter Logging Guidelines," which address four issues: (1) General helicopter safety for forestry operations; (2) Integration of ground and flight activities; (3) Helicopter specific planning; and (4) A pre-accident plan (HAI, 1997).[9]

More detailed accounts of these data, events, and interventions have been published elsewhere.[10, 11] The insurance industry also has played a major role in progress made in helicopter logging, by substantially discounting helicopter insurance costs for operators adhering to standards developed by the helicopter logging guidelines.

The partnership developed among government agencies, HAI, and insurance agencies has demonstrated the value of joint efforts to address specific occupational safety problems to workers in Alaska.

COMMERCIAL FISHING

Working conditions in the Alaskan commercial fishing industry are very hazardous, compounded by isolated fishing grounds, seasonal darkness, cold waters, high winds, icing, and in some cases brief fishing seasons.

Throughout the 1970's and 1980's, Alaska experienced a boom in its commercial fishing industry. By the mid-1980's, it had become clear that commercial fishing-related deaths were the principal category in Alaska's very high occupational fatality rate.[12] In the early 1990's, this setting resulted in an unacceptably high occupational fatality rate of 200/100,000/year for the two-year period 1991-1992, for Alaska's commercial fishermen.[13] Over 90% of these deaths were from drowning, presumed drowning, or drowning plus hypothermia, in association with vessels capsizing or sinking, or with falls overboard. Fortunately, the Commercial Fishing Industry Vessel Safety Act (CFIVSA) was enacted in 1988, and implemented incrementally during 1990-1995. Fishing vessels began carrying specific safety, survival, and fire-fighting equipment, and requiring crew members to obtain first-aid and emergency-drill training.

From 1990 to 1999, Alaska experienced a 49% decline in work-related deaths, including a 67% decline in commercial fishing deaths (1990-1992 average compared to 1997-1999 average, see Figure 4). By 1999, there had been a significant

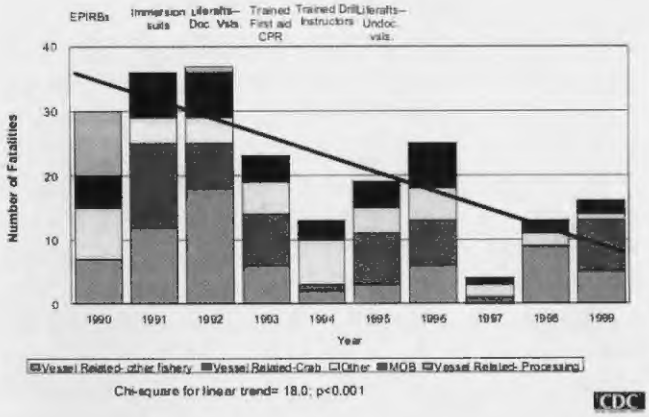

Fig. 4. Implementation of the Commercial Fishing Vessel Safety Act of 1988 and Commercial Fishing Fatalities by Year, Alaska, 1990-1999, n=217 (Act Requirements shown by year of implementation).

($p<0.001$) decrease in the number of deaths in the Alaskan commercial fishing industry. While man-overboard drownings and vessel-related events in crabbing (often conducted far offshore and in winter) have continued to occur, and still require urgent attention, marked progress ($p<0.001$) has

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been made in saving lives of those involved in vessel-related events. Given the mean full-time equivalent Alaska commercial fishing workforce of 17,500,3 this statistic is equivalent to a fatality rate of 112/100,000 workers/year, a substantial decrease from the rate reported in 1991 through 1992 (200/100,000/year).

While mortality in commercial fishing has indeed been reduced, the continuing pattern of losing 25 to 45 vessels every year and approximately 100 persons who must be rescued each year from cold Alaskan waters is unacceptable, and is still accompanied by the remaining possibility of future catastrophes. Successful rescue still is dependent on the expertly trained personnel of the USCG Search and Rescue (SAR) operations, and such efforts can be hindered by the harshness of seas and the weather.[14] Furthermore, the people involved in USCG SAR operations are themselves at considerable risk for injury or death during these rescue attempts.

We have recommended augmenting the current standard approach to minimizing the deaths associated with commercial fishing by preventing such emergency incidents in the first place, as well as by preparing workers in advance in how to react to such emergencies if they should occur.

The critical etiologic factors that must be addressed for definitive, primary prevention efforts in this industry are vessel stability and hull integrity to keep vessels afloat, licensing and training of operators and crew to ensure at least a minimum level of competency, coordination of management regimes and safety considerations, avoidance of the most harsh sea and weather conditions, and avoidance of falls overboard.

Alaskan efforts have started to benefit fishermen in other parts of the US: In 1999, the USCG established a "Fishing Vessel Casualty Task Force" to perform a fast-track examination of commercial fishing industry operational and safety issues that may have contributed to a recent increase in marine casualties on the east coast of the U.S. A report of their findings was published in April 1999, written with a list of recommendations for the fishing fleet.[5] The task force relied heavily on three earlier government studies, including a 1987 report from the NTSB,[10] a 1991 NRC proposal for a national fishing safety program,[7] and a 1997 NIOSH/AFS study[8] of Alaskan fishing deaths. Eight of the major recommendations for changes in national management and policies for commercial fishing safety came from the 1997 Alaska report. The USCG also recently developed a number of innovative programs, including damage control training, vessel risk indexing,

and safety checks prior to historically high-risk fishery season openings. To combat the problems associated with short fishing periods in difficult weather conditions an Individual Fishing Quota (IFQ) system was instituted primarily in the halibut fisheries. The beneficial effect of the IFQs has been detectable, but relatively modest as changes during the 90s were largely limited to the halibut fisheries. Effective surveillance and interventions for commercial fishing-related mortality in Alaska, historically the worst-case setting in the United States, should provide a useful paradigm and productive venue for prevention of similar deaths throughout the world.

The substantial progress made to date in Alaska's most hazardous industry, through the thoughtful application of the public health prevention model, as well as the incorporation of new technologies and comprehensive training, should encourage others to try similar approaches elsewhere and in response to other problems. Building further on the progress already made in preventing deaths in the historically dangerous occupation of fishing could lead to much safer working conditions for commercial fishermen.

CONCLUSIONS

Using surveillance data as information for action, collaborative efforts in Alaska have been very successful in applying derived insights toward prevention of occupational mortality and serious injury in Alaska. Specifically, epidemiological analysis has been effectively applied toward reducing mortality in Alaska's rapidly expanding helicopter logging industry, and played an important supportive role in the continuing progress made in reducing the mortality rate of Alaska's commercial fishing industry, as well as numerous local injury prevention efforts. The single most important determinant of the considerable success in reducing fatalities of Alaskan workers may have been the passage of the CFIVSA. However, it would be very difficult to separate the direct impact of that legislation from many other efforts made in parallel, by NGOs and government agencies.

Results suggest that the extension of Alaska's approach to occupational injury surveillance and prevention to other locales, and application of these strategies to the full spectrum of occupational injury hazards, could have a broad impact on the reduction of occupational injuries.

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