

Injuries and illnesses to children in commercial fishing in Alaska: A brief report

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Funding information

National Institute for Occupational Safety and Health, Grant/Award Number: U54OH009568-10

Abstract

Background: Commercial fishing is the most hazardous occupation in the United States. While the epidemiology of adult injuries and fatalities are well documented, injuries to children (<18 years old) are not described. The purpose of this report was to describe the characteristics of nonfatal injuries to children involved in commercial fishing.

Methods: Nonfatal commercial fishing injuries to children were identified in the Alaska Fishermen's Fund. The Alaska Fishermen's Fund is an emergency fund payor of last resort. Data on nonfatal injuries to victims aged 17 or younger were analyzed. Descriptive statistics were used to characterize demographics and injury characteristics.

Results: Forty-four nonfatal child injury claims were made between 2012 and 2016. The mean age at the time of claim was 15.6 years ($SD = 1.8$) and 84% were male. The most common types of injuries among children were sprains and strains and the most commonly injured body parts were upper extremities and the trunk. Most injuries occurred in salmon fisheries.

Conclusions: Children are participating in commercial fishing. Based on the results of this analysis, children are also experiencing occupational injuries. The results of this analysis underscore the need for additional safety and health information, guidance for supervisors, and intervention to prevent injuries to children participating in commercial fishing.

KEYWORDS

children, commercial fishing, injury, occupational safety and health, prevention, youth

1 | INTRODUCTION

Commercial fishing is recognized as the most hazardous occupation in the United States.¹ Despite its hazardous nature, it is not uncommon for children to be present on commercial fishing vessels, based on personal conversations with commercial fishing researchers. The Fair Labor Standards Act protects young workers in the United States by protecting the educational opportunities of youth and prohibiting their participation in jobs that are hazardous to their health and safety. However, there are some exemptions. Under Alaska's state law, "children under 18 years of age may work under the direct supervision of a parent in a business owned and operated by a parent or a boat owned and operated by their parent."² As such, we hypothesize

children are involved in commercial fishing and experiencing work-related injuries, similar to their adult counterparts.

Agriculture is somewhat analogous to fishing in that parental exemptions to the Fair Labor Standards Act allow children to participate in agricultural work. However, unlike fishing, substantial research has characterized injuries among children on farms,³⁻⁵ identified risk factors,⁶⁻⁹ tested interventions,^{10,11} and recommended preventative measures and policy.^{12,13} In contrast, research focused on children in commercial fishing is scarce; however, fatal and nonfatal injuries do occur. Sources of data for these reports are typically Coast Guard reports, which rely on fishermen to call and report an injury. However, despite this limitation, cases have been reported that were as young as 10 years of age.¹⁴⁻¹⁷

Data sources to explore injuries among children in commercial fishing are limited. One unique data set is the Alaska Fishermen's Fund. Alaska's Division of Workers' Compensation maintains a database of commercial fishermen who submit a claim to the Alaska Fishermen's Fund. Since 1951, this fund has provided for the treatment and care of Alaska's commercial fishermen who have been injured or fall ill while fishing on or offshore in Alaska. The Fishermen's Fund is an emergency fund payor of last resort, with the exception of Medicaid, and benefits are only awarded after full consideration from alternative sources. The following criteria must be met to qualify for benefits: (1) crewmembers with injury or illness directly connected to operations as a commercial fisherman must hold valid commercial fishing licenses or limited entry permits before the time of injury or illness to qualify for benefits, (2) treatment must have been received within 60 days after onset of injury or illness, (3) an application must be submitted within 1 year after initial treatment, (4) each treatment must be documented by a medical chart note and submitted, (5) injury must have occurred in Alaska or in Alaskan waters.¹⁸ This data set is unique to Alaska and includes injuries to individuals under the age of 18. To date, adult workers have been the focus of published reports of injuries and fatalities in commercial fishing. However, children are participating in commercial fishing and understanding their risk for injury is necessary to prevent future incidents. The objective of this study was to describe the injuries among children (<18 years old) involved in commercial fishing in Alaska and to use a unique data source in commercial fishing to explore the incidence and injuries among children.

2 | METHODS

2.1 | Study design and population

Our study years ranged from 2012 to 2016 and included victims aged 17 or younger who submitted a claim for an injury or illness to the Alaska Fishermen's Fund. Access to the Fishermen's Fund data set was granted to the [Marshfield Clinic Research Institute] by the State of Alaska Department of Labor and Workforce Development, Workers' Compensation Division via the National Institute for Occupational Safety and Health for the purpose of describing injuries to children over this time period.

2.2 | Variables

Demographic variables examined in our study included *age* and *gender*. Commercial fishing variables included *activity while injured*, *fishery*, *gear type*, *license type*, and *work process*. Injury variables included *nature of injury*, *body part of injury*, and *severity of injury*.

Nature of injury and *body part of injury* were included in the original data set and appeared to be coded in accordance with the Workers Compensation Insurance Organization (WCIO) codes (https://www.wcio.org/Active%20PNC/WCIO_Part_Table.pdf). Reviewing narrative

description provided additional context for analysis and confirmed appropriate *nature of injury* categories.

Work process and *severity* were coded for cases by NIOSH researchers as described previously.^{16,19} *Severity* was based on the Coast Guard Injury Severity Scale and included the following categories: minor, moderate, serious, severe, critical, no physical injury, and unknown. *Minor* injuries were defined as injuries that were minor or superficial, no medical treatment was required. *Moderate* injuries were defined as those injuries that exceeded minor level but did not result in broken bones (other than fingers, toes, or nose), loss of limbs, severe hemorrhaging, muscle, nerve, tendon, or internal organ damage. Professional medical treatment may have been required but the injured was not hospitalized for more than 48 h within 5 days of injury. *Serious* injuries were defined as injuries that required significant medical/surgical management. The injured was not hospitalized for more than 48 h within 5 days of the injury. *Severe* injuries were defined as injuries that required significant medical/surgical management. The person was hospitalized for more than 48 h within 5 days of the injuries and, if in intensive care, was in for less than 48 h. *Critical* injuries were defined as injuries that required significant medical/surgical management. The injured was hospitalized and in intensive care for more than 48 h within 5 days of the injury. *Unknown* was defined as an injury with too little information to determine severity.¹⁹ *No physical injury* referred to illnesses, conditions, and infections. Work process or task at the time of injury was coded by NIOSH researchers and each case was assigned a code from NIOSH's Work Process Classification System (WPCS).¹⁹ A list of applicable work processes can be found in Table 1.

2.3 | Data cleaning and analysis

Analyses in this report are limited to descriptive summaries which present standard descriptive statistics. The analysis focused on the injury/illness necessitating the claim and not any pre-existing injuries or conditions that may have appeared in narrative fields. For example, two infections had been reclassified by NIOSH researchers to capture the original injury from which an infection developed, although the claim was for the infection. In this study, the authors kept the original coding to describe the Fishermen's Fund claims. Authors collapsed *severity* options of "no physical injury" and "unknown" into one category labeled "Not Applicable." The protocol was deemed not human subjects research by the Institutional Review Board at the Marshfield Clinic Research Institute.

3 | RESULTS

In the 5-year period of our study, 44 children (<18 years of age) submitted a claim to the Fishermen's Fund for injuries incurred while working in commercial fishing. Claims among children represented about 2% of the total claims ($n = 2404$). The mean age at the time of claim was 15.6 years ($SD = 1.8$) and 84% were male. Most injuries

TABLE 1 Demographics of injuries

Demographic characteristic	N (%) or mean (SD)
Age; mean (SD)	15.6 (1.8)
Gender	
Male	37 (84.1)
Female	7 (15.9)
Injured while	
Commercial fishing	27 (62.8)
Other	9 (20.9)
Working on a boat	4 (9.3)
Working on gear	3 (7.0)
Fishery and gear type ^a	
Salmon Drift Gillnet	21 (47.7)
Salmon Seine	7 (15.9)
Salmon Setnet	5 (11.4)
Halibut/Sablefish Longline	4 (9.1)
Salmon/Herring Tender	2 (4.6)
Unknown/unspecified	5 (11.4)
License	
Resident crew	33 (75.0)
Nonresident crew	9 (20.5)
Nonresident 7 day	1 (2.3)
Unknown	1 (2.3)
Work process	
Hauling gear	6 (13.6)
Offloading fish	6 (13.6)
Handling fresh catch	5 (11.4)
Walking, climbing	3 (6.8)
Repair, maintenance, cleaning	3 (6.8)
Preparing gear	2 (4.5)
Setting gear	2 (4.5)
Pulling up anchor	2 (4.5)
Handling gear on deck	1 (2.3)
Processing the catch	1 (2.3)
Mooring	1 (2.3)
Off duty	1 (2.3)
Preparing vessel for sea	1 (2.3)
Other	3 (6.8)
Unknown	7 (15.9)

^aFisheries with injuries to children <18, not an exhaustive list of fisheries in Alaska.

occurred while the child was commercial fishing ($n = 27$). Salmon was the most hazardous fishery on an event basis, resulting in 81.8% of the injuries. (Table 1).

Upper extremities (42.3%) and the trunk area (34.1%) were among the most commonly injured body parts in our analysis of injuries to children (Table 2). The most common types of injuries among children were sprains and strains (45.5%; Table 3). Additional notable injuries included fractures/dislocations and lacerations. Almost half of the injuries occurred while *hauling gear* (13.6%),

TABLE 2 Body part injured ($N = 44$)

Body part injured	N (%)
Upper extremities	19 (43.2)
Trunk	15 (34.1)
Lower extremities	6 (13.6)
Head, face, neck, eyes, teeth	2 (4.5)
Multiple body parts	1 (2.3)
No physical injury	1 (2.3)
Total	44 (100.0)

offloading fish (13.6%), and *handling fresh catch* (11.4%). However, a variety of work processes were represented among injuries including *repairs, maintenance, cleaning, and preparing gear*.

The majority of injuries to children were classified as *minor* or *moderate*. The only type of injuries in this data set that were *serious* were fractures and dislocations (Table 3). The data set did not include any severe or critical injuries. In reviewing the injury narratives, four of the most serious injuries were wrist fractures and one was a finger fracture. All five of the most serious injury claims were gear-related, and specifically referenced nets and/or rope.

4 | DISCUSSION

This is the first study, to our knowledge, that examined commercial fishing injuries among children (<18 years of age). We identified 44 injuries to children in a 5-year period. Our findings, including the nature of injury and body part injured, are similar to those observed among adult commercial fishermen in Alaska and/or the West Coast. Common injuries reported among fishermen include fractures, lacerations, and sprains/strains, and upper extremities and the trunk are among the most common injury locations.^{16,20} Within the Fishermen's Fund data set, about 11% ($n = 5$) of commercial fishing injuries to children were classified as *serious*. Comparatively, in the examination of nonfatal injuries to adult commercial fishing injuries in Alaska, about 30% of injuries were classified as *serious* or *severe*,¹⁶ suggesting child injuries may not be as severe as their adult counterparts and may be reflective of the type of tasks they perform or differences in exposures. However, this could be due to the difference in data sources, as injuries reported to the US Coast Guard may generally be more serious (e.g., requiring US Coast Guard assistance/medevac). A comparison of injury and illness patterns using data from US Coast Guard reports, Fishermen's Fund, and the Alaska Trauma Registry is currently underway by NIOSH researchers that may help determine the extent to which severity differs between data sets.

Among children, most injuries occurred while *hauling gear, offloading fish, and handling fresh catch*. Other notable work processes included *walking, climbing, and repair, maintenance, and clearing*. Among adults, *processing catch on slime line, stacking block of frozen*

TABLE 3 Nature of incident by severity

Nature of incident	Minor, N (%)	Moderate, N (%)	Serious, N (%)	Not applicable, N (%)	Total, N (%)
Strains, sprains	10 (50.0)	10 (50.0)	0 (0.0)	0 (0.0)	20 (45.5)
Fractures, dislocations	0 (0.0)	3 (37.5)	5 (62.5)	0 (0.0)	8 (18.2)
Laceration	5 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (11.4)
Contusion	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.5)
Crushing	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	2 (4.5)
No physical injury/infection	0 (0.0)	0 (0.0)	0 (0.0)	4 (100)	2 (4.5)
Carpel tunnel syndrome	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (2.3)
Concussion	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	1 (2.3)
Foreign body	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.3)
Total	20 (45.5)	15 (34.1)	5 (11.4)	4 (9.1)	44 (100.0)

product, and *offloading product* are common work processes associated with injuries in commercial fishing.¹⁹ This overlap in tasks suggests that children and adults are participating in similar tasks and might be experiencing similar injuries. This may also present joint opportunities for injury prevention.

Commercial fishing is similar to agriculture in that children are legally allowed to participate in work due to exceptions to traditional labor laws. However, children's participation in agriculture and subsequent injuries are well documented. Commonly injured body parts among children in agriculture include the upper extremities, similar to what we observed among children in commercial fishing. Sprains, strains, fractures, and dislocations were leading types of injuries among children in commercial fishing, whereas, in agriculture, lacerations, concussions, and fractures are also common medically attended injuries to children.²¹ However, comparisons between commercial fishing and agriculture should be interpreted with some caution, as the data sources for commercial fishing injuries and agricultural injuries differ and may represent disparate ends of the injury spectrum.

The results of our analysis show that children are participating, at least to some extent, in commercial fishing and experiencing occupational injuries. While some recommendations for child safety on commercial fishing vessels are available (i.e., personal flotation device standards and recommendations)²² the information does not suggest the types of work tasks children should be participating in, the health and safety hazards present, or expectations for the parent as a supervisor. As previously mentioned, resources focused on child agricultural injury prevention are abundant,²³ and similar effort should be invested for children in commercial fishing.

While this analysis contributes new information to the occupational safety and health literature, the study should be interpreted in light of some limitations. The Alaska Fishermen's Fund is a payor of last resort for injuries that occurred while commercial fishing. As

such, injuries among children that were covered by other insurance providers are not included in this data set. We suspect, but do not know, that this data set underrepresents injuries to children while commercial fishing. Another limitation to the data set is the lack of relationship between the child and the captain/crew, which would help describe how children get involved in fishing. Our findings are limited to the fisheries of Alaska and may not be generalizable to other regions. Finally, we are not able to compare injury rates between children and adults in Alaska's fishing industry without age-specific denominator information for youth.

The results of this analysis underscore the need for additional safety and health information and intervention to prevent injuries to children participating in commercial fishing and inform future lines of research inquiry. Recognizing the limitations of the Fishermen's Fund data set, additional injury surveillance systems should be explored to better quantify the burden of injury among children and the extent of participation of children in commercial fishing. Additionally, recognizing commercial fishing injuries are not isolated to Alaska, an examination of injuries to children in other commercial fishing regions (i.e., northeast and southeast) should be pursued given injuries have been reported in these areas.^{24,25} Finally, if denominator data could be ascertained for the number of children participating in commercial fishing, comparing rates of injury among children in commercial fishing and agriculture could inform potential areas of emphasis for the agriculture, forestry, and fishing sector.

ACKNOWLEDGMENTS

We acknowledge and appreciate Samantha Case, National Institute for Occupational Safety and Health, who assisted with data access and interpretation. This study was supported by The National Children's Center for Rural and Agricultural Health and Safety under Grant NIOSH U54OH009568-10.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John D. Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTIONS

Josie M. Rudolphi and Richard L. Berg conceptualized and designed the research project and obtained the data set. Richard L. Berg completed data analysis. Josie M. Rudolphi drafted the manuscript. Josie M. Rudolphi and Richard L. Berg revised the manuscript. All authors approve the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

ETHICS APPROVAL AND INFORMED CONSENT

The research protocol was approved by the Institutional Review Board at the Marshfield Clinic Research Institute.

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How to cite this article: Rudolphi JM, Berg RL. Injuries and illnesses to children in commercial fishing in Alaska: a brief report. *Am J Ind Med*. 2021;64:398-402. <https://doi.org/10.1002/ajim.23232>