

**Analysis of Injuries/Illnesses
in the Seafood Processing Industry in Alaska**

by

**Bernice W. Carmon, R.N., M.P.H.
Associate Professor of Nursing
Principal Investigator**

**Lawrence Weiss, Ph.D., M.P.H.
Associate Professor of Sociology
Co-investigator**

**Jacquelyn Pflaum, R.N., M.S., M.P.H.
Associate Professor of Nursing
Co-investigator**

**University of Alaska Anchorage
Anchorage, Alaska**

July 1992

**Final report submitted to the
National Institute of Occupational Safety and Health**

Grant Award No. 1 RO3 OH0 2656-01

REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. PB93-159150
4. Title and Subtitle Analysis of Injuries/Illnesses in the Seafood Processing Industry in Alaska			5. Report Date 1992/07/29
7. Author(s) Carmon, B. W., L. Weiss, and J. Pflaum			8. Performing Organization Rept. No.
9. Performing Organization Name and Address College of Nursing and Health Sciences, University of Alaska, Anchorage, Alaska			10. Project/Task/Work Unit No. 11. Contract (C) or Grant(G) No. (C) (G) R03-OH-02656
12. Sponsoring Organization Name and Address			13. Type of Report & Period Covered 14.
15. Supplementary Notes			
16. Abstract (Limit: 200 words) Data were gathered concerning injuries and illnesses experienced by workers employed in the seafood industry in Alaska over the period from 1985 through 1987. Over this 3 year period there were 2707 workers' compensation claims filed with nine of ten claims being for a work related injury. More injury claims were filed by men than women, and more illness claims by women. While 67% of the industry's workforce was made up of men, they were responsible for 80% of the injury or illness claims filed. A large majority, 74.5%, of the claims filed were filed within the first 3 months of employment. The most frequently occurring category of illness claims was for cumulative trauma disorder. The largest number of injury claims were for sprains and strains of the back and trunk. Other reported injuries included contusions and bruises (16.5%), cuts and lacerations (11.9%), and fractures (7.9%). Workers employed as packing and filling machine operators and those listed as miscellaneous food handlers were responsible for 75% of all claims filed.			
17. Document Analysis a. Descriptors b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Grant, Grant-Number-R03-OH-02656, End-Date-01-31-1992, Traumatic-injuries, Musculoskeletal-system-disorders, Food-processing-industry, Food-handlers, Sex-factors, Back-injuries, Accident-statistics, Cumulative-trauma-disorders c. COSATI Field/Group			
18. Availability Statement	19. Security Class (This Report)	21. No. of Pages 42	
	22. Security Class (This Page)	22. Price	

TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
LIST OF TABLES.....	ii
SIGNIFICANT FINDINGS.....	iii
ABSTRACT	iv
I. INTRODUCTION.....	1
II. METHODS.....	2
Supplementary Data System.....	2
Analysis.....	3
III. RESULTS.....	4
IV. DISCUSSION.....	25
V. CONCLUSIONS.....	30
REFERENCES.....	33
APPENDIX.....	35

LIST OF TABLES

TABLE

1	Injury/Illness Incidence Ratios for Seafood Processing Workers, 1985 - 1987.....	4
2	Workers' Compensation Claims by Year and Type of Claim.....	5
3	Workers' Compensation Claims by Sex, Age and Occupational Group, 1985 - 1987.....	7
4	Distribution of Claims by Type of Accident or Exposure....	10
5	Distribution of Claims by Source of Injury or Illness....	11
6	Distribution of Claims by Nature of Illness or Injury....	12
7	Distribution of Claims by Body Part Affected.....	13
8	Distribution of Claims by, Sex, Age, Length of Service and Type of Claim.....	14
9	Distribution of Claims by Occupation and Nature of Injury/Illness.....	16
10	Distribution of Claims by Occupation and Body Part Affected.....	17
11	Distribution of Claims by Occupation and Source of Injury/Illness.....	18
12	Distribution of Claims by Occupation and Type of of Accident/Exposure.....	19
13	Type of Claims by Occupation and Sex.....	19
14	Nature of Claims by Sex and Occupation.....	21
15	Type of Accident/Exposure by Sex and Occupation.....	22
16	Source of Injury/Illness by Sex and Occupation.....	24

SIGNIFICANT FINDINGS

This study describes occupational injuries and illnesses experienced by workers employed in the seafood processing industry in Alaska over the three year period 1985 - 1987. Workers' Compensation data compiled as part of the Supplementary Data System (SDS) were analyzed to determine the demographic characteristics of claimants and the distribution of injury/illness characteristics.

Significant findings:

- 2707 workers' compensation claims were filed by workers over the three year period 1985 - 1987.
- Nine out of ten claims were filed for a work-related injury. Men filed proportionately more injury claims than women. Women filed proportionately more illness claims than men.
- Men accounted for approximately 67% of the industry's workforce but almost 80% of the injury/illness claims.
- Almost seventy-five percent (74.8%) of all claims were filed within the first three months of employment.
- Cumulative trauma disorders (CTDs) of the hand and wrist were the most frequently occurring category of illness claims.
- Sprains and strains of the back and trunk were the most frequently occurring category of injury claims.
- Seventy-five percent (75%) of all claims were filed by workers employed as packing and filling machine operators and miscellaneous food handlers. These two occupations account for approximately 62% of the food industry.

ABSTRACT

During the three year period from 1985 through 1987, a total of 2707 Worker's compensation claims were filed by workers employed in the seafood processing industry in Alaska. Ninety-two percent (92%) of the claims involved injuries. The mean age of claimants was 31 years. Males accounted for nearly 80% of all claims while comprising approximately 67% of the employment in the industry. Females filed significantly more illness claims than men. Almost seventy-five percent (74.8%) of all injuries or illnesses occurred within the first three months of employment. Over fifty percent (55.7%) of the claims were filed during the employment season, June through August. Sprains and strains (35.4%), contusions and bruises (16.5%), cuts and lacerations (11.9%) and fractures (7.9%) characterized the most frequently occurring injuries. Nervous disorders involving inflammation of the tendons and joints ranked first among illnesses (4.8%). The parts of the body most often affected by injury or illness were wrists, hands and fingers (26%) and the trunk (30%). Most injuries clustered among workers employed as packaging and filling machine operators and miscellaneous hand work operators. These two occupations accounted for 75% of all workers' compensation claims filed in the seafood processing industry during the three year period.

Analysis of Seafood Processing Injuries/Illnesses in Alaska

Introduction

In 1990, Alaska posted the second highest occupational injury and illness rate in the country. This translates into over 133,050 lost workdays in the private sector at an estimated cost of 15 million dollars (Miller et al, 1992). The fact that Alaska consistently ranks high in occupational injuries and illnesses is generally attributable to the high concentration of employment in hazardous industries.

Seafood processing, one of the fastest growing industries in the state, is one of the most hazardous. From 1985 through 1989, the seafood processing industry has recorded injury and illness case rates in the low to mid thirty's, peaking in 1989 at 35.6 cases per 100 workers (Miller, 1992). Consistently, the seafood industry's case rate is two to three times the injury and illness rate for all industries in the state. While these statistics suggest the magnitude of the problem they do not begin to reveal the human costs. Yet, human and economic costs are the basis for the growing concern about workplace safety.

In an effort to curtail the increase in occupational injuries and illnesses many industries are placing greater emphasis on prevention. It is unlikely that industries will be able to develop effective prevention without a thorough understanding of the epidemiology of the injuries or illnesses occurring in those industries. Knowing worker characteristics, the workplace characteristics, and the injury or illness event,

contributes to our understanding of how multiple factors interact to cause occupational injuries and illnesses. Yet, a descriptive account of the injuries and illnesses experienced by workers employed in the seafood processing industry is conspicuously absent from the literature. Hence, the purpose of this study was to describe injuries and illnesses experienced by seafood processing workers. The specific objectives of this study were:

1. Develop demographic and occupational profile of workers injured in the seafood processing industry in Alaska over the three-year period from 1985 - 1987.
2. Identify high risk occupations within the seafood processing industry and the characteristics of injuries/illnesses sustained most frequently by workers in these occupations.
3. Derive hypotheses that can be used to direct future research on injuries/illnesses in the seafood industry.

Methods

Supplementary Data System (SDS)

The source of data for this descriptive study was the Supplementary Data System (SDS) files for Alaska for the years 1985, 1986 and 1987. The Supplementary Data System (SDS) is a federal/state cooperative program administered by the U. S. Bureau of Labor Statistics (BLS) enacted in 1976 to augment its annual survey on occupational injuries and illnesses. The SDS program compiles information annually on the characteristics of occupational injuries and illnesses by industry and occupational

groups. The source of information for the SDS program are workers' compensation claims which are filed with the state during the year. Each case is analyzed for specific information about the employer, the worker, the injury or illness as well as administrative information necessary for processing the claim. This information is then uniformly coded for the required elements and computer files are forwarded annually to the Bureau of Labor Statistics.

At the inception of this study, Alaska was one of 27 states participating in the SDS program. The years 1985 - 1987 represent the final three years that SDS data were compiled by the state.

Analysis

Seafood processing employment is found in two segments of the food processing industry in Alaska: canned and cured fish and seafoods and fresh/frozen packaged fish and seafoods. These segments are identified in the SDS files by the Standard Industrial Codes (SIC) 2091 and 2092 respectively (Standard Industrial Classification Manual, 1987). After obtaining the SDS files from the Alaska Department of Labor, all cases bearing the (SIC) codes 2091 and 2092 were selected for analysis. Each case represented one claim and the two terms are used interchangeably in this report.

The data were first analyzed by year. Age, sex, occupation group and type of claim were analyzed to determine if cases differed significantly over the three years. Next, cases from

all three years were combined and analyzed descriptively along demographic and injury/illness case variables. The case variables used in this study are defined in Appendix A. Relationships between selected demographic and injury/illness variables were explored through crosstabulation tables. Lastly, the analyses focused on the groups that were the most frequent source of injury/illness claims. When available, state employment figures and statistics were used as denominator data or as a basis for comparison.

The Statistical Package for the Social Sciences (SPSSx and SPSS/PC+) was used to generate frequencies, cross-tabulation tables, chi-square tests, t-tests and ANOVA's, as appropriate. A significance level of 0.05 was used in all statistical testing.

Results

Table 1 describes the injury/illness claims by frequency and incidence ratio over the three year period 1985 - 1987. The number of claims increased with each successive year. In 1987, the number of claims increased approximately 15% above the 1986

Table 1

Injury/Illness Incidence Ratios for Seafood Processing Workers 1985 - 1987

Year	Average Annual Employment	Frequency	Ratio per 100 workers
1985	6,080	809	13.31
1986	6,462	883	13.67
1987	6,611	1015	15.35

total and 25% above 1985. However, when incidence ratios were compared, the rate of change was decidedly less. Although an upward trend persisted, 1987 showed a 15% increase over 1985 and a 12.3% over 1986.

Worker's compensation cases are categorized as either an illness claim or an injury claim. Table 2 describes the type of worker's compensation claims that were filed during the three years, 1985, 1986 and 1987. Each year, the number of injury claims exceeded the number of illness claims. Injury claims were

Table 2

Workers' Compensation Claims by Year and Type of Claim

Type of claim	Year					
	1985		1986		1987	
	n	%	n	%	n	%
Illness	81	(10.0)	125	(14.16)	141	(13.89)
Injury	719	(89.9)	731	(82.79)	842	(82.96)
missing	9	(1.1)	27	(3.1)	31	(3.15)
Total	809	(100.0)	883	(100.01)	1015	(100.0)

filed nine times more frequently than illness claims in 1985 and 6 times more frequently than illness claims in 1986 and 1987. A chi-square test was done to determine if a significant difference existed between observed versus expected frequencies by types of claims filed. A statistically significant difference was found

($\chi^2 = 9.22$; $df = 2$; $p = 0.01$). However, this difference was essentially meaningless since the strength of the association was very weak (Cramer's $V = 0.06$).

The demographic makeup of the worker filing a claim did not vary over the three years. In 1985, males outnumbered females 3:1. In that same year, fifty percent of the claimants were below the age of 30 and for every 10 claims submitted, 8 were filed by workers in the occupational category 'Laborer'. A comparable pattern was seen among claims received in 1986 and 1987. These findings are presented in Table 3. When compared statistically over the three years, claimants did not differ significantly by age ($F = 1.49$; $df = 2, 2654$; $p = 0.23$), sex ($\chi^2 = 1.76$; $df = 2$; $p = 0.41$), or occupational category ($\chi^2 = 7.31$; $df = 6$; $p = 0.29$). Because the three years did not differ significantly by type of claim, age, sex and occupational category, subsequent analysis was conducted on the combined three year total.

Over the three year period from 1985 - 1987, 2707 Worker's Compensation claims were filed in the seafood processing industry in Alaska. Table 3 summarizes the frequency distributions by age, sex and occupation for all claims submitted during the three years. The Alaska Department of Labor (Elder & Hadland, 1990) reports that in the food industry in Alaska (where seafood processing accounts for over 90% of the employment) approximately 63% of the workforce is male and 37% is female. However, the present study found that males in the industry accounted for

Table 3

Workers' Compensation Claims by Sex, Age and Occupation,
1985 - 1987

	1985		1986		1987		Total	
	n	%	n	%	n	%	n	%
Sex								
Male	613	(75.8)	692	(78.4)	776	(76.5)	2081	(76.9)
Female	196	(24.2)	191	(21.6)	239	(23.5)	626	(23.1)
Age								
<20	37	(4.5)	40	(4.5)	39	(3.0)	116	(4.3)
20 - 29	438	(54.1)	453	(51.3)	480	(47.3)	1171	(50.6)
30 - 39	191	(23.6)	230	(26.0)	295	(29.1)	716	(26.4)
40 - 49	79	(9.8)	87	(9.9)	119	(11.7)	281	(10.5)
50 - 59	34	(4.2)	33	(3.7)	38	(3.7)	105	(3.9)
60+	23	(2.8)	16	(1.8)	23	(2.3)	62	(2.3)
missing	7	(0.9)	24	(2.7)	21	(2.1)	52	(1.9)
Occupational Group								
Prof	9	(1.1)	17	(1.9)	8	(0.8)	34	(1.3)
Tech	6	(0.7)	10	(1.1)	21	(2.1)	37	(1.4)
Service	31	(3.8)	28	(3.2)	31	(3.1)	90	(3.3)
Craft	64	(7.9)	49	(5.5)	67	(6.7)	180	(6.6)
Laborer	696	(86.0)	776	(87.9)	887	(87.4)	2359	(87.1)
missing	3	(0.4)	3	(0.3)	1	(0.1)	7	(0.3)

almost 77% (76.9%) of all claims filed while females filed slightly

more than 23% (23.1%). Clearly, males filed proportionately more claims than females.

The mean age of all claimants in this sample was 30 years. The average age for male (31.8 years) and female (30.1 years) claimants was nearly identical. Over 51.6% of the claims were filed by workers less than 30 years of age. Eighty three percent of the workers filing claims were less than 40 years old. According to employment figures, the average age of the Alaskan workforce is 34.1 years with approximately 35% under 30 years of age and 68% below 40 years. Within the food industry, however, the average age of the worker is approximately 30 years (Elder & Hadland, 1990). Relative to the average age of the Alaskan workforce, workers in the seafood industry are young.

Nearly ninety percent (87.4%) of all claims were generated from injuries and illnesses sustained by workers in the major occupational group identified by the Census Occupational Classification (COCS) as 'Laborers' (Alphabetical Index of Industries and Occupations, 1982). Approximately 85% (84.88%) of the employees in the food industry work in jobs classified under the category 'Laborer' (Hadland et al, 1990).

Most injuries and illnesses occurred during June, July and August, the peak season in the industry. Almost three-quarters of all claims were filed by workers who had been on the job less than three months (74.8%). Approximately eighty-six percent (85.8%) of all injury and illness claims were filed during the first six months of employment. Workers who began their workday between 0601 - 1200 hours reported the highest frequency of injuries and illness (56.9%). A

similar percentage of injuries and illnesses occurred between 0600 - 1200 hours (26.2%) and 1201 - 1800 hours (25.0%).

Ninety-two percent of the claims involved injuries; eight percent involved illnesses. Injury/illness characteristics are described using the four case variables type of accident or exposure, source of injury or illness, nature of the injury or illness, and part of body affected (see Appendix for definitions). Tables 4, 5, 6, and 7 present the frequency distribution for each of these four case variables.

Table 4 describes frequency by type of accident/exposure. Generally, this category involved injuries/illnesses occurring during events of lifting, pulling, pushing, throwing, holding or carrying objects. Overexertion was the most frequent type of accident/exposure cited (27.7%). The second most frequently occurring type of accident were accidents in which workers were struck by or against an object (26.6%). These were followed closely in frequency by falls (19.3%).

The leading sources of injury/illness were attributable to working surfaces, such as floors, ground and stairs/steps (17.4%) and containers (16.9%). Seafood products were next in frequency (10.7%) followed by non-powered hand-tools (6.2%). Together these three sources were implicated in 45% of all claims. A variety of injury/illness sources were assigned to the remaining claims. As shown in Table 5, none of the remaining sources were as prominent.

Table 4

Distribution of Claims by Type of Accident or Exposure

	Frequency	Percent
Type of Accident/Exposure	n	%
Caught in, under or between	232	8.6
Struck against	185	6.8
Struck by	469	17.3
Fall from elevation	253	9.3
Fall on same level	291	10.7
Rubbed or abraded	94	3.5
Bodily motion	146	5.4
Overexertion	751	27.4
Contact w/elect current	5	0.2
Contact w/temp extremes	75	2.8
Contact w/caustic radiation	125	4.6
All others	81	3.0
Total	2707	100.0

Table 5

Distribution of Claims by Source of Injury or Illness

Source of Injury/Illness	Frequency	Percent
	n	%
Working surface	470	17.4
Containers	457	16.9
Food products	291	10.7
Hand tools	198	7.3
Metal	170	6.3
Vehicles	180	6.6
Bodily motion	146	5.4
Machines	126	4.7
Wood products	58	2.1
Chemicals	46	1.7
All others	565	20.9
Total	2707	100.00

The frequency distribution of claims by nature of injury and illness is shown in Table 6. Over one-third of all claims were submitted for sprains and strains sustained in the workplace (35.4%). The number of sprains and strains were more than double that of contusions and bruises (16.2%) and lacerations and cuts (11.9%), the next two most frequently occurring injury/illness categories.

Table 6

Distribution of Claims by Nature of Illness or Injury

Nature of Injury/Illness	Frequency	Percent
	n	%
Contusions, bruises	446	16.5
Cuts, lacerations	322	11.9
Fractures	213	7.9
Inflammation of joints, tendons	129	4.8
Sprains, strains	958	35.4
All others	639	23.6
Total	2707	100.0

As noted in Table 7, the trunk was the part of the body most frequently involved in work-related injuries and illness. The trunk was cited in over twenty-nine percent (29.1%) of all claims. The wrists, hands and fingers were involved in twenty-nine (29.1%) of all claims and 77% of all claims citing upper extremity involvement. Overall, upper extremity parts were involved in over one-third (33.2%) of all claims.

When occupational categories were considered, laborers accounted for 87.1% (2359) of the 2707 claims filed in the seafood industry during the three years. Within the laborer category, 2036 claims were

Table 7

Distribution of Claims by Body Part Affected

	Frequency	Percent
Body part affected	n	%
Head	67	2.5
Eye, ear, nose, face	153	5.7
Upper extremities except wrists/hands/fingers	206	7.6
Wrist/hands/fingers	694	25.6
Trunk	789	29.1
Lower extremities	548	20.2
Multiple parts	139	5.1
Multiple body systems	100	3.7
NEC (not elsewhere classified)	11	0.4
Total	2707	100.0

filed by laborers classified as packaging and filling machine operators (machine operators) and miscellaneous hand workers (handlers). The 2036 claims received from workers in these two occupational classifications represented almost 90% (86.3%) of the claims filed by all laborers in this sample. Yet, handlers and machine operators comprise less than 65% (62.43%) of the food industry (Hadland et al, 1991). Table 8 shows the frequency

Table 8

Distribution of Claims by Sex, Age, Length of Service and Type of Claim

	Occupation			
	Machine operators		Handlers	
	n	%	n	%
Sex				
Male	549	(74.7)	969	(74.5)
Female	186	(25.3)	332	(25.5)
Age				
< 20	45	(6.1)	58	(4.5)
20 - 29	398	(54.1)	721	(55.4)
30 - 39	169	(23.0)	327	(25.1)
40 - 49	61	(8.3)	119	(9.1)
50 - 59	31	(4.2)	35	(2.7)
> 59	17	(2.3)	13	(1.0)
missing	14	(1.9)	28	(2.2)
Length of Service				
< 3 Months	600	(81.7)	986	(75.8)
3M - 5M	64	(8.7)	153	(11.8)
6M - 8M	19	(2.6)	35	(2.7)
9M - 11M	12	(1.6)	20	(1.5)
> 1 Year	39	(5.3)	107	(8.2)
missing	1	(0.0)	-	-
Type of Claim				
Illness	95	(12.9)	188	(14.5)
Injury	627	(85.3)	1075	(82.6)
missing	13	(1.8)	38	(2.9)

distributions for selected demographic variables for machine operators and handlers. The two occupations did not differ significantly by sex ($\chi^2 = 0.002$; $df = 1$; $p = 0.96$), age ($t = 1.16$; $df = 1992$; $p = 0.25$) or type of claim ($\chi^2 = 0.98$; $df = 1$; $p = 0.32$).

A statistically significant relationship between length of service was found ($\chi^2 = 11.25$; $df = 4$; $p = 0.02$). Slightly more claims were received from handlers who had been on the job between 3 and 5 months (11.8%) or one or more years (8.2%) than from machine operators in those comparable categories (8.7% and 5.4%, respectively). However, the strength of this relationship is very low (Cramer's $V = 0.07$) and therefore of no practical significance. The distribution of the injury/illness characteristics for the two occupations are shown in Tables 9, 10, 11 and 12. Considering that these two occupations accounted for over 75% of all claims, it was not unexpected to find that they shared comparable frequency distributions with the those distributions described for all claims (see Tables 4 through 7).

In order to derive a more complete picture of the injury or illness events, 'nature of injury/illness' was combined with 'body part affected'. Both occupations were quite similar in how injuries and illnesses were distributed. Fingers and hands were the primary sites for contusions, cuts and laceration. Among machine operators, close to one-third (27.66%) of all contusions involved the hands and fingers. The percent was even higher for handlers (38.71%). Almost 80% (76.82%) of all cuts sustained by handlers and 55% (54.14%) of cuts sustained by machine operators were confined to the hands and

Table 9

Distribution of Claims by Occupation and Nature of Injury/Illness

Nature of Illness/Injury	Occupation			
	Machine operators		Handlers	
	n	%	n	%
Contusions, bruises	141	(19.2)	217	(16.7)
Cuts, lacerations	85	(11.6)	151	(11.6)
Fractures	52	(7.1)	90	(6.9)
Inflammations of joints, tendons	40	(5.4)	72	(5.5)
Sprains, strains	240	(32.7)	470	(36.1)
All others	177	(24.1)	301	(23.1)
Total	735	(100.0)	1301	(100.0)

fingers. Likewise, fingers were the most vulnerable site for fractures for both occupations (machine operators; 21.15%; handlers: 26.67%).

Sprains and strains, by nature, the most frequently occurring injury/illness, most often affected the back and shoulders. The latter accounted for 57% of all sprains/strains from machine operators and 52% of those from handlers. The lower extremities, that is, ankles and knees were affected in 18.33% of claims from machine operators and 17.02% of claims from handlers.

When 'type of accident' was combined with 'source of injury/illness', the working surface was implicated in almost 20% (16.4%) of all falls among machine operators and handlers. Containers (11.1%) and food product (8.11%) were the two most frequently

occurring agents associated with claims listing overexertion as a contributing factor. Being struck by/against containers (5.5%) and hand tools (3.8%) followed next in frequency.

Table 10

Distribution of Claims by Occupation and Body Part Affected

Body part affected	Occupation			
	Machine operators		Handlers	
	n	%	n	%
Head	21	(2.9)	34	(2.6)
Eye, ear, nose, face	46	(6.3)	56	(4.3)
Upper extremities except wrist/hand/fingers	42	(5.7)	117	(9.0)
Wrist/hand/fingers	202	(27.5)	344	(26.4)
Trunk	211	(28.7)	373	(28.7)
Lower extremities	148	(20.1)	248	(19.1)
Multiple parts	39	(5.3)	67	(5.1)
Multiple body systems	24	(3.3)	55	(4.2)
Missing	2	(0.3)	7	(0.5)
Total	735	(100.0)	130	(100.0)

Inflammation of the joints, tendons and muscles was the leading illness category. The hands and fingers were the parts of the body most often affected. Over 50% of all illnesses involving inflammation or irritation of the joints, tendons and muscles were confined to the wrists and hands (machine operators: 52.5%; handlers: 52.8%).

Table 11

Distribution of Claims by Occupation and Source of Illness/Injury

Source of Illness/Injury	Occupation			
	Machine operators		Handlers	
	n	%	n	%
Containers	123	(16.7)	255	(19.6)
Bodily motion	35	(4.8)	73	(5.6)
Chemicals	17	(2.3)	14	(1.1)
Food products	101	(13.7)	170	(13.1)
Hand tool	41	(5.6)	95	(7.3)
Machines	38	(5.2)	58	(4.5)
Metals	33	(4.5)	56	(4.3)
Vehicles	49	(6.7)	83	(6.4)
Wood products	15	(2.0)	26	(2.0)
Working surfaces	137	(18.6)	199	(15.3)
All others	146	(19.9)	272	(20.9)
Total	735	(100.0)	1301	(100.0)

When claims were examined by occupation, no statistically significant relationship was found between occupation and type of claim ($\chi^2 = 0.98$; $df = 1$; $p = 0.32$), type of accident ($\chi^2 = 7.12$; $df = 8$; $p = 0.52$), source of illness/injury ($\chi^2 = 18.64$; $df = 11$; $p = 0.07$), body part affected ($\chi^2 = 12.51$; $df = 8$; $p = 0.13$), or nature of illness or injury ($\chi^2 = 3.50$; $df = 5$; $p = 0.62$).

Table 12

Distribution of Claims by Occupation and Type of Accident/Exposure

Type of Accident	Machine operators		Handlers	
	n	%	n	%
Caught in/under between	54	(7.3)	83	(6.4)
Struck against	120	(16.3)	231	(17.8)
Struck by	66	(9.0)	103	(7.9)
Fall from elevation	88	(12.0)	138	(10.6)
Fall on same level	72	(9.8)	114	(8.8)
Rubbed or abraded	28	(3.8)	40	(3.1)
Bodily motion	35	(4.8)	73	(5.6)
Overexertion	191	(26.0)	386	(29.7)
All others	81	(11.1)	133	(10.2)
Total	735	(100.0)	1301	(100.0)

Table 13

Type of Claim by Occupation and Sex

Type of Claim	Machine operators				Handlers			
	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
Illness	56	(10.2)	39	(21.0)	113	(11.7)	75	(22.6)
Injury	484	(88.2)	143	(76.9)	824	(85.0)	251	(75.6)
missing	9	(1.6)	4	(2.2)	32	(3.3)	6	(1.8)
Total	549	(100.0)	186	(100.0)	969	(100.0)	332	(100.0)

Interestingly, however, when these injury/illness characteristics were examined for males and female machine operators and handlers, striking and statistically significant differences were noted. First, the sex of the worker was associated with the type of claim filed for machine operators ($\chi^2 = 14.74$; $df = 2$; $p = 0.0006$; Cramer's $V = 0.14$) and handlers ($\chi^2 = 24.99$; $df = 2$; $p = 0.0000$; Cramer's $V = 0.14$). In both occupations, the percentage of women reporting illness claims was approximately twice that of men (see Table 13). Conversely, men on the averaged filed 15% more injury claims than did women.

The sex of the worker was also associated with the nature of the injury or illness. This association was statistically significant for machine operators ($\chi^2 = 21.18$; $df = 5$; $p = 0.0003$; Cramer's $V = 0.18$). Male workers in the occupation of machine operators submitted claims involving fractures (8%) and cuts (13.3%) at percentages twice that of women (see Table 14).

Table 14

Nature of Claim by Sex and Occupation

Nature of Claim	Machine operators				Handlers			
	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
Contusions	105	(19.1)	36	(19.4)	69	(17.4)	48	(14.5)
Cuts/lacerations	73	(13.3)	12	(6.5)	115	(11.9)	36	(10.8)
Fractures	44	(8.0)	8	(4.30)	70	(7.2)	20	(6.0)
Inflammation of joints	20	(3.6)	20	(10.8)	44	(4.5)	28	(8.4)
Sprains/strains	171	(31.1)	69	(37.1)	344	(35.5)	126	(38.0)
All others	136	(24.8)	41	(22.0)	227	(23.4)	74	(22.3)
Total	549	(100.0)	186	(100.00)	969	(100.0)	332	(100.0)

Among these workers, males posted twice the percentage of claims involving fractures (8.0%) and cuts (13.3%) than did women (see Table 14). Conversely, the percentage of women filing claims for illnesses involving inflammation of joints and nerves (10.8%) was three times that of men (3.6%).

The association between sex and nature of illness/injury was not statistically significant for claims filed by handlers, ($\chi^2 = 9.38$; $df = 5$; $p = 0.10$). Male and female machine operators ($\chi^2 = 22.12$; $df = 9$; $p = 0.009$; Cramer's $V = 0.17$) and handlers ($\chi^2 = 35.23$; $df = 9$; $p = 0.0001$; Cramer's $V = 0.17$) differed significantly in the types of accident experienced. As shown in

Table 15, the pattern is similar across occupations. Males are more likely than females to be involved in injuries where they struck against something in the work environment or sustained falls from the same level. Females were more likely to be involved in injuries where overexertion or falls from elevations occurred.

Table 15

Type of Accident/Exposure by Sex and Occupation

Type of Accident/ Exposure	Machine operators				Handlers			
	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
Caught in/under between	44	(8.0)	10	(5.4)	67	(6.9)	16	(4.8)
Struck against	101	(18.4)	19	(10.2)	188	(19.4)	43	(13.0)
Struck by	51	(9.3)	15	(8.1)	72	(7.4)	31	(9.3)
Fall from elevation	64	(11.7)	24	(12.9)	91	(9.4)	47	(14.2)
Fall on same level	59	(10.7)	13	(7.0)	93	(9.6)	21	(6.3)
Rubbed or abraded	19	(3.5)	9	(4.8)	35	(3.6)	5	(1.5)
Bodily motion	22	(4.0)	13	(7.0)	55	(5.7)	18	(5.4)
Overexertion	128	(23.3)	63	(33.9)	265	(27.3)	121	(36.4)
All others	61	(11.2)	20	(10.8)	103	(10.6)	30	(9.0)
Total	549	(100.0)	186	(100.0)	969	(100.0)	332	(100.0)

The sex of the worker was associated with the source of the injury/illness for those workers employed as handlers ($\chi^2 = 27.28$; $df = 9$; $p = 0.001$; Cramer's $V = 0.15$). Containers were the number one source of injury/illness for males (19.2%) and females (20.8%). Notable differences between the distributions were in the higher frequency of injury/illness events among males involving vehicles (7.3%) and metal/wood products (7.2%). Chemicals and working surfaces were named more often as an injury/illness source for females than for males. Although chemicals posted a very low frequency count for males and females, the percentage of all claims for female handlers (2.1%) was 3 times the percentage for male handlers (0.7%). Although the difference in the proportion of claims attributable to working surfaces was not as great for females as that for chemicals, working surfaces were cited in an appreciably higher proportion of claims filed by females (1.6%) than males (13.8%). Table 16 presents these findings.

Table 16

Source of Illness/Injury by Sex and Occupation

Source of Injury/ Illness	Machine Operators				Handlers			
	Male		Female		Male		Female	
	n	%	n	%	n	%	n	%
Containers	87	(15.8)	36	(19.4)	186	(19.2)	69	(20.8)
Bodily motion	22	(4.0)	13	(7.0)	55	(5.7)	18	(5.4)
Chemicals	12	(2.2)	5	(2.7)	7	(0.7)	7	(2.1)
Food products	70	(12.8)	31	(16.7)	116	(12.0)	54	(16.3)
Hand tool	32	(5.8)	9	(4.8)	74	(7.6)	21	(6.3)
Machines	31	(5.6)	7	(3.8)	42	(4.3)	16	(4.8)
Metals	40	(7.3)	8	(4.3)	70	(7.2)	12	(3.6)
Vehicles	42	(7.7)	7	(3.8)	71	(7.3)	12	(3.6)
Working surfaces	100	(18.2)	37	(19.9)	134	(13.8)	65	(19.6)
All others	113	(20.6)	33	(17.7)	214	(22.1)	58	(17.5)
Total	549	(100.0)	186	(100.0)	969	(100.0)	332	(100.0)

Source of illness was not associated with the sex of those workers employed as machine operators ($\chi^2 = 12.33$; df 9; $p = 0.19$) (See Table 16). Nor was a relationship detected between the sex of the worker and the part of the body affected by the injury or illness for either machine operators ($\chi^2 = 5.24$; df = 8; $p = 0.73$) or handlers ($\chi^2 = 5.50$; df = 8; $p = 0.70$).

Discussion

The results of this study reveal how person and job-related factors combine to generate a pattern of injuries and illnesses specific to the seafood processing industry. Although the information provided by Supplementary Data System (SDS) lacked the degree of specificity that permits a level of analysis necessary to explore questions of a causal nature, it does provide the basis for a descriptive understanding.

The complex etiology of occupational injury and illness can generally be understood by exploring the contribution of person-related factors and job related factors. In this sample of injury/illness claims, among the demographic variables explored, the sex of the worker appeared to have the greatest influence on the injury/illness patterns in the industry. A particularly notable finding was the disproportionate number of males in relationship to females who filed claims. Although males comprised only 63% of the employment in the food industry, they accounted for almost 80% (76.9%) of all claims. Although a likely inference could be that men are exposed to more hazardous work environment than women, other equally valid inferences can be made.

It may be that males are disproportionately assigned to work activities where they are more likely to sustain injuries, which by nature are more acute and are more likely to be reported. Conversely, females may be engaged in work situations wherein they are more prone to illnesses which by definition, develop

over time. As such, illnesses are less likely to be attributable to the workplace which leads to underreporting. The underreporting of illness claims is well documented in the literature (McNeely, 1991). Males in this sample filed significantly more injury claims than did female workers. Female workers filed significantly more illness claims than did males. This relationship held firm for both occupations which suggests that factors, such as those mentioned above, may be influencing the injury/illness pattern.

Likewise, it is premature to discount the influence that occupation may have. Although the data revealed no statistically significant relationship between sex of worker and the occupational categories used to group workers in this sample, the broad nature of these occupational categories may obscure the specific character of the work done by workers in the various occupations. In fact, within the two most frequently occurring occupation among seafood claimants, machine operators and miscellaneous hand workers (handlers), workers could be involved in various dissimilar work activities; yet, their jobs would still be classified as 'machine operators' or 'miscellaneous hand workers'. For example, machine operators may be involved in feeding cans and lids into lidding machine; packing seafood in cans, boxes or containers or operating machines that transport seafood along an assembly. The work of handlers could vary from butchering frozen or fresh seafood, slicing and filleting fish or cleaning and gutting fish (Alaska State Employment Service,

1992).

In the seafood industry where a broad range of work activities occur within occupations, it may be more important to draw inferences based on an examination of the work being done, rather than from the occupational title. The former approach would provide a more accurate picture of workers' exposure to hazardous factors in the workplace.

It is important to note that the nature of the SDS data and a lack of available employment data on the industry, prohibited a thorough analysis of the influence of age on injury/illness pattern. However, the data did reveal that claimants were young, but representative of the food industry. Relative to workers in other industry segments in the Alaska, only the retail trade segment had a lower average age. Yet, the average age of seafood claimants (30.1 years) and food workers (30 years) was not very different from that of the Alaskan workforce.

Based on age and sex, the developing profile of a typical claimant is that of a young male, employed as a machine operator or handler. Added to this profile would be the sobering fact that the claimant would have experienced this injury sometime during the first three months of employment. Although the seafood industry is moving toward a more stable workforce fueled by an increasing shore-based groundfish production (Knapp & Smith, 1991), to date, it remains highly seasonal. The demand for additional workers occurs during the peak season from June - August. Hence, a large number of inexperienced workers are

recruited and given on the job training. Generally, workers may work as long as 16 hours per day under labor intensive conditions. Given these factors, it is not unexpected to find the current injury/illness pattern among seafood workers.

Like other segments in the manufacturing industry, seafood processing workers are more likely than workers in non-manufacturing industries to experience a work-related injury (Miller, 1992). As previously noted, the nature of those injuries and illnesses are highly influenced by work-related activities. In a recent brochure published by the Alaska State Employment Service (1992), the 'desired' seafood worker was described as someone who:

- is able to work the full season;
- is physically able to stand long hours, lift heavy weight and work long hours;
- can get along well with other people in remote and sometimes wet and cold conditions;
- is not afraid of hard work and isn't a chronic complainer;
- will follow directions and abide by safety rules (p. 2)

Considering these qualifications, combined with the nature of the work executed by machine operators and handlers, the characteristics of the injuries or illnesses experienced by workers are quite reflective of the work done in the seafood industry.

Sprains and strains of the back and shoulders were the most frequently occurring injuries. A static work posture, lifting, frequent bending and twisting are known risk factors for back and shoulder injuries (Burdorf, 1992). Each of these elements are common aspects of seafood processing work. Contusions of

the hands and fingers were the next most frequent injury. Hands and fingers were vulnerable sites for cuts and lacerations, as well. The fact that the work involves intensive, strenuous and repetitive involvement of the hands, explains this finding. The latter also explains the frequent occurrence of inflammation of the joints, tendons and muscles, the only illness category ranked among the top five most frequently occurring claims. The wrist and hand were most often involved in this illness category. Much has been written about repetitive wrist/hand work as a risk factor for the category of illnesses referred to as cumulative trauma disorders (CTDs) (Esernhagen, 1988).

Overexertion injuries generally involved containers or seafood as principal agents associated with the injury. The working surface was a major factor in falls. Falls, the third most common type of injury nationwide, were responsible for 17% of all disabling work injuries in 1986 (Vogel, 1991) . Falls were ranked second among seafood workers. Those falls resulting from hazardous working surfaces accounted for most falls. A wet, slippery floor is a major workplace hazard.

In developing this descriptive account of injuries and illnesses in the seafood industry, all findings must be interpreted with a clear understanding of the limitations posed by the SDS data. The limitations include the following:

1. Each case in the data represents a claim filed by a worker. There is no way of knowing how many workers sustained injuries or illnesses but did not file

claims. It is estimated that fewer than 20% of those thought to be eligible ever apply for worker's compensation (Schwartz, 1987).

2. The data more accurately reflect acute conditions characteristic of most injuries. The long latency period of most illnesses and diseases and the fact that most claims must be filed within a specified time period leads to a systematic under reporting of occupational diseases and illnesses. In addition, the etiology of many occupational illnesses and diseases is limited which makes it difficult to link causality to factors in the workplace.
3. All workers are not covered by workers compensation. In Alaska, self-employed persons, federal workers and certain other groups are not (Wilson, Vawter, & Griffith, 1990).

Conclusions and Recommendations

In 1990, approximately 6.8 million workers in the United states experienced an injury or illness on the job ("Overview," 1992). Economic and health burdens of these events have generated a growing interest in intervention strategies that focus on prevention. Central to understanding prevention is the recognition of the pattern and characteristics of occupational injuries and illnesses. The goal of this study was to describe the pattern and characteristic of injuries and illnesses experienced by workers employed in the seafood processing

industry in Alaska using an existing data base. This study was exploratory in nature and the analysis was guided by questions that focused on determining the relationship between demographic characteristics of the worker and injury/illness characteristics. In view of the findings and the limitations, the following recommendations are made:

1. Improve the surveillance system in order encourage more accurate reporting of illnesses and injuries.
Systems designed to link multiple injury/illness data sources should be an important feature. Safety personnel must be skilled in early recognition and documentation of workplace hazards and injury/illness events.
2. Develop and implement pre-employment and on-going safety training programs for seafood workers. This should be followed by periodic monitoring of worker compliance. When available, workers must be encouraged to wear protective appliances.
3. Initiate worksite analyses programs. On site evaluations studies are needed to improve our understanding of the complex etiology of workplace injuries/illnesses. These studies are crucial to designing "worker-friendly" environments consistent with ergonomic principles that foster adapting the job to the worker rather than vice versa.
4. Encourage input from workers, industry and state

and federal agencies in developing injury/illness prevention strategies. Collaboration must be fostered if prevention and intervention strategies are to have any chance of success.

Occupational injuries and illnesses are a major public health problem nationwide and in Alaska. This study has provided a glimpse of one industry and the injury/illness risks faced by the workers.

References

1. Alaska State Employment Service (1992). Seafood processing jobs in Alaska.
2. Burdorf, A. (1992). Exposure assessment of risk factors for disorders of the back in occupational epidemiology. Scandinavian Journal of Environment, Work and Health, 1(2), 1 - 9.
3. Elder, F. & Hadland, J. (1990). A comparison of Alaskan female and male wage income and employment patterns in 1988: The Gender gap, Juneau, AK: Alaska Department of Labor.
4. Handland, J., Klein, C. McHardy, B., Rasmussen, D., Fowler, J. Ruby, J. & Goforth, J. (1991). Alaska industry/occupation outlook to 1994, Juneau, AK: Alaska Department of Labor.
5. Isernhagen, S. J. (1988). Ergonomics and cumulative trauma. In S. J. Isernhagen (Ed.), Work Injury: Management and Prevention (pp. 54- 75). Rockville, MD: Aspen Publications.
6. Knapp, G. & Smith, T. (1991). The Alaska seafood industry: Seafood sector report. Anchorage, AK: University of Alaska Anchorage, Institute of Social and Economic Research.

6. McNeely, E. M. (1991). Who's counting anyway? The Problem with occupational safety and health statistics. Journal of Occupational Medicine, 33(10), 1071 - 1075.
7. Miller, C., Wilson, J., Davis, N., Goforth, Ruby, J. & Fowler, J. (1992). Occupational injury & illness information: Alaska 1990, Juneau, AK: Alaska Department of Labor.
8. Office of Management and Budget. Executive Office of the President. (1987). Standard industrial classification manual. Springfield, VA: National Technical Information Service.
9. Occupational injuries and illnesses, in the United States by industry, 1990. (1992, April). Monthly Labor Review, 1-8.
10. Schwartz, E. (January 1986 - March 1987). Use of workers' compensation claims for surveillance of work-related illness--New Hampshire. MMWR, 36, 713-720.
11. US Department of Commerce, Bureau of the Census. (1982). Alphabetical index of industries and occupations, (PHC80-R3), Superintendent of Documents.
12. Vogel, C. (1991). Food industry stands up to slips, trips and falls. Safety and Health, 7, 58 - 61.
13. Wilson, J., Vawter, S. & Griffin, B. (1990). Occupational injury and illness information: Alaska 1987, Juneau, AK: Alaska Department of Labor.

APPENDIX

Glossary

Age

The age of the injured or ill worker in years.

Sex

Sex of the sex of the worker expressed as male or female.

Industry

This identifies the business of the injured or ill worker's employer. The standard Industrial Classification (SIC) system is the standard for coding this information.

Occupational Group

The broad categories of occupations, such as 'Managerial and Professional' and 'Operators, Fabricators and Laborers.'

Occupation

Title of worker as coded according to the 3-digit Census Occupational Classification System (COCS) coding structure.

Length of Service

The amount of time (months/years) the employee has worked.

Year of Occurrence

Year of occurrence of injury or illness.

Month of Occurrence

Month of occurrence of injury or illness.

Time of Accident/Exposure

Specifies the time of data that the injury/illness occurred.

Time Workday Began

Specifies the time the shift began for the injured/ill worker on the day of the injury.

Occupational Injury

Any injury, such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from exposure involving a single incident in the work environment.

Occupational Illness

Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with the employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption ingestion or direct contact.

Type of Claim

Whether or not the distinguishing features of the claim characterizes it as an illness or an injury.

Nature of Injury or Illness

Description in terms of its principal physical or mental characteristics.

Part of Body Affected

Part of body injured or affected by the injury or illness.

Source of Injury or Exposure

The object, substance, or bodily motion which directly produced or inflicted the injury or illness.

Type of Accident or Exposure

The event which directly resulted in the injury or illness.

