sector, firm size, firm location and 6 years of historical claims information about the firm. Models suggest that the lost-time claims can be reduced by 25% by moving a firm from the lowest to the highest scale score.

Conclusion: This research presents new data on the validity of a short easy-to-use tool. It appears to have reasonable validity. Currently, it is being used in 6 Canadian provinces and at least 2 other countries to provide basic data for managing leading indicators.

G3.3
Title: **Ladder Safety - development of the first NIOSH smartphone app**
Authors: Peter Simeonov, Hongwei Hsiao, John Powers

The NIOSH Ladder Safety app was developed as part of a large National Occupational Research Agenda project on extension ladder safety. The app features an innovative multimodal indicator, which uses visual, sound, and vibration signals to assist the user in positioning an extension ladder at an optimal angle. The app also provides graphic-oriented, interactive reference materials, safety guidelines and checklists for extension ladder selection, inspection, safe use, and accessories.

The patented multimodal indicator concept used in the app was first tested in the NIOSH laboratories with 40 participants. The tests included a comprehensive comparative evaluation of five ladder positioning methods and devices, using four extension ladder conditions. The multimodal indicator prototype was shown to be both effective and efficient - it improved the accuracy of ladder set-up angle and required less time to set up as compared to other methods. The graphic-oriented ladder safety guide in the app was largely based on the existing US ladder safety standards and regulations, and was developed with input from the ANSI A14 committee on Ladder Safety, the American Ladder Institute, and other stakeholders. The final development and release of the app was accomplished in collaboration with a NIOSH contractor.

The Ladder Safety app was released in June 2013, and is available in English and Spanish as a free download for Apple and Android devices. Postings through webpages, email, social media, and partnering agencies were used for broad dissemination of the app. Since its release, the Ladder Safety app has been downloaded more than 28,900 times, and has received excellent reviews and high ratings from ladder users and safety professionals. Focus group interviews with ladder users and safety professionals were used to get feedback for app further enhancement. Current development efforts are directed to improve the app content and functionality and add a section on step ladders safety.

The NIOSH Ladder Safety app was received with great enthusiasm by safety professionals and ladder users, and has proved to be a great vehicle for delivering safety related interactive tools and information directly into the hands of various occupational audiences.

G3.4
Title: **Protecting fishermen from hazards on deck: Winch entanglements - research to practice**
Authors: Jennifer Lincoln, Chelsea Woodward, Devin Lucas, Grant King, Theodore Teske

Objective: The objective of this study is to use epidemiological research to guide the design and implementation of effective solutions to protect deckhands from entanglement hazards.

Background: In 2012, a 15-year-old deckhand on a shrimp trawler in the Gulf of Mexico lost his life after getting entangled in a winch. NIOSH reviewed data from the Commercial Fishing Incident Database as well as US Coast Guard investigative reports to understand the risk factors associated with winch entanglements in this fishing fleet. During 2000-2011, 35 injuries (8 fatal) involving winches were reported in the shrimp fleet. Injuries involving the main winch drums had a higher risk for fatal outcomes compared to injuries involving the winch cathead (RR=7.5; 1.1-53.7). Fatal outcomes were also associated with being alone on the vessel (RR=5.8; 2.1-15.9).

Methods: NIOSH conducted a site visit to better understand the current design and use of deck winches on shrimp trawlers. Each trawler has main winch drums and smaller try-net winch drums. Each type of winch drum also has a rotating cathead. Several hazardous areas and activities were identified. Based on the characteristics of the injuries, site visit observations and input from vessel owners, NIOSH determined that the use of effective winch drum guarding would reduce the risk for entanglement. The initial focus is on the main winch drums since they are highly associated with fatalities. Surveys identified the most common types of main winches.

Results: Three prototype designs for standardized stationary guarding have been installed on vessels and are being tested at sea. The data collected during sea trials will be used to improve the prototypes. The plans for each guarding system, including materials and estimated build costs, will be widely disseminated and provided to industry and workers free of charge. The next phase of this project will focus on incentives for installation.

Conclusions: This approach has proven effective in providing tools to prevent other types of winch injuries. By using injury epidemiology to identify hazards along with practical industry input, effective safety

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