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Developing a national occupational health surveillance system in the United States

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FRAZIER TM. Developing a national occupational health surveillance system in the United States. *Scand j work environ health* 7 (1981): suppl 4, 127—132. The United States National Institute for Occupational Safety and Health (NIOSH) is developing a national information base for the identification of workplace hazards and for the detection of work-related disease, disability, or mortality. In the first national occupational hazard survey completed in 1974, surveyors observed more than 85,000 tradename products in a probability sample of 5,000 US workplaces. Manufacturers of these tradename products have given NIOSH information about the chemical ingredients in more than 60,000 products. Prior to this survey the ability to identify and inform workers of the potential hazards to which they were exposed was limited. The occupational health effect surveillance system is presently based on data obtained from three data systems, the national Health Interview Survey, the Social Security Administration Disability Award File and proportionate mortality ratio studies conducted by several states. Industry and associated disease rubrics identified by these data systems become topics for more intensive analysis culminating in brief reports called surveillance intelligence bulletins (SIBs). This paper gives an example of work in progress in developing an SIB concerned with accidents among loggers.

Key terms: accidents, death, disability, disease, hazards, information systems, loggers, occupational health surveillance, tradename products.

This paper gives a brief overview of the US National Institute for Occupational Safety and Health (NIOSH) program in occupational surveillance and describes, by means of an example, the way existing national and state data systems are being used to generate hypotheses about workplace-related health effects.

The Occupational Safety and Health Act of 1970 required the Secretary of the Department of Health, Education and Welfare to conduct research, experiments, and demonstrations that call for innovative methods, techniques, and approaches for dealing with occupational safety and health problems. This mission is being conducted by NIOSH, which was given the responsibility for developing a national occupational health surveillance system. Within NIOSH the Surveillance Branch in the Division of Surveillance, Hazard Evaluations and Field Studies is responsible for developing a national information base for the identification of workplace hazards and for the detection of work-related disease, disability, or death. Our experience suggests that occupational surveillance is best accomplished in a two-tiered fashion — hazard surveillance and health effects surveillance.

Hazards

In the United States the only national comparable worksite hazard identification system has been derived from the first National Occupational Hazard Survey (NOHS I), which was conducted by NIOSH

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in 1972—1974 when a team of 20 graduate engineers conducted observational surveys for a probability sample of 5,000 worksites (5). A total of more than 9,000 different potential hazards were discovered and more than 85,000 tradename products were listed by these surveyors. During the past 5 a, more than 10,500 manufacturers of these tradename products have been contacted, and the chemical ingredients of about 60,000 products have been identified. Until this survey was conducted, there was very little information available with which to identify and inform workers of the hazards to which they were exposed and to direct research and regulatory efforts toward high-priority industrial sectors. The information from NOHS I, despite limitations in sample size and the present age of the data, continues to be the main resource used by government, labor, and medical care providers for data on the type, extent, and distribution of potential workplace hazards.

Data from NOHS I are now 6 a old. Since 1974, there have been substantial changes in workplace hazards, in the mix of industries, and in the use of control technology. Because of these changes, NIOSH initiated, in October 1980, the data collection phase of a second survey that will yield new hazard data by 1983. A

Table 1. Disease rubrics identified from the Health Interview Survey, the Social Security Administration Disability Award File and vital statistics.

	All three systems	Two of the three systems
Agriculture	Mental and nervous, circulatory	Infective, neoplasms, respiratory, pregnancy, musculoskeletal, accidents
Mining	Respiratory, accidents	
Construction	Respiratory	Neoplasms, mental and nervous, accidents
Textile industry		Mental and nervous, circulatory, respiratory, musculoskeletal
Lumbering	Accidents	Musculoskeletal
Chemical industry		Circulatory
Primary metal industry	Circulatory, accidents	Infective, neoplasms, respiratory

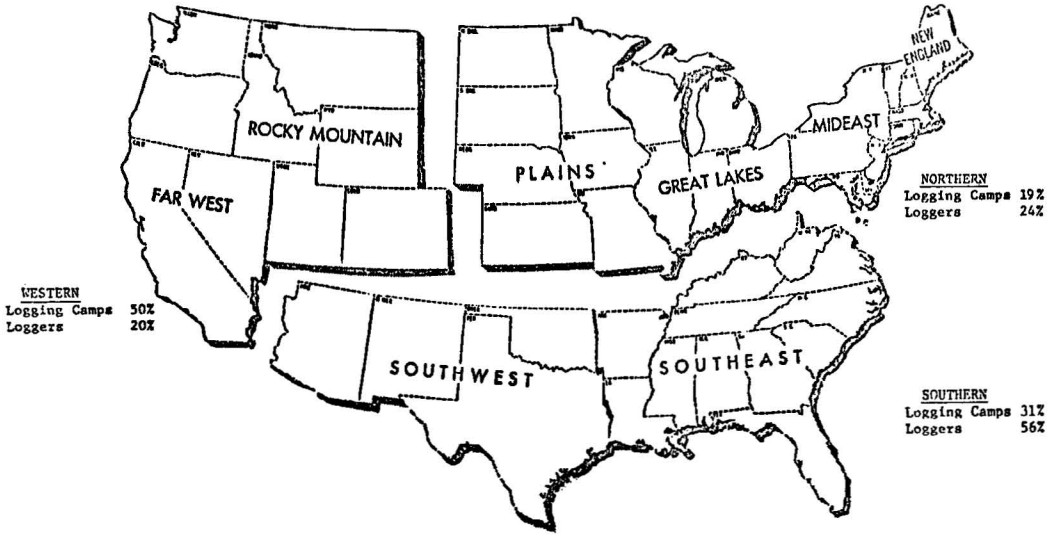

Fig 1. Percentage distribution of logging camps and loggers in the United States by lumber regions. The logging camp distribution has been taken from the 1980 industrial file of the National Institute for Occupational Safety and Health, whereas the distribution of loggers is based on the 1970 census (Detailed Characteristics, PC(1)-D1, table 294).

series of special topic reports and publications is anticipated from NOHS II over a 3- to 4-a period beginning at the end of the field phase of the survey. These publications will deal in depth with either a class of chemicals, an industry or sets of industries, and occupations.

Health effects

Currently, our health effect surveillance efforts rely on existing national and state health information systems that were not originally designed to meet our specialized needs. Nevertheless, they provide valuable occupational health surveillance leads. Results from the Health Interview Survey (HIS) of the National Center for Health Statistics (NCHS) have been used to show associations between disease and employment (2). Social Security Administration (SSA) disability award files have been used to identify occupational groups that have unusually high levels of disability (4). Death records from those states in which the occupation or industry of the decedent is coded on the death certificate have also provided leads for more intensive epidemiologic investigations (3, 6).

The number and variety of studies that use existing data bases to relate employment to disease, disability, and death are increasing rapidly. NIOSH and the NCHS are collaborating on a HIS project that will provide information on usual or lifetime occupation. These changes will be particularly useful for assessing current differences in disease profiles and medical care utilization patterns among retirees from a wide range of occupational groups.

Four recently funded surveillance cooperative agreements between NIOSH and states will increase the number of states that contribute data to occupational health mortality and morbidity reporting systems. The first four awards were made on 29 September 1980 to Maine, New York, Rhode Island, and Utah.

The expectation that the occupational health surveillance value of these national and state data sets will improve in time does not, however, preclude the use of the leads we now have. From the 11 industries that had been identified by NIOSH as being of great interest, seven were selected for further evaluation. These seven were the industries in which at least two of the three national data sets showed an association between employment and causes of disease, disability, or death. These industry/disease relationships are shown in table 1.

We expect to do at least six of these studies in 1981. The purpose of these studies, referred to as surveillance intelligence bulletins (SIBs), will be to (i) identify previously unrecognized industry/disease associations or (ii) provide baseline measures for monitoring change in known industry/disease relationships. The following example concerning accidents among loggers illustrates our planned approach.

Loggers/accidents — Nature and extent of the problem

The 1970 census enumerated a total of 79,507 lumbermen, raftsmen, and woodchoppers (referred to as loggers in this study). Of these, 73,192 males were employed specifically in the logging industry (7). For the purposes of this surveillance report these men comprise the population at risk. Nationally, 27 % of the loggers are black and nearly all of this 27 % works in the southern lumber region.[2] Over 51 % of the loggers in the United States are under 40 a of age; 23 % being between 40 and 49, 18 % between 50 and 59, and 8 % 60 a or over.

Other estimates of the size of the population of loggers at risk are considerably higher than these census figures. In the 1974 NIOSH survey it was concluded that as many as 300,000 workers may be employed in the logging industry (1). In part, the differences can be attributed to definitional problems (full-time, part-time loggers; other occupations, eg, truck drivers included in the counts of workers in the logging industry). Another part of the variation may be due to changes in the number of workers included in these estimates over time and season. The rationale for using census estimates in this study is that census data provide detailed descriptors that are not reported in other sources.

[2] The three major US lumber regions are shown in fig 1.

Table 2. Percentage distribution of injuries among lumber and wood product workers by lumber region (Health Interview Survey 1969—1974).

	Northern	Southern	Western	Total
Injuries reported in the Health Interview Survey	25	43	32	100
Loggers — 1970 census	24	56	20	100
Incidence ratio (injuries:loggers)	1.04	0.77	1.60	1.00

Table 3. Percentage distribution of nature of injury among lumber and wood products workers (Heath Interview Survey 1969—1974).

International Classification of Disease [a]	%
830—839, dislocation without fracture	64
820—829, fracture of lower limbs	13
840—849, sprains and strains	11
800—809, fracture of skull, spine and trunk	8
All other injuries	4
All injuries	100

[a] Eighth revision.

The three national data systems referred to earlier in this paper provide information about work-related accidents that range from minor medically attended injuries to fatalities. The first data set, taken from the HIS, depicts nondisabling injuries. During the period 1969—1974, males employed in the manufacturing of lumber and wood products (a classification that includes loggers) experienced an accident rate that was 38 % greater than the record for all types of workers combined. Table 2 compares the percentage distribution of injuries in the HIS to the distribution of loggers by lumber region.

The incidence ratio suggests that the western lumber region reported a disproportionately high share of the national accident experience. One weakness of this inference is that the proportion of loggers to all employees in the group — manufacturing of lumber and wood products — may (and probably does) vary among regions. Self-reported information on the nature of the injury is also available from the HIS. Table 3 shows this percentage distribution. As noted later, these injury patterns differ markedly from the more serious injuries reported in the SSA Disability Award File analysis.

During the period 1969—1973 SSA reports showed that approximately 1,053 disability awards were made to loggers as the result of injuries sustained in accidents. Seventeen percent of all disability awards were made to black males, who comprise about 27 % of all loggers. Table 4 compares the percentage distribution of SSA disability awards for all loggers to their distribution according to geographic area.

As was the case with the HIS results, the incidence ratio for the western area indicates that this area experienced a disproportionately high share of disabling logging accidents. Because of the consistency in the SSA occupational coding rules for all three regions, it is unlikely that the high incidence ratio for the western region is a classification artifact.

The percentage distribution of SSA disability awards by age, contrasted with the 1970 census age distribution for loggers, is shown in table 5. The increase with age in the incidence ratio suggests that experience as a logger does not protect workers from disabling accidents. Additional evidence of this is that among the 1,053 SSA disability awards made during 1969—1973, only 72, or 14.6 %, were made to loggers who had less than 5 a of experience. Census data show that over 20 % of all loggers had less than 5 a of experience.

Table 6 shows the leading reasons for disability awards to loggers during the period 1969—1973. One-third of all disabling injuries involved fractures to the lower limbs [International Classification of Disease (ICD) 820—829, N codes, nature of accident]. Limbs, skull, spine and trunk injuries accounted for another 20 % (ICD 800—809). Dislocation without fracture (ICD 830—839), the leading cause of injuries among loggers in the HIS, ranked

Table 4. Percentage distribution of disability awards among loggers by lumber region (Social Security Administration 1969—1973).

	Norhern	Southern	Western	Total
Social security awards	14	35	51	100
Loggers — 1970 census	24	56	20	100
Incidence ratio (awards:loggers)	0.58	0.63	2.55	1.00

Table 5. Percentage distribution of disability awards among loggers by age.

	All loggers	Age (a)			
		< 40	40—49	50—59	60—64
Social security awards	100	26.5	17.7	35.1	19.1
Loggers — 1970 census	100	51.3	22.8	17.9	5.2
Incidence ratio (awards:loggers)	1.0	0.52	0.77	1.96	3.67

third as a cause of disabling injury and accounted for only 4 % of all SSA disability awards.

In brief, the important discriptors available from the SSA Disability Award File identify a high risk group in terms of personal characteristics (age, race, occupation), geographic location, and the nature of the disabling injury. Cutters, fellers, and buckers in the age group 50 and over, working in the western lumber region, have the greatest risk of disabling injuries caused by fractures of the lower limbs, skull, spine, and trunk. The extensive nature of the data from the disability data file provides a possibility to monitor the severe accident experience of this dangerous industry.

Table 6. Leading causes of disability among loggers (Social Security Administration 1969—1973).

International Classification of Disease [a]	Number of disability awards
820—829, fracture of lower limbs	350
800—809, fracture of skull, spine and trunk	218
830—839, dislocation without fracture	44
810—819, fracture of upper limb	38
840—848, sprains and strains of joints and muscles	32
All other	371
All causes	1,053

[a] Eighth revision, N code.

Mortality studies from states

Two states, Washington and California, have carried out occupational mortality investigations that include workers in the logging industry as one of the occupational groups studied (3, 6). The results of these two studies for loggers — occupational code 970 — indicate that in both Washington and California loggers have an excess mortality from accidents caused by falling objects.

A comparison of the experience for loggers in these states, taken from the California report, is shown in table 7. This table shows that about one-fourth of all accidental deaths among loggers were caused by blows from falling objects. Differences in the coding of accidents precludes a comparison of the leading causes in the HIS, SSA, and state mortality study experience. In the HIS and SSA studies, causes of accidents are coded according to the ICD "N" code, which describes the nature of the result of the accident, eg, fracture. The state mortality studies use the ICD "E" code, the "external cause," eg, accidental fall. Both the "N" and "E" codes are needed to describe different aspects of injuries.

Table 7. Number and percentage distribution of accidental deaths — External cause among loggers in Washington (1950—1971) and California (1959—1961).

International Classification of Disease [a]	Number		Percentage	
	Washington	California	Washington	California
800—999, accidents, poisoning, violence	1,544	157	100.0	100.0
810—835, motor vehicle	315	38	20.4	24.2
900—904, accidental falls	148	8	9.6	5.1
910, blow from falling objects	368 [b]	42	23.8	26.8
912, caused by machinery	76 [b]	5	4.9	3.2
970—979, suicide	239 [b]	26	15.5	16.6
980—985, homicide	35	8 [b]	2.3	5.1

[a] Seventh revision, E code.
[b] Statistically significant proportional mortality ratio.

In brief, three data systems, ie, injury statistics from the HIS, disability data from the SSA, and cause of death from the experience of two states, provide baseline evidence of the nature and extent of the problem of accidents among loggers. Specifics on personal characteristics, geographic region, and causes of accidents (both the nature and external cause) can be used for two main purposes: first, to identify new accident prevention and occupational health promotion activities that might help to reduce the morbidity and mortality now associated with this industry; second, to select injury, disability, and mortality indices that can be used to evaluate changes in the frequency, type, and severity of accidents.

In the next phase of this study of loggers and accidents, two additional topics will be assessed. The first, which we expect to carry out collaboratively with the Division of Safety Research, will be an attempt to incorporate Workmen's Compensation and Consumer Product Safety Commission data into the analyses. The second effort will be to estimate the economic burden, both medical care costs and lost wages, associated with accidents among loggers. Thereafter we may have a basis for recommendations (i) for changes that will improve the monitoring capability of our information system and (ii) for further study that could lead to improved health promotion and accident prevention programs. With this study as a background we are now proceeding to develop surveillance intelligence bulletins in a similar manner for the other high-interest areas identified by parameters of occupation and causes of disease, disability, and death.

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