NIOSH Surveillance Report

Job Injuries Among Loggers

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH

NIOSH
Surveillance Report

JOB INJURIES AMONG LOGGERS

by

Todd M. Frazier
Chief, Surveillance Branch
Division of Surveillance, Hazard Evaluations and Field Studies

and

Patrick J. Coleman
Chief, Safety Surveillance Branch
Division of Safety Research

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health

January 1983

DISCLAIMER

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

DHHS (NIOSH) Publication No. 83-104

Preface

Surveillance Reports: Background and Purpose

The Occupational Safety and Health Act of 1970 requires the Secretary of HEW 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 conducted by the National Institute for Occupational Safety and Health (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 (DSHEFS), has the responsibility for developing a national information base for the identification of workplace hazards and for the detection of work related disease, disability or death.

Information about workplace hazards comes from the National Occupational Hazard Surveys (NOHS), the first of which was conducted by NIOSH during the period 1972-1974. The second NOHS was initiated November 1980 for the purpose of updating information on potential hazards and the occupational groups exposed to these hazards.

To obtain information on work related diseases, injuries, disability and mortality, the existing national data sets of other agencies have been adapted to meet occupational health surveillance needs. These data sources include surveys conducted by the National Center for Health Statistics (NCHS), the Social Security Administrations Continuous Disability History Sample and the Vital Record Systems of states. Other national data systems are also used when appropriate. Together, information on workplace hazards and effects on health form the base for an occupational health surveillance system that can be used to monitor illnesses among selected groups of workers, to identify occupational hazards that are associated with certain occupational groups, and to provide trend data that can contribute to the evaluation of occupational health programs.

Information from these national data bases will be presented in a series of NIOSH Surveillance Reports that will be disseminated to other NIOSH units, governmental agencies and occupational health researchers. For epidemiologists, these Surveillance Reports are intended to suggest hypotheses or problems that may warrant further investigation. For administrators, planners and program analysts these reports will contribute to the complex stream of information that influences program priority decisions.

In addition, in developing these Surveillance Reports, one aim is to concentrate efforts on "collecting relevant facts, on assembling and evaluating them, and on reporting them to responsible health authorities as well as the general public" from Langmuir, A.D. "William Farr: Founder of Modern Concepts of Surveillance" Int. Jr. of Epi Vol. 5, No. 1, 1976.

This first Surveillance Report - Job Injuries Among Loggers - represents a collaborative effort between the Surveillance Branch in DSHEFS and the counterpart Surveillance Branch in the Division of Safety Research (DSR).

ABSTRACT

Four data systems, the National Health Interview Survey, the Social Security Administration Continuous Disability History File, workers compensation and mortality studies from Washington and California have been used to describe nonfatal and fatal injuries among U.S. loggers. Differences were found among the 3 major lumber regions with the Western region showing accident rates about 60 percent greater than total U.S. rate. Social Security Administration Disability Awards increased with age with loggers 60-64 experiencing an incidence ratio more than 3-1/2 times that found for all loggers. Six questions that may warrant further investigation are identified.

CONTENTS

FIGURE

TABLES

1. Introduction

"In 1971, the Department of Labor marked the lumber and wood products industry, of which logging is a major segment, as one of the five most dangerous occupations in the United States".[1]

It is not surprising then that three of the national statistical systems that have been adapted by DSHEFS for use as a part of an occupational health surveillance network indicate an unusually high injury experience for this industrial sector.* Additional evidence about on the job injuries to loggers comes from state workers' compensation files obtained from the Supplementary Data System Program (SDS) of the Bureau of Labor Statistics, compiled by DSR. This Surveillance Report describes the nature and extent of accidents among loggers, and the implications for injury prevention and safety promotion programs.

2. Nature and Extent of the Problem

The 1970 U.S. 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.[2] For the purposes of this Surveillance Report these men characterize the population at risk. Nationally 27 percent of the loggers are black with nearly all of these working in the Southern lumber region (See Fig. 1). Over 51 percent of the loggers in the United States are under 40 years of age; 23 percent 40-49; 18 percent 50-59; and 8 percent 60 and over.[3,4]

A NIOSH estimate of the number of loggers at risk is considerably higher than the census figure. In the 1974 NIOSH Survey it was concluded that as many as 300,000 may be employed in the logging industry.[5] In part, the differences can be attributed to definitional problems (full-time, part-time loggers; other occupations, e.g. truck drivers included in the counts of workers in the logging industry). Another source of variation in estimates may be seasonal changes in the number of workers included in these estimates. The rationale for using census estimates in this study is that census data provide detailed descriptors that are not available from the 1974 NIOSH Survey.

Using 1970 census data as a denominator to define the population of loggers at risk of injury, the three national data sets described in

*The three data bases are:
- The National Center for Health Statistics (NCHS) Health Interview Survey (HIS) which gives self reported information on accidents, illnesses and occupation/industry.
- The Social Security Administrations Continuous Disability History Sample which gives information on disabling conditions and occupation.
- State based mortality studies which give information on cause of death and occupation/industry.

the next few pages provide the numerators used to calculate injury incidence ratios.

National Health Interview Survey Data (HIS)

National data systems provide information about occupation and causes of disease, disability and death. The Health Interview Survey (HIS)* depicts mainly nondisabling injuries. During the period 1969-74, males employed in the manufacture of lumber and wood products (a classification that includes loggers) experienced an injury rate 38 percent greater than the record for all types of workers combined. Assuming that the proportion of loggers to all other men employed in the manufacture of lumber and wood products is the same for the three regions, Table 1 compares the percentage distribution of injuries in the HIS to the distribution of loggers by lumber region.

TABLE 1

Percent Distribution of Injuries among Lumber and Wood Product Workers by Lumber Region

H.I.S. 1969-74

	Total	Northern	Southern	Western
Injuries reported in the HIS	100	25	43	32
Loggers - 1970 Census	100.	24	56	20
Incidence Ratio Injuries / Loggers	1.00	1.04	.77	1.60

The incidence ratio suggests that the Western lumber region reported a disproportionately high share of the national accident experience.

One series of HIS questions provides information on injuries incurred during the two weeks prior to the time of interview. Responses obtained from lumber and wood products workers over the period 1969-74 gave the injury distributions shown below in Table 2,

*For a description of the way this National Health Interview Survey (HIS) was adapted for use in occupational health surveillance studies, see the paper by Kaminski, R. and Spirtas, R. "Industrial Characteristics of Persons Reporting Morbidity During the Health Interview Surveys Conducted in 1969-1974. An Exploratory Review." DHHS (NIOSH) Pub. No. 80-123.

coded according to the International Classification of Diseases (ICD) 8th Revision.

TABLE 2

Percent Distribution of Nature of Injury among Lumber and Wood Products Workers

H.I.S. 1969-74

ICD 8th Revision	All Injuries	100%
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, trunk	8
	All other injuries	4

Social Security Administration Continuous Disability History Sample (SSA)

For the period 1969-1973, the SSA file shows that approximately 1,053 disability awards were made to loggers as the result of injuries sustained in work related accidents.* Table 3 shows the leading causes of disability awards to loggers during the period 1969-73. One-third of all disabling injuries involved fractures to the lower limbs (ICD 820-829, N codes, nature of accident); limbs, skull, spine and trunk injuries accounted for another 20 percent (ICD 800-809); dislocation without fracture (ICD 830-839) accounted for only four percent of all disability awards. In contrast, dislocation without fracture was the most frequently reported type of injury among the lumber and wood product workers interviewed in the HIS.

*For a description of the way in which the SSA disability award file was adapted for use in occupational health surveillance see NIOSH, "Occupational Characteristics of Disabled Workers--Analysis of Social Security Disability Awards to Workers 1969-1973" DHHS (NIOSH) Pub. No. 80-145.

TABLE 3

Leading Causes of Disability among Loggers

SSA 1969-73

ICD 8th Revision N Code		Number of Disability Awards	
All causes		1,053	
820 - 829	Fracture of lower limb	350	
823	Fracture of tibia and fibula		131
828	Multiple fractures		93
821	Fracture - unspecified parts of femur		52
827	Ill defined fractures of lower limb		39
820	Fracture of neck of femur		24
	All other		11
800 - 809	Fracture of skull, spine and trunk	218	
805	Fracture of vertebral column without mention of spinal cord lesion		101
809	Multiple and ill defined fractures of trunk		53
806	Fracture of vertebral column with spinal cord lesion		25
808	Fracture of pelvis		15
803	Skull - not otherwise stated		10
	All other		14
830 - 839	Dislocation without fracture	44	
810 - 819	Fracture of upper limb	38	
840 - 848	Sprains and strains of joints and muscles	32	
950 - 959	Injury to nerves and spinal cord	25	
	All other	346	

In terms of frequency of disabling injury, cutters (DOT 940) are at greatest risk with 79 percent of the awards, followed by sorters (DOT 942) with 11 percent.*

Analysis of the percentage distribution of SSA disability by cause of disability and geographic region shows that for fractures of lower limbs (820-829) and fractures of skull, spine and trunk (800-809), the greatest frequency of awards occurred in the Western region which has only 20 percent of all loggers. Analysis by age group shows that for both these leading causes of disability, the disability award frequency was highest in the age group 50-59. Seventeen percent of all disability awards were made to black males who comprise 27 percent of all loggers.

Table 4 compares the percentage distribution of SSA disability awards for all loggers to their distribution according to geographic area.

TABLE 4

Percent Distribution of Disability Awards
among Loggers by Lumber Region

SSA 1969-73

	Total	Northern	Southern	Western
SSA Awards	100	14	35	51
Loggers - 1970 Census	100	24	56	20
Incidence Ratio Awards / Loggers	1.00	.58	.63	2.55

As was the case with the HIS results, the incidence ratio for the Western area indicates that this region 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.

*DOT: Dictionary of Occupational Tables, 1965, Vol. II. p. 23.
Code 940: timber cutters and related occupations.
Code 941: log inspecting, grading, scaling, etc.
Code 942: log sorting, gathering, storing.
Code 949: other occupations in logging.

TABLE 5

Percent Distribution of Disability Awards
among Loggers by Age

	All Loggers	Age			
		<40	40-49	50-59	60-64
SSA Awards	100	26.5	17.6	35.1	19.1
1970 Census	100	51.3	22.8	17.9	5.2
Incidence Ratio Awards / Loggers	1.00	.52	.77	1.96	3.67

The increase in the incidence ratio with age suggests that older loggers (presumably more experienced) have a greater risk of disabling injuries than younger loggers. Additional evidence of this is that among the 1,053 SSA disability awards made during 1969-73, only 72 or 6.8 percent were made to loggers who had less than 5 years experience. Census data shows that over 20 percent of all loggers have less than five years experience.

In brief, the important descriptors available from the SSA disability award file identify a high risk group in terms of the personal characteristics (age, occupation, race), the geographic location and the nature of the disabling injury. White male cutters (including buckers, fallers, timber markers and wood boss) in the age group 50 and over working in the Western lumber region are at greatest risk of disabling injuries caused by fractures of lower limbs, skull, spine and trunk. The extensive nature of the data from the SSA disability data file provides a way of monitoring the severe injury experience of this dangerous industry.

Mortality Studies from States

Two states, Washington and California (by coincidence in the same lumber region) have conducted occupational mortality investigations that include workers in the logging industry as one of the occupational groups studied.[6,7] Summarization of results from these two studies for loggers - occupational code 970 - indicates that in both Washington and California loggers have an excess mortality from injuries caused by falling objects. A comparison of the experience for loggers in these states, taken from the California report, is shown in Table 6.

TABLE 6

Proportionate Mortality Ratios for Loggers in California (1959-61) and Washington (1950-71)*

ICD 7th Revision	California Deaths OBS**	EXP	PMR	Washington Deaths OBS**	EXP	PMR
Tuberculosis (001-008)	8	4	194	74	57	130
Cancer of the stomach (151)	9	8	112	223	186	120
Lymphatic leukemia (204.0)	4	1	392	18	14	128
Bronchiectasis (526)	1	1	90	31	16	199
Chronic interstitial pneumonia (525)	4	1	321	24	26	94
Blow from falling object (910)	42	1	R	368	34	1075

**OBS - Observed deaths
EXP - Expected deaths
R - PMR not calculated

In California, during the period 1959-61, 42 deaths were recorded in contrast to an expectation of one death due to injuries from a blow from a falling object. In Washington during the period 1950-1971, 368 fatal accidents of this type were recorded compared to an expectation of 34 deaths.

Table 7 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. The state studies use only the ICD "E" code, the "external cause", e.g. accidental fall for deaths due to accidents. In the HIS and SSA studies, causes of accidents are coded according to the International Classification of Disease (ICD) "N" code which describes the nature of the result of the accident, e.g. fracture. Both types of codes are needed to describe different aspects of injuries resulting from accidents.

*Proportionate Mortality Ratio (PMR) - The percentage ratio of the number of deaths observed from a particular cause in the age-race-sex specific group studied (i.e. loggers) to the number expected from the age-race-sex in specific proportions of total deaths attributed to that cause for a reference or standard population, e.g. state or U.S. population.

TABLE 7

Number and Percent Distribution of Accidental Deaths
External Cause among Loggers in
Washington (1950-71) and California (1959-61)

ICD 7th Revision E Code		Number WA	Number CA	Percent WA	Percent CA
800-999	Accidents, Poisoning, Violence	1544	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 object	368*	42	23.8	26.8
912	Caused by machinery	76*	5	4.9	3.2
970-979	Suicide	239*	26	15.5	16.6
980-985	Homicide	35	8*	2.3	5.1

*Statistically significant PMR

Workers Compensation Data

Specific descriptive characteristics of injuries to loggers in California and Washington were also tabulated, both to provide detail not available through the other data systems, and to compare the nature of injury between the Workers Compensation cases and the SSA data. These data files used were made available by the states under the Supplementary Data System (SDS) program of the Bureau of Labor Statistics and the U.S. Department of Labor.

Table 8 presents the percent distribution of nature of injury among loggers in California and Washington. While the ICD 8 codes are not strictly comparable to the ANSI z16.2 classifications, meaningful comparisons can be made between Table 8 and Table 3.* The latter indicates that almost 60% of SSA disabling injuries were fractures, while Table 8 shows that fractures comprise only five to nine percent of Worker's Compensation (SDS) cases. Table 8 also indicates that cuts and lacerations are predominant (27 to 28%), with sprains and strains a close second (22 to 26%). These types of

*ANS1 z16.2 is the designation used for the American National Standards Institute, Inc.

injuries make up only a small part of the more severe disabling injuries as shown in Table 3.

TABLE 8

Percent Distribution of Nature of Injury among Loggers in California and Washington

S.D.S. - 1979

Nature of Injury (ANS1 z16.2)	California Percent	Washington Percent
Cut & Laceration	27	28
Sprain & Strain	22	26
Contusion	10	22
Fracture	9	5
Abrasion	7	7
Nonclassifiable	19	0
All Other Natures	6	12

Table 9 shows in more detail the most frequently reported combinations of nature of injury, part of body, and source of injury. The combinations most frequently reported among California and Washington loggers are cuts, lacerations or puncture of the finger, knee or thigh by a saw (8.4%); sprains or strains of back, knee or ankle, due to falls (6.3%) and injuries to the eye (3.6%).

TABLE 9

Distribution of Loggers Injuries According to
Nature and Source of Injury, California and Washington

S.D.S. 1979

Total number of injuries reported	1,426	100.0%
Cut, laceration or puncture of finger, thigh or knee by a saw		8.4
Sprains or strain of back, knee or ankle through contact with the ground		6.3
Scratches or abrasions of the eye by unidentified particles		3.6
All other injuries		81.7

In brief, four types of data systems, i.e., HIS, SSA, Workers Compensation and mortality experience from California and Washington have been used to characterize personal descriptors, geographic region and causes of accidents (both the nature and external cause). This information can be used to generate hypotheses about the nature of the problem and to provide a basis for safety programs evaluation.

3. Implications for injury prevention and safety programs

This analysis raises several questions that may provide an impetus for the identification of new types of accident prevention efforts. The first concerns regional differences in the risk of work related injuries among loggers. What is different about the Western lumber region? Another question raised by the analysis of the SSA data is why should older and presumably more experienced loggers have a greater risk of serious injury? Is this an artifact of the SSA disability award system, i.e. greater probability of an award to an older worker, or is it related to differences in risk for younger and older workers? If the latter, how does this finding relate to the present focus of safety and accident prevention programs?

Several years ago Haddon developed an approach for analyzing the factors that contribute to automobile accidents.[8] In addition to its utility in the systematic identification of the interaction of phases (pre-crash, crash and post crash) with factors (human, vehicle and equipment, and environment), the resulting 3 by 3 factor matrix also stimulated one to think of intervention strategies.

This matrix can be used here as a starting point for the assessment of injury intervention programs in the logging industry. The following matrix is a first approximation to the type of analysis that could be conducted by specialists in the field of safe logging practices.

FACTORS MATRIX

		Human	Equipment	Environment
Phase:	Pre injury	2,4	6	1
	Injury	5	3	
	Post injury			

While each of the nine cells in this matrix might be used to suggest questions for further research, the five identified here relate to the previous stated implications for program evaluation based on the results obtained from the four data files.

1 - What environmental conditions may contribute to the apparent increased risk of injury to loggers in the Western region?

2 - What characteristics of older loggers may be contributing to increased risk of injury?

3 - What characteristics of chain saws and other equipment contribute to the causes of cuts and lacerations? How do these characteristics differ across regions?

4 - To what extent could training programs (or in the case of older loggers possibly retraining) contribute to a reduction in logging injuries?

5 - How does worker behavior in controlling hazards affect risk? What behaviors differ between older and younger workers, or between workers between one region and another?

6 - What are the practices concerning use of personal protective equipment, such as protective eye goggles?

4. Summary and Recommendations

This Surveillance Report describes the general nature and extent of work related injuries among loggers. Existing statistical systems i.e., HIS, SSA and State Mortality and workers compensation award statistics provide some but not all of the data needed to characterize the injury experience in this dangerous industry. Using available data, differences were found in (1) regions, with

the Western lumber region showing the highest accident rates; and (2) age groups, with high risk for older loggers. Although the reasons for these differences are not obvious from the analysis of these national data sets, six questions that may warrant further investigations are raised.

REFERENCES

1. Logging from Felling to First Haul. Criteria document for a recommended standard. HEW Pub. No. (NIOSH) 76-188.

2. 1970 Census of Population, Occupation by Industry. PC(2)-7C, Table 8, p 271, Oct. 1972.

3. 1970 Census of Population, Occupational Characteristics PC(2)-7A, Table 41, p 648, June 1973.

4. 1970 Census of Population, Occupational Characteristics PC(2)-7A, Table 40, p 620, June 1973.

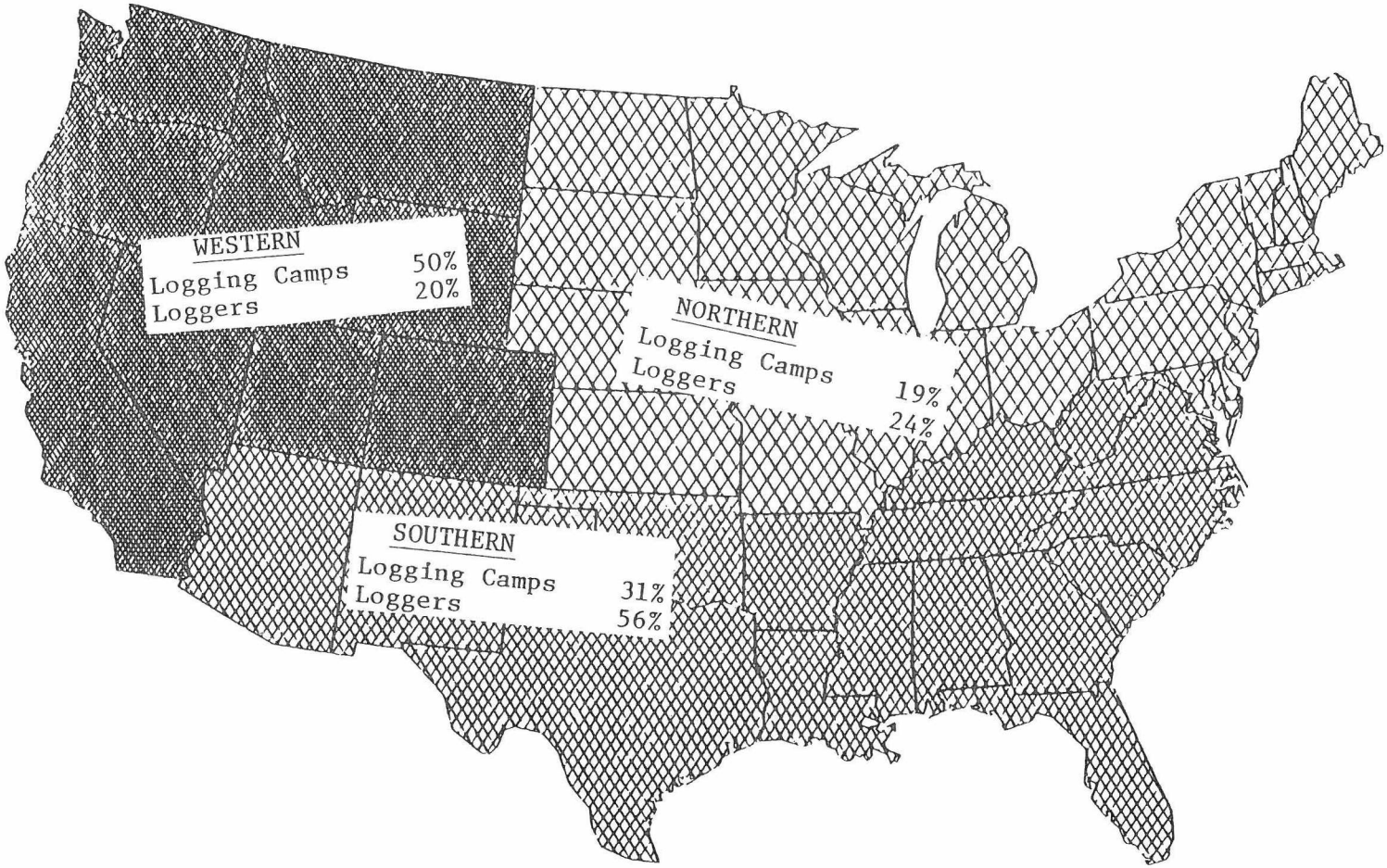
5. Goldberg, M.N. "Worker Safety in Logging Operations". HEW Pub. No. (NIOSH) 74-103, p 18, 1974.

6. Milham, S. Jr., "Occupational Mortality in Washington State 1959-71." DHEW Pub. No. (NIOSH) 76-175-C. NIOSH Research Report. 3 vol.

7. Petersen, G.R. and Milham, S. Jr., "Occupational Mortality in the State of California 1959-61." DHEW (NIOSH) Pub. No. 80-104.

8. Haddon, W. "A Logical Framework for Categorizing Highway Safety Phenomena and Activity". Jr. of Trauma, 12, 3, 1972. pp 193-207.

FIGURE 1
PERCENT DISTRIBUTION OF LOGGERS BY LUMBER REGIONS



☆ U.S. GOVERNMENT PRINTING OFFICE:1983--659-096/623

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

Third Class Mail

DHHS (NIOSH) Publication No. 83-104