HHS Public Access

Author manuscript

J Safety Res. Author manuscript; available in PMC 2024 November 25.

Published in final edited form as:

J Safety Res. 2022 December ; 83: 260–268. doi:10.1016/j.jsr.2022.08.022.

Have you met Angus? Development and evaluation of a social marketing intervention to improve personal flotation device use in commercial fishing

Theodore D. Teske[a,*], **Samantha L. Case**[b], **Devin L. Lucas**[b], **Christy L. Forrester**[c], **Jennifer M. Lincoln**[b,1]

[a]National Institute for Occupational Safety and Health, Western States Division, 315 E. Montgomery Avenue, Spokane, WA 99207, USA

[b]National Institute for Occupational Safety and Health, Western States Division, 4230 University Drive, Anchorage, AK 99508, USA

[c]National Institute for Occupational Safety and Health, Office of the Director, Patriots Plaza 1, 395 E Street, S.W., Suite 9200, Washington, DC 20201, USA

Abstract

Introduction: Drowning is the leading cause of death among commercial fishermen in the United States. Approximately 30% of all commercial fishing fatalities are attributed to falls overboard. One of the simplest and most affordable ways to prevent these fatalities is for crewmembers to wear personal flotation devices (PFDs) while on deck. An examination of over 200 fatal falls overboard in the U.S. fishing industry revealed that none of the victims were wearing PFDs when they died. PFDs are not required to be worn by commercial fishermen in the United States, so this study was designed to encourage behavior change using targeted health communication and social marketing.

Methods: This study developed, implemented, and evaluated a multi-media social marketing campaign featuring a fictitious, culturally relevant spokesman designed to look, talk, and act like the target audience. The messages were crafted to address common barriers to PFD adoption and misconceptions about fleet-specific risks for fatalities from falls overboard. The campaign was evaluated over two seasons of fishing to look at message retention and intent toward action following exposure to the campaign materials.

[*]Corresponding author at: NIOSH Western States Division, 315 E. Montgomery Avenue, Spokane, WA 99207, USA. tteske@cdc.gov (T.D. Teske).

[1]New work address: National Institute for Occupational Safety and Health, Office of Agriculture Safety and Health, Room 513, 1150 Tusculum Ave, Cincinnati, OH 45226, USA.

Conflict of interest statement

I, Theodore D. Teske, have no conflicts of interest related to the research described in this manuscript.

This work was conducted as part of my job at NIOSH using internal funding.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the National Institute for Occupational Safety and Health. Mention of company names or products does not imply endorsement by the National Institute for Occupational Safety and Health. This study was funded internally by the Centers for Disease Control and Prevention's National Institute for Occupation Safety and Health (CDC/NIOSH). There were no external grants or contracts provided to me to conduct the research.

Results: Survey respondents indicated overall positive opinions about the spokesman and the messages. Results also show a reported change in behavior related to using PFDs while working on deck.

Discussion: Targeted multi-media messaging can influence behavior of workers in high-risk occupations in remote locations. Safety message development should focus on occupational culture to create valid and authentic communication products for workers in high-risk industries.

Introduction

Drowning is the leading cause of death among commercial fishermen in the United States (National Institute for Occupational Safety and Health, 2021). During 2000–2019, 871 fishermen died while commercial fishing in the United States (National Institute for Occupational Safety and Health, 2021). This resulted in the highest fatality rate for any occupation in 2019, at 145 fatalities per 100,000 full-time equivalent (FTE) workers, 41 times higher than the average worker (Bureau of Labor Statistics, 2020). Most of these fatalities were due to drownings after a vessel disaster or from a crewmember falling overboard (Lincoln and Lucas, 2010; Lucas and Case, 2018; Case et al., 2018). Approximately 30% of all commercial fishing fatalities are attributed to falls over- board (Lincoln and Lucas, 2010; Lucas and Case, 2018).

While the number of deaths from falls overboard in the fishing industry has declined slightly since 2000, the lack of widespread adoption of prevention strategies persists (Case et al., 2018). For instance, one of the simplest and most affordable ways to prevent these fatalities is for crewmembers to wear personal flotation devices (PFDs) while on deck. An examination of over 200 fatal falls overboard in the U.S. fishing industry revealed that none of the victims were wearing PFDs when they died (Case et al., 2018). This finding is consistent with earlier studies focused in Alaska that highlighted the lack of PFD use among fall overboard victims (Lincoln and Conway, 1999; Lucas and Lincoln, 2007; National Institute for Occupational Safety and Health (NIOSH), 1994; National Institute for Occupational Safety and Health (NIOSH), 1997).

There is a clear need to increase the use of PFDs in the fishing industry, and understanding the barriers that workers have to wearing PFDs is an important first step. A previous NIOSH study of predictors of PFD use among workers in the Alaskan fishing industry concluded that workers are likely to increase their PFD usage if their perceptions of risk and beliefs about PFDs are improved (Lucas et al., 2013). The study found that fishermen with heightened risk perceptions related to falling overboard had significantly higher levels of PFD usage than fishermen with lower risk perceptions. The study also showed a gap between fishermen’s perceived efficacy of PFDs to prevent fatalities from falls overboard and their use when working on deck. Of those surveyed, 85% said PFDs were fairly or very effective at preventing fatalities from falls overboard; however, only 33% of those same respondents indicated that they frequently or always wore a PFD when working on the deck of a fishing vessel (Lucas et al., 2013). The study also found that significant barriers to PFD usage included beliefs that wearing a PFD is uncomfortable, interferes with work, and creates an entanglement hazard (Lucas et al., 2013). However, field-testing of PFDs with

Alaskan fishermen showed there are commercially available PFDs that overcome some off these barriers and are acceptable to work in (Lucas et al., 2012). Based on these findings, researchers recommended the development and implementation of tailored interventions to improve risk perception and to overcome efficacy barriers to PFD use (Lucas et al., 2013).

Health behavior research has shown that increasing risk perceptions can lead to behavior change when accompanied by increased self-efficacy (Witte, 1992; Rosenstock et al., 1988). Attitudes and beliefs can be influenced, and previous research has demonstrated that when attitudes and beliefs are modified, behavior change may follow (Prochaska and Velicer, 1997). For example, researchers with the Florida Prevention Research Center at the University of South Florida used participatory research, peer-level recommendations, and social marketing to increase the use of safety glasses among citrus industry workers and overcome their belief that safety glasses reduced their productivity (Tovar- Aguilar et al., 2014). In this study, the researchers were able to increase the use of safety glasses among the primary audience by having well-respected workers model the behavior and demonstrate the glasses had no impact on productivity. In a similar fashion, based on NIOSH's previous studies on PFD use among fishermen, it should be possible to influence fishermen's perceptions and beliefs regarding PFDs, overcome their negative attitudes about working in PFDs, and thereby increase PFD use.

Social marketing is an intervention approach that has a strong foundational theory, which suggests that by using a "marketing mix" of product, price, place, and promotion to engage audiences, one can provide an effective channel for motivating behavior change (Kotler et al., 2002).

NIOSH has applied a social marketing approach to underground hard rock miners, another high-risk occupation. NIOSH incorporated adult learning theory, storytelling, and a focus on occupational culture to create valid and authentic communication products for these workers and others in high-risk industries (Cullen and Fein, 2005; Cullen et al., 2008). As Van Maanen and Barley (Van Maanen and Barley, 1984) explained, this shared risk is a bonding attribute in the occupational culture of high-risk industries:

"Danger... invites work involvement and a sense of fraternity... Recognition that one's work entails danger heightens the contrast between one's own work and the safer work of others, and encourages comparison of self with those who share one's work situation. Attitudes, behaviors, and self-images for coping physically and psychologically with threat become part of an occupational role appreciated best, it is thought, only by one's fellow workers."

Similarly, commercial fishing is a high-risk industry with a strong occupational culture that converts high-risk to an integral part of their occupational culture. Therefore, this combination of adult learning theory, storytelling, and occupational culture could also be important to increasing PFD use among commercial fishing crews. The purpose of this study was to develop a social marketing intervention to increase PFD use among commercial fishermen, and to evaluate message recollection and appeal, motivation towards action, and perceptions of fall overboard risks.

Methods

Researchers used the 4 Ps of the social marketing mix and results of past PFD studies to set the parameters of the project as shown below. The social marketing intervention ran from May 2014 to November 2015.

Product

Social marketing campaigns have two basic tenets to help focus efforts on measurable outcomes: identifying a specific target audience and a targeted behavior to be changed. In the case of this intervention, the product is the behavior fishermen are being encouraged to adopt, wearing a PFD while working on deck. The social marketing intervention targeted two fishing populations in Alaska: Bristol Bay salmon drift gillnet fishermen (hereafter, gill-netters) and Bering Sea and Aleutian Island (BSAI) crab fishermen (hereafter, crabbers). These groups of fishermen were selected because of their inclusion in the original NIOSH PFD study and existence of baseline data on PFD use and fleet-specific attitudes towards PFDs (Lucas et al., 2013; Lucas et al., 2012).

Price

The price was considered on both a social and monetary level. There was potentially a social cost for adopting a behavior that could run counter to the dominant culture of commercial fishing. Fishermen could be perceived as being too risk adverse to be an effective fisherman, resulting in a cost of loss of social status. The monetary cost arose from the need for fishermen to purchase the PFD from a gear vendor. In some cases, this could be over $200 dollars for the more effective models as indicated in the NIOSH PFD study.

Place

For the third part of the marketing mix, place, the study focused on two aspects of this as well: the location where the messages would be shared and the channels that would be used to spread the messages. The locations for the dissemination of the messages were the ports of Naknek, AK and Dutch Harbor, AK with additional materials sent to gear vendors around the Northwest coast of the United States including Seattle and Bellingham, Washington and Newport, Oregon. The Northwestern target ports are areas where fishermen purchase gear ahead of their respective fishing season and have it shipped up to Alaska for use when they arrive.

Each of the Alaskan ports see a large influx of fishermen directly before the start of either the salmon season (in Naknek) and crab season (in Dutch Harbor). This concentration of workers prior to the season makes it an ideal location to present messages related to fall overboard safety as the fishermen gear up for the season, purchasing necessary equipment, and readying their vessels. Qualitative data gathered during the previous NIOSH PFD study indicated that local fishing supply shops were the primary place fishermen purchased their personal protective equipment for the season such as rain gear and boots. These locations also carried PFDs and other safety gear for the fleet. Having physical messages in these shops was a critical channel for sharing our PFD safety messages. Other locations targeted in the ports were grocery stores, restaurants and bars, community centers, and health centers.

Two print advertising channels were developed to support these port-based channels. Half-page, full-color ads ran for two years in a widely read commercial fishing trade magazine and direct mail postcards with fishery-specific messages were sent to all permit holders in the salmon drift gillnet and BSAI crab fleets prior to the start of each season.

In addition to physical messages, researchers used web-based channels to promote their messages including the NIOSH website, a campaign-specific website run by a partner, digital display ads on industry websites and blogs, and dedicated social media accounts for the campaign on Facebook and Twitter.

Promotion

A strategic communication firm was contracted to develop the creative concept for the promotion of the social marketing campaign. The firm reviewed NIOSH research on falls overboard and came back to the agency with three final concepts for consideration: Loss, Steer, and Salty.

The Loss concept focused on highlighting the risks of falls over- board as shown in hypothetical scenarios and pivoting to the social and emotional toll felt by survivors. One of the key messages said, “His boots didn’t save him. A PFD would have.” The goal as stated by the communication firm was to have fishermen start to see PFDs as standard deck gear like their boots and rain gear, not just as emergency or safety gear. This concept was ultimately rejected by NIOSH as being an overly emotional appeal that was similar to other safety messages used with the audience in the past. It could be dismissed by fishermen because they could overestimate their survival skills or ability to avoid the situations outlined in the scenarios. In essence they could tell themselves, “I’m smarter than that and wouldn’t get myself into that situation.”.

The second concept, Steer, focused on the vessel skippers as opinion leaders among the target audiences. There are no regulations requiring fishermen to wear a PFD while working on their vessel, however the skipper can choose to institute a PFD use policy on his vessel. The creative concept for Steer featured images of a skipper with text stating, “There are only two acceptable answers on board. “Yes” and “Captain.” Secondary copy discussed the skipper’s duty to look after the crew’s safety by saying, “Put low-profile, purpose-built PFDs on your crew’s gear list. And require they wear them while working on deck.” While this concept did a good job of reaching out to strong opinion leaders in these audiences, it was not selected because there was no supporting messaging for the larger part of the audience, the crewmembers, who would be ultimately responsible for performing the behavior of wearing PFDs. This type of solution or messaging would also reduce the self-efficacy of the deck crew and could potentially undermine the long-term adoption of PFDs by individuals if they were seen as something being done to them and not something they were choosing for themselves.

The final concept, Salty, featured a fictitious, culturally-relevant spokesman that would look, talk, and act like gillnetters and crabbers. The concept tagline, “Live to be Salty,” focused on the idea that by wearing a PFD, crewmembers would reduce their risk of a fatal fall overboard and live to be an experienced, older expert in the industry. The main goal was to

make the spokesman memorable, quotable, and different from other safety messages in this industry. This type of message was expected to jolt message recipients out of their standard media consumption habits. When compared to the two other concepts, this one was viewed as the most innovative and most likely to resonate with the audience based on what was known about their attitudes towards PFDs and their occupational culture.

Initial concepts for the spokesman, Angus (Fig. 1), aligned with many cultural norms associated with commercial fishermen, including a desire for independence, bluntness, practicality, respect for successful fishermen (known as highliners), and a master/apprentice style training environment.

Based on the feedback of local fishing experts, the initial design was refined to more fully align with the specific traits of Alaskan gillnetters and crabbers. Stock photography images used in test versions of the concept did not depict the correct types of vessels or settings. These images also showed the subject holding a cigar, which was not acceptable for a public health message. The spokesman character's name was Angus McGilly, a humorous but memorable name that gave license for the spokesman to speak bluntly and sarcastically about PFD use. This name was changed to Angus Iversen to better reflect the Scandinavian heritage of many Northwest and Alaskan fishermen. Finally, the subject was not wearing a PFD and therefore not demonstrating the desired behavior change. To correct these initial problems, a new version of Angus was photographed on an Alaskan crab vessel and salmon gillnet vessel wearing a PFD (Fig. 2). Photographs were also taken in the wheelhouse of the crab vessel to target messages to vessel captains.

Refinement with stakeholder input

Posters with revised images and proposed messages were tested with industry stakeholders including commercial fishermen, US Coast Guard marine safety experts, marine safety trainers, and marine supply vendors. A small focus group featuring commercial fishermen and marine safety trainers helped narrow down draft quotes from Angus. Stakeholders were asked to review the concepts and provide feedback, focusing on the messaging to make sure the messages resonated with them and were appropriate for cultural norms. Some reviewers expressed dissatisfaction in some of the phrasing, such as using improper language (e.g., "ain't") (Fig. 2), or in making crude jokes, however they approved of the concept overall. Other reviewers expressed appreciation for the creativity and plain-spoken tone of the messages. Using this information, the messages were revised to better reflect the stakeholder preferences (Fig. 3). Concurrently the draft messages were shared with potential gear vendor partners to get buy in from them as dissemination channels for the physical campaign materials. Researchers also ran workshops with sales staff at the shops to educate them on the results of the NIOSH PFD study and give them information about which PFDs may work best for a fisherman based on their type of fishery and other gear preferences.

Development of social marketing intervention materials

Twelve posters were developed, combining Angus images and quotes addressing specific hazards. For example, an image of Angus on a salmon gillnet vessel was combined with the quote, "You may learn to think like a fish, but you'll never breathe like one." This

quote was supported by a tailored hazard message and language addressing common barriers for salmon fishermen identified in the original PFD study, “Salmon fishermen have the highest number of man overboard fatalities in Alaska. It doesn’t have to be this way. Today’s low-profile PFDs are comfortable, don’t tangle in gear, and extend survival time in the water. Choose your PFD today at livetobesalty.org. Wear it. And Live.” Another example focused on captains starts with the quote, “My boat. My rules. You’re wearing one, period.” This addresses the captain’s role as policymaker on the vessel and responsibility for the care of the crew. The message was again supported by additional copy addressing barriers to PFD use, “Today’s options make it easy to find a comfortable, work-friendly PFD that extends survival time in the water. Guide your men to livetobesalty. org. Then make PFDs mandatory on deck.” Six posters focused on PFD comfort and cold-water hazards, three referenced specific hazards to gillnet fishermen, and three were targeted at vessel captains. This series of messages formed the foundation of all the social marketing intervention messaging.

In addition to the quote and hazard information, each poster contained a call to action with the link to a website (livetobesalty.org) containing information on the results from the NIOSH PFD study. Live to be Salty also featured a Facebook page and Twitter account to disseminate messages and engage participants with timely information and responses. Posters and other point-of-sale collateral, including stickers, standup cardboard displays and beverage coasters were created. Stickers were placed on packaging of rain gear and deck boots to encourage crews to think of PFDs as standard deck equipment, rather than solely emergency devices (Fig. 4).

Social marketing intervention rollout

NIOSH researchers and external partners distributed intervention materials in Naknek, AK in the weeks prior to the Bristol Bay salmon season opening in June 2014. This process was repeated in Dutch Harbor, AK in preparation for two Bering Sea Aleutian Island crab seasons in October 2014 and January 2015. Materials were distributed to other ports and coastal communities in Alaska and the Pacific Northwest to engage fishermen during their off- seasons, which ran from July 2014 through May 2015 for gillnetters and March 2015 to September 2015 for crabbers.

Evaluation

A cross-sectional survey was administered during 2014 and 2015 at the beginning of the summer gillnet season and the fall crabbing season. The survey instrument included 20 closed- ended questions repeated from the 2008/2009 survey (Lucas et al., 2013; Lucas et al., 2012) to measure perceptions of the risk of falling overboard; attitudes about PFD efficacy and comfort, 6 multi-part questions to measure the social marketing intervention, and 4 demographic questions. The survey in 2014 allowed researchers to track any change in PFD use among the populations of fishermen between the survey in 2008/2009 and the start of the Live to be Salty campaign. The 2015 survey allowed researchers to track changes in PFD use and intended behavior change based on exposure to and recollection of the Live to be Salty messages. Skip patterns were used in the survey. For example, if the respondent did not recognize Angus Iversen or the Live to be Salty campaign messages, they did not answer

subsequent questions regarding actions taken. The survey was approved by the NIOSH Human Subjects Review Board and the Office of Management and Budget.

The survey methodology was the same as for the previous PFD survey conducted in Alaska in 2008/2009. Researchers arrived in Naknek and Dutch Harbor several days prior to the start of salmon and crab seasons, respectively. Potential survey respondents were identified in ports and boat yards and were invited to participate. Paper-based surveys were completed on-the-spot with fishermen that volunteered and met the inclusion criteria. Surveys were administered until 100 responses had been collected in each fishery. Surveys were conducted in Naknek for gillnetters in June 2014 and June 2015, and in Dutch Harbor for crabbers in October 2014 and October 2015.

Statistical analysis

Descriptive statistics were calculated to explore patterns among variables and differences between crabbers and gillnetters working during the 2014 and 2015 seasons. Comparisons were made to examine overall differences between crabbers and gillnetters, as well as within-fishery differences before and after the intervention. Missing data were excluded from percent distributions. Statistics describing the recognition of Angus and the intervention were cal- culated from the 2015 survey only, since the campaign had not yet started in the baseline year of 2014. Significance tests were not performed since the sample sizes were small, especially when stratifying on certain groups (such as fishermen who recalled seeing an Angus message).

Results

Demographics and PFD use

A total of 401 surveys were completed in four trips ahead of the start of salmon and crab fishing seasons in 2014 and 2015 (Table 1). Characteristics such as age, sex, crew position, and fishing experience were similar from year to year for each group.

Among crabbers, self-reported PFD use (measured on a scale of never, sometimes, frequently, or always) remained high in both years, at 83.7% sometimes, frequently, or always wearing a PFD in 2014 and 85.9% in 2015. The proportion of crabbers who reported always wearing a PFD remained high in 2015 at 45.5%, and in all years was much higher than gillnetters.

Among gillnetters, any PFD use (responses of sometimes, frequently, or always wearing a PFD) increased from 36.7% in 2014 to 44.8% in 2015. However, very few gillnetters reported always wearing their PFD in both 2014 and 2015 (4.4% and 5.2%, respectively).

Message recall

Table 2 shows unaided and aided message recall among respondents. Participants were first asked about general PFD safety messages without any additional prompts or aids (e.g., photos of the ads). Over half of crabbers (56, 56.6%) and gillnetters (52, 51.5%) recalled hearing or seeing PFD safety messages within the previous month. Among crabbers, recognition of the intervention increased with additional prompting, with 56.7% recognizing

the “Live to be Salty” slogan, 62.0% recognizing Angus from a photograph, and 72.7% recognizing a complete ad involving Angus and a PFD message. Recall with intervention-specific prompts among gillnetters also increased, but overall recognition of the ads was lower than among crabbers, at 50.0%.

Participants were also asked to select all channels where they saw the ads (Table 3). Magazines and posters were the most commonly identified channels from which respondents recalled seeing the ads. Of the 72 crabbers who recognized the ads, 46 (63.9%) saw the magazine ads and 33 (45.8%) recalled the intervention posters. Stickers that had been placed at local gear shops were also frequently identified (21, 29.2%). These results were similar among the 50 gillnetters, who also selected magazine ads (26, 52.0%) and posters (22, 44.0%), although stickers were less common (6, 12.0%).

The intervention involved internet components, including a website and social media pages, as well as a mailing component. These channels experienced low responses in both groups. Only five crabbers (6.9%) and two gillnetters (4.0%) identified “internet” as the source from which they saw the ad. Postal mail was the least commonly identified channel in both groups, with only two crabbers and no gillnetters selecting this response.

Appeal

Opinions of Angus were largely positive. Among the 62 crabbers who recognized Angus, the majority agreed or strongly agreed with statements that he seemed “like a seasoned fisherman” (42, 71.2%), “smart” (35, 60.3%), and “funny” (33, 58.9%). These responses were similar among 48 gillnetters, who also indicated he was “like a seasoned fisherman” (35, 77.8%), “smart” (32, 72.7%), and “funny” (24, 54.5%). Most respondents did not perceive Angus as a peer, with only 42.1% of crabbers and 46.5% of gillnetters agreeing or strongly agreeing that he was “like me.”.

Message appeal was also favorable. Overall, respondents indicated they liked the PFD message. The majority of the 72 crabbers who had seen the ads agreed or strongly agreed that the message “was meant for fishermen like me” (65, 94.2%), “grabbed my attention” (60, 87.0%), “was convincing” (56, 83.6%), and “said some- thing important” (56, 81.2%). Likewise, gillnetters responded that the message “was meant for fishermen like me” (47, 95.9%), “grabbed my attention” (45, 91.8%), “said something important” (42, 85.7%), and “was convincing” (40, 81.6%).

Risk perception

Fall overboard risk perceptions were examined to determine any relationship between recalling the ads and those perceptions. Respondents indicated, on a scale from 0 to 100%, their perceived likelihood of ever falling overboard during their career. In general, respondents felt they were at low risk with little variation by ad recall status. Among crabbers, those who had seen the ads reported a median 12.5% (IQR = 45.0) chance of falling overboard, similar to 15.0% (IQR = 50.0) among crabbers who did not recall seeing the ads. Gillnetters who recalled the ads reported slightly higher likelihood at a median 35.0% (IQR = 40.0), compared to those who had not seen the ads (median = 16.0; IQR = 45.0).

Changes in behaviors

To measure the intervention's effect on behavior, respondents were asked if the ads prompted them to take action in a number of ways (Table 3). Trying on a PFD was the leading action taken among both groups. Crabbers then most frequently purchased a new PFD (19, 26.4%) while gillnetters sought more information on PFD models (14, 28.0%). Visiting the Live to be Salty website rarely occurred in either group. Overall, 32 crabbers (44.4%) and 26 gillnetters (52.0%) indicated they planned to take some type of action based on seeing the ads.

Discussion

Commercial fishermen work on wet, rolling vessels and are at risk of falling overboard while working on an open deck. Increased wear of properly sized and fitted PFDs would help prevent further deaths in the industry. Federal regulations require all fishing vessels to carry-one US Coast Guard-approved PFD per person on board; however, there are no requirements for them to be worn (46 CFR §28.110). In Alaska's cold-water fisheries, the requirement is to carry immersion suits (buoyant, full-body suit worn in the event of a vessel evacuation) (46 CFR §28.110), and many vessels do not also carry PFDs that could be worn while working. This, in conjunction with fishermen's general resistance to additional regulations, means it is critical to continue efforts to promote voluntary adoption of PFDs (Weil et al., 2016).

The findings from the 2014/2015 surveys showed that PFD use varied greatly between gillnetters and crabbers. In both years of the study, nearly half of crabbers reported they always wore PFDs, in contrast to over half of gillnetters reporting they never wore PFDs. The increase in crabbers reporting they always wear a PFD since the original survey in 2008/2009 is encouraging. Crabbers reported a substantial increase in always wearing a PFD, from 22.3% during the 2008/2009 survey (Lucas et al., 2013) to 52.0% in 2014. Crabbing vessels are larger, averaging 90'–120' in length, and are often company-owned. Because the high wear rate in the fleet occurred prior to the 2014/2015 surveys, the increase was not primarily due to the intervention, but instead was likely due to changes in company and vessel policies. In contrast, Bristol Bay drift gillnet boats are smaller, about 32' in length, and tend to be independently owned and operated and therefore not subject to widespread company policies. The findings of continued low PFD use among this fleet is consistent with the 2008/2009 survey finding of 4.7% saying they always wear a PFD when working on deck (Lucas et al., 2013). The consistent low PFD wear rate in this fleet is of continued concern, particularly as they experience some of the highest numbers of loss of life due to falls overboard in the country (Case et al., 2018). It is clear that additional efforts targeted to workers in this fishery are a priority, including increasing awareness of commercially available PFDs that alleviate concerns of discomfort and potential for entanglement. Additionally, manufacturers should incorporate feedback from workers in the design and development of new, innovative devices. For example, based on the 2008/2009 survey, Kent Safety Products conducted market research to obtain feedback on a prototype PFD. In turn, adjustments were made to the PFD resulting in a lightweight, inherently buoyant vest thin enough to wear under rain gear (National Institute for Occupational Safety

and Health (NIOSH), 2014). This process should be adopted by other manufacturers to make workable, wearable products for fishermen.

Our findings also showed that Angus was a memorable spokesman for the safety messages. Overall recognition of Angus, the slogan, and the ads was higher among crabbers than gillnetters. Because some crabbers also participate in salmon tendering during the summer months, it is plausible that the crabbers were more exposed to the messaging by seeing posters and other materials in both ports. Study results also suggest that the channel selection put Angus in places where he would be seen by the audiences. For these remote workers, print channels proved to be the most successful, especially the repetition of large ads in a popular trade magazine. While this should be expanded in future interventions where possible, this was also the most expensive channel to use and could not be easily expanded without an increase in resources. The partnerships with local gear vendors proved to be an effective channel as well, as the posters and apparel stickers used in these locations were seen and remembered by the fishermen. In contrast, the online resources were not commonly used among these remote workers. Most fishermen in Naknek and Dutch Harbor have little or no access to the internet while in port, so directing them to a website or social media was found to be of little value.

The findings show an interesting result regarding Angus' cultural appropriateness. While the majority of respondents from both groups agreed with the statement that Angus seems "like a seasoned fisherman," fewer felt that he was "like me." This may have to do with the age demographics of our respondents. The average respondent was in their mid-30 s, much younger than Angus who appears to be in his late 50 s or early 60 s. Despite the age difference, respondents showed collegial feelings for Angus through comments while the survey was being administered: "Who is that old bastard? I've seen him in Pacific Fishing [Magazine]." "I've seen the ads with the crusty old guy." "Angus Iversen? Sounds like a guy who goes to the bar, gets drunk, then loses a fight with himself in the parking lot." While these sentiments may sound harsh or dismissive, it is reassuring to see them remembering Angus, treating him like a peer, and not dismissing him outright.

The overarching goal of the intervention was to facilitate behavior change and improve PFD use in these fleets, and the survey results showed that a number of respondents took or planned to take some form of action because of the Live to be Salty ads. Trying on a PFD was the most common action taken, and nearly a quarter of respondents reported wearing their PFD more often because of the intervention. Although further work is needed to continue to improve consistent PFD use in these fisheries, we consider the intervention to be successful at motivating workers to take action, from gathering and sharing safety information to incorporating a PFD into their standard work gear. However, fishermen reported low self-perceived risk of falling overboard. This potentially helps explain the overall low rate of PFD wear among gillnetters. As discussed by Lucas et al. (Lucas et al., 2013), efforts to increase concern over man overboard risks may lead to increased PFD use by changing workers' attitudes about the value and utility of PFDs.

The overall reaction by the target fisheries to this campaign are encouraging and researchers should consider the further use of social marketing to encourage behavior change in

commercial fishing through the use of fishery-specific campaigns. Social marketing has been shown to be a successful method occupational safety and health intervention in other fisheries and industries around the Unites States. Researchers from the Northeast Center for Occupational Health and Safety (NEC) have conducted successful social marketing interventions with lobstermen in New England related to PFD adoption (Sorensen et al., 2021) and farmers throughout the Northeast to encourage installation of rollover protection systems (ROPS) on farm tractors (Sorensen et al., 2011).

Limitations

This study is subject to a number of limitations. The first is the sampling methodology. The researchers used convenience sampling to identify and approach fishermen. The sample size for each year for each fishery was 100 respondents, however since the surveys were anonymous there was no way to determine if fishermen had taken the survey before. Additionally, the populations of these audiences are predominantly male, with the crab fishery being likely 100% male, so capturing female respondents' attitudes about the campaign spokesman was virtually impossible. The salmon gillnet fleet does have more gender diversity, but it is still predominantly male. Future research could be conducted to evaluate whether Angus Iversen is a suitable spokesperson for fishing workers not identifying as male.

Another limitation is the inability to generalize the results to the rest of the commercial fishing industry. Since the messages were targeted specifically at the two Alaskan fisheries included in the study, it is unknown if these messages would be effective in other fisheries or areas of the country. Anecdotal evidence during the dissemination of campaign materials showed that other fisheries did see some value in the messages with requests for materials coming from the east coast and Gulf coast.

Conclusion

The survey showed that Angus was a culturally appropriate spokesman with a strong message that could be recalled and acted upon. Further message development should consider focusing on occupational culture to create valid and authentic communication products for fishermen and others in high-risk industries.

While the printed channels (e.g., posters, ads, stickers) were successful in delivering the messages and reaching our audiences, the development and implementation of this intervention was extremely resource intensive, and the images and messages may not be easily transferrable to other fisheries or regions. Future research may examine the utility of Angus as a messenger for other hazards in commercial fishing or could include the development of a new spokesman using the similar PFD safety messages for other fisheries with high fall overboard fatality risks around the country. Additionally, because of the small number of female respondents, we could not examine differences in PFD perceptions or opinions of Angus based on sex. Study of these topics among females in the fishing industry may reveal unique differences and could provide valuable insight needed to improve future interventions.

Acknowledgements

The authors express their gratitude to the commercial fishermen who participated in the study. The authors also wish to thank the many partners who assisted in the development and imple- mentation of the intervention, including the Alaska Marine Safety Education Association, US Coast Guard, Commercial Fishing Safety Advisory Committee, and local gear shops in Naknek, Dutch Harbor, Bellingham, and Seattle.

Biographies

Theodore Teske is a health communication specialist for the National Institute for Occupational Safety and Health (NIOSH) Western States Division (WSD). He has worked for NIOSH since 1999 developing communication-based interventions for the commercial fishing, mining, oil and gas, and aviation industries. His research is focused on improving the process of bringing NIOSH research into practice, including conducting health communication and research translation projects with focuses on occupational culture, social marketing, and technology transfer. He received his BA in Broadcasting and MA in Communication and Leadership Studies from Gonzaga University in Spokane, WA.

Dr. Jennifer Lincoln is an Injury Epidemiologist currently serving as the Associate Director for the Office of Agriculture, Forestry and Fishing Safety and Health, National Institute for Occupational Safety and Health. She received her PhD from Johns Hopkins, School of Public Health. Dr. Lincoln’s career has focused on scientific research and leadership to develop tailored risk-reduction interventions for high- risk work, especially in the prevention of traumatic injuries among workers in the commercial fishing industry. In 2007, she created the NIOSH Commercial Fishing Safety Research and Design Program and in 2015 established the Center for Maritime Safety and Health Studies.

Devin Lucas is an injury epidemiologist at the National Institute for Occupational Safety and Health (NIOSH), Western States Division, stationed in Anchorage, Alaska. Dr. Lucas has a PhD in Occupational and Environmental Health from Oregon State University and 15 years of experience designing epidemiologic studies of work-related injuries. Dr. Lucas leads research projects that apply epidemiologic methods to identify and characterize occupational hazards and focuses on developing, testing, and promoting practical and scalable injury prevention solutions.

Samantha L. Case is an epidemiologist at the National Institute for Occupational Safety and Health (NIOSH), Western States Division in Anchorage, AK. She earned her MPH from the University of Alaska Anchorage and is currently a PhD student in Safety Sciences at Indiana University of Pennsylvania. She has worked with NIOSH since 2014 to conduct research on safety and injury prevention in the US commercial fishing industry.

Christy L. Forrester, PhD, MS is a health scientist with the National Institute for Occupational Safety and Health (NIOSH), Communication and Research to Practice (r2p) Office. She leads the NIOSH r2p team in developing and adapting innovative strategies and solutions to bridge gaps in the translation of research findings into practical workplace use to improve the safety and health of workers. Dr. Forrester earned her PhD in communication with a focus on organizational and risk communication from George Mason University and MS in epidemiology from the University of Cincinnati.

References

Bureau of Labor Statistics. Civilian occupations with high fatal work injury rates (2019). Washington (DC): US Department of Labor, Bureau of Labor Statistics. Available from: https://www.bls.gov/charts/census-of-fatal-occupational-injuries/civilian-occupations-with-high-fatal-work-injury-rates.htm.

Case SL, Lincoln JM, & Lucas DL (2018). Fatal falls overboard in commercial fishing – United States, 2000–2016. MMWR, 67(16), 465–469.

Cullen E, Fein A (2005). Tell me a story: why stories are essential to effective safety training. Spokane (WA): US Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. (DHHS [NIOSH] Publication No. 2005–152-163 [RI 9664]).

Cullen E, Matthews L, & Teske T (2008). Use of occupational ethnography and social marketing strategies to develop a safety awareness campaign for coal miners. Social Marketing Q, 14(4), 27–46.

Kotler P, Roberto N, & Lee N (2002). Social marketing: Improving the quality of life.Thousand Oaks, (CA): Sage.

Lincoln JM, & Conway GA (1999). Preventing commercial fishing deaths in Alaska. Occupational and Environmental Medicine, 56, 691–695. [PubMed: 10658549]

Lincoln JM, & Lucas DL (2010). Occupational fatalities in the United States commercial fishing industry, 2000–2009. Journal of Agromedicine, 15(4), 343–350. [PubMed: 20954029]

Lucas DL, & Case SL (2018). Work-related mortality in the US fishing industry during 2000–2014: New findings based on improved workforce exposure estimates. American Journal of Industrial Medicine, 61, 21–31. [PubMed: 28833290]

Lucas DL, & Lincoln JM (2007). Fatal falls overboard on commercial fishing vessels in Alaska. American Journal of Industrial Medicine, 50, 962–968. [PubMed: 17910031]

Lucas DL, Lincoln JM, Carozza SE, Bovbjerg VE, Kincl LD, Teske TD, Somervell PD, & Anderson PJ (2013). Predictors of personal flotation device (PFD) use among workers in the Alaska commercial fishing industry. Safety Science, 53, 177–185.

Lucas D, Lincoln J, Somervell P, & Teske T (2012). Worker satisfaction with personal flotation devices (PFDs) in the fishing industry: Evaluations in actual use. Applied Ergonomics, 43, 747–752. [PubMed: 22123533]

National Institute for Occupational Safety and Health (NIOSH) (1994). Request for assistance in preventing drownings of commercial fishermen. Cincinnati (OH): US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (DHHS[NIOSH] Publication No. 94–107).

National Institute for Occupational Safety and Health (NIOSH) (1997). Commercial fishing fatalities in Alaska: Risk factors and prevention strategies. Anchorage (AK): US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (DHHS[NIOSH] Publication No. 97–163 [CIB 58]).

National Institute for Occupational Safety and Health (NIOSH) (2014). A story of impact: PFD Manufacturer adopts NIOSH research into product development process. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (DHHS [NIOSH] Publication No. 2015–119).

National Institute for Occupational Safety and Health (NIOSH) (2021). Commercial Fishing Incident Database [Date file]. Anchorage (AK): US Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

Prochaska J, & Velicer W (1997). The transtheoretical model of health behavior change. American Journal of Health Promotion, 12(1), 38–48. [PubMed: 10170434]

Rosenstock I, Strecher V, & Becker M (1988). Social learning theory and the health belief model. Health Education Quarterly, 15(2), 175–183. [PubMed: 3378902]

Sorensen J, Jenkins P, Emmelin M, Stenlund H, Weinehall L, Earle-Richardson G, & May J (2011). The social marketing of safety behaviors: A quasi-randomized controlled trial of tractor retrofitting incentives. American Journal of Public Health, 101(4), 678–684. [PubMed: 21330581]

Sorensen J, Weil R, Echard J, Tinc P, Hirabayashi L, Roome A, Lally E, & Jenkins P (2021). Evaluation of the Lifejackets for Lobstermen program: A social marketing initiative to increase lifejacket use in the Northeast lobster fishing industry. Safety Science, 142.

Tovar-Aguilar JA, Monaghan PF, Bryant CA, Esposito A, Wade M, Ruiz O, & McDermott RJ (2014.). Improving eye safety in citrus harvest crews through the acceptance of personal protective equipment, community-based participatory research, social marketing, and community health workers. Journal of Agromedicine, 19(2), 107–116. [PubMed: 24911686]

Van Maanen J, & Barley SR (1984). Occupational communities: Culture and control in organizations. Research in Organizational Behavior, 6, 287–365.

Weil R, Pinto K, Lincoln J, Hall-Arber M, & Sorensen J (2016). The use of personal flotation devices in the northeast lobster fishing industry: An examination of the decision-making process. American Journal of Industrial Medicine, 59, 73–80. [PubMed: 26443130]

Witte K (1992). Putting the fear back into fear appeals: The extended parallel process model. Communications Monographs, 59(4), 329–349.

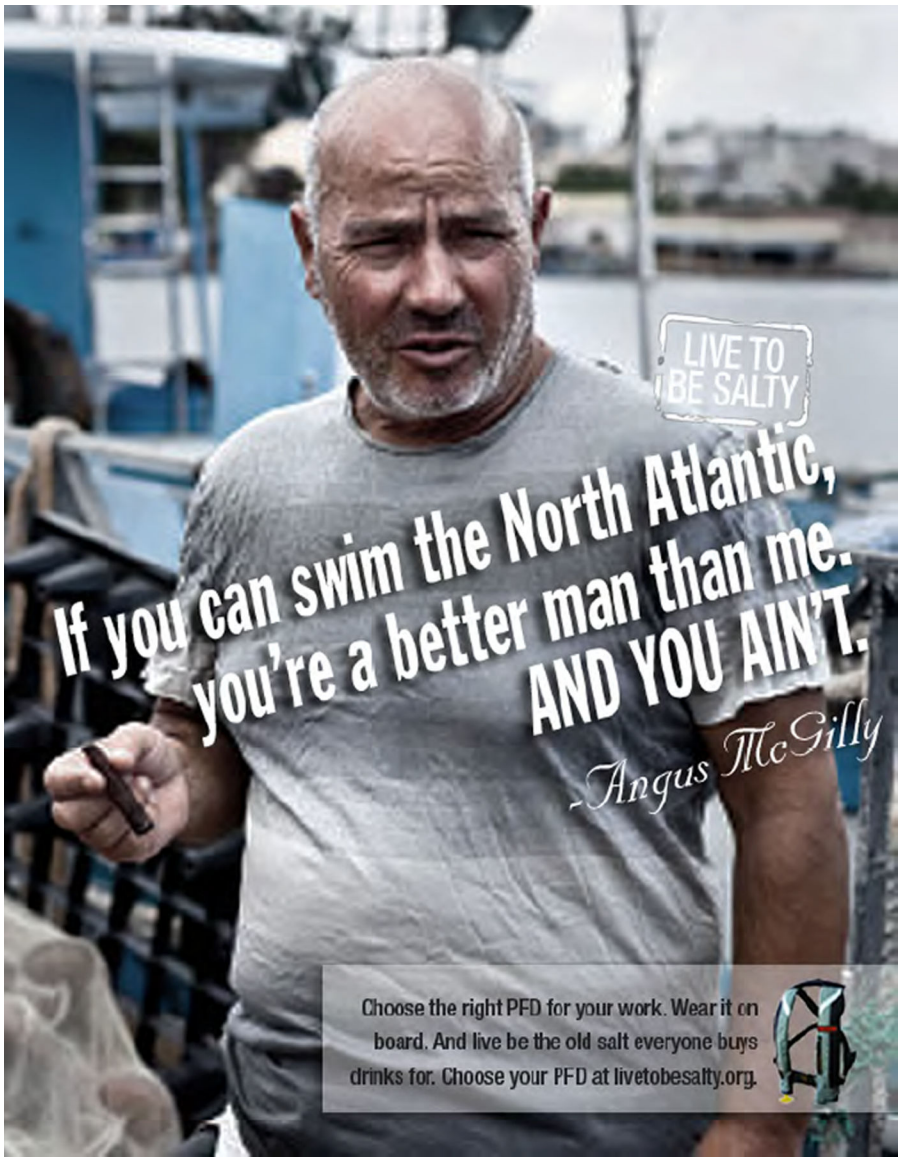

Figure 1 -
Original Live to be Salty concept message that needed to be adjusted to meet the needs of the campaign.

Figure 2 -
Revised message concept with correct imagery.

Figure 3 -
Bering Sea message with revised copy removing improper English.

Figure 4 -
"Apparel Stickers" used in marine supply stores to remind fishermen to purchase a PFD while buying their "standard" deck workwear.

Table 1.

Demographic characteristics and PFD use by fleet and survey year.

	Bering Sea Crabbers						Bristol Bay Drift Gillnetters					
	2014 (N=100)			2015 (N=100)			2014 (N=100)			2015 (N=101)		
Continuous Variables	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**	**n**	**Mean**	**SD**
Age (yrs)	100	36.7	10.7	100	35.9	11.1	98	36.9	14.0	101	35.4	14.4
Experience (yrs)	100	16.0	10.6	100	15.6	11.0	97	15.8	13.3	100	14.6	12.7
Season (months)	99	7.3	2.1	99	7.1	1.9	97	3.6	2.4	97	3.9	2.8
Vessel Length (ft)	100	123.8	17.8	100	123.0	18.9	95	31.9	1.5	100	32.3	3.9
Crew Size (# workers)	100	6.8	1.3	100	6.6	1.4	96	3.4	0.6	100	3.5	0.7
Categorical Variables	**Freq**	**%**		**Freq**	**%**		**Freq**	**%**		**Freq**	**%**	
Sex (male)	100	100.0		99	100.0		94	95.0		92	91.1	
Position												
Captain	16	16.0		15	15.2		47	48.5		41	40.6	
Deckhand	74	74.0		72	72.7		48	49.5		54	53.5	
Other	10	10.0		12	12.1		2	2.1		6	5.9	
Missing	0	-		1	-		3	-		0	-	
PFD Usage												
Never	16	16.3		14	14.1		57	63.3		53	55.2	
Sometimes	23	23.5		28	28.3		23	25.6		26	27.1	
Frequently	8	8.2		12	12.1		6	6.7		12	12.5	
Always	51	52.0		45	45.5		4	4.4		5	5.2	
Missing	2	-		1	-		10	-		5	-	

Table 2 –

Intervention recall by fleet, 2015

	Bering Sea Crabbers (N=100)		Bristol Bay Drift Gillnetters (N=101)	
	n	**%**	**n**	**%**
Recalled any PFD safety ads				
Yes	56	56.6	52	51.5
No	43	43.4	49	48.5
Missing	1	-	-	-
Heard “Live to be Salty” slogan				
Yes	55	56.7	26	26.8
No	42	43.3	71	73.2
Missing	3	-	4	-
Recognized Angus				
Yes	62	62.0	48	48.0
No	38	38.0	52	52.0
Missing	-	-	1	-
Recognized campaign ads				
Yes	72	72.7	50	50.0
No	27	27.3	50	50.0
Missing	1	-	1	-

Table 3 -

Intervention channels identified and actions taken based on the intervention by fleet, 2015*

	Bering Sea Crabbers (N=72)		Bristol Bay Drift Gillnetters (N=50)	
	n	%	n	%
Intervention Channels				
Newspaper	6	8.3	2	4.0
Magazine	46	63.9	26	52.0
Billboard	8	11.1	5	10.0
Poster	33	45.8	22	44.0
Postcard	2	2.8	1	2.0
Internet	5	6.9	2	4.0
Email	3	4.2	1	2.0
Postal Mail	2	2.8	0	0.0
Sticker	21	29.2	6	12.0
Actions Taken				
Looked for more information about PFD models	15	20.8	14	28.0
Visited the Live to be Salty website	4	5.6	1	2.0
Shared PFD message with others	19	26.4	9	18.0
Tried on a PFD	20	27.8	15	30.0
Purchased a new PFD	19	26.4	10	20.0
Wore PFD more often	18	25.0	11	22.0
Planned to take one or more actions	32	44.4	26	52.0

* Based on responses from those who recalled the ads. Responses not mutually exclusive.