

company owners; academic and technical experts; and SSM equipment manufacturers and operators. Site visits were made to SSM logging operations and manufacturers of SSMs. Injury claim and safety and health inspection information were obtained from the Washington State Department of Labor and Industries (L&I). An advisory committee reviewed and gave input during the development of best management and operating practices. Logging industry stakeholders were recruited to report and provide information on near-miss incidents that occurred during the project period. An injury root-cause analysis approach was used to identify the factors contributing to reported incidents and develop safety outreach materials.

Results: The scope of and hazards associated with the emerging use of SSM technology in Washington State were characterized. Best management and operating practices for steep slope machine logging were developed, and a system was created for ongoing update and review of these practices. Easy to understand one-page Hazard Briefs and Near Miss Alerts were issued. Outreach materials were disseminated by L&I and industry associations.

Discussion: The introduction of steep slope machine logging technology promises both increased production for the logging industry and safety for logging industry workers by eliminating most manual timber falling. But as a shift is made in how logging site operations are carried out, this new technology has been shown to have its own hazards. Continued surveillance of fatality and injury incidents and the safety aspects of this developing technology are warranted to ensure the safety of logging industry workers. The cooperation of stakeholders in this relatively small and hard-to-reach industry is integral to the effectiveness of this type of safety assessment and outreach project, and having a technical expert with industry connections was key to its success.

P18

Title: SW AgCrash: Leveraging Motor Vehicle Crash Data for Injury Surveillance and Research in AFF

Authors: Eva Shipp, Amber Trueblood, Hye-Chung Kum, Tanya Garcia, Ashesh Pant, Shubhangi Vasudeo, Kim Jisung, Das Subashish

Background: Workers in the Agriculture, Forestry, and Fishing sector (AFF) experience substantially higher

motor vehicle related fatal injury rates compared to workers in other sectors. However, little is known about the magnitude of this problem and how to best address it specifically in the Southwest region (AR, LA, NM, OK, and TX). The objective of the Southwest Agricultural Crash Surveillance System (SW AgCrash) project is to inform the development of AFF injury surveillance systems while also identifying factors contributing to transportation-related injuries in AFF populations. In addition, crash narratives are free-text fields that are a rich source of data for identifying relevant crashes and illuminating causal factors. This resource has yet to be fully incorporated into surveillance and research in AFF or other sectors.

Methods: This three-year project began in 2016 and involves constructing a regional crash surveillance system for the Southwest region. The system is comprised of a crash database largely populated by state crash reports that police officers collect on-scene. It also includes data cleaning and analysis protocols including descriptive and inferential statistics and mechanisms for dissemination of information including via an advisory panel. In addition, it involves developing simple and complex methods for mining the crash narratives such as a Microsoft Excel-based tool and advanced computer science techniques (e.g., Natural-language processing, support vector machines).

Results: The database currently includes data on over 5 million crashes. Each state, at a minimum, contributed data for 2011-2015 with more recent years expected to be added as available. From 2012-2015, there were 2,084 crashes involving agricultural vehicles and 1,240 crashes involving logging vehicles. As expected based on population size and economic factors, the greatest number of crashes occurred in Louisiana and Texas. Analyses are currently underway to estimate crash rates for each state and identify contributing factors. Preliminary findings are available for logging-related crashes in Louisiana from 2010-2015 (n=368). In a multiple logistic regression model, behavioral factors associated ($p<0.05$) with an injury among logging drivers involved in a single motor-vehicle crash included: no or improper seatbelt use ($OR=3.12$), careless operation of a vehicle ($OR=3.19$), and other non-behavioral factors. Most states do not have a structured data field to indicate which vehicle is at-fault. Analyzing the crash narratives along with the structured data allowed for developing a method for assigning fault to a specific vehicle. Among

the logging drivers involved in a crash with at least one other vehicle, approximately 46% were found to be at-fault for the crash. Additional findings are forthcoming with respect to this analysis and additional benefits of mining the crash narratives.

Discussion: Motor vehicle crash records are a credible and valuable source of data for monitoring injuries among agricultural and logging workers and producing data to support outreach and other interventions in the Southwest region. Structured data can provide information on injury frequency, severity, and contributing factors at the person, vehicle, crash, and environment levels. Narrative data can be mined to provide additional details and to assess the quality of the structured data. Both simple and complex data mining methods are useful to this end.

P19

Title: Occupational Immersion Deaths in Canada 1991-2014

Authors: Peter Barss, Yasmina Tehami

Background: Occupational immersions represented 7% (731/11280) of submersion fatalities in Canada. Practically all involved persons over age 15, with 76% between 25 and 64 (n=556). Objective: Assess circumstances of occupational immersions, including, incidents, activities, personal, equipment, supervisory and environment factors.

Methods: Using structured questionnaires, coroners' data were collected prospectively in 1991-2014 during national surveillance of water-related injury deaths. Population averaged 30 million.

Results: Between 1991 and 2014, there were 731 occupational immersion deaths. Provinces: Most deaths occurred in coastal provinces of British Columbia 21% (n= 151), Newfoundland/ Labrador 16% (n=117) and Nova Scotia 15% (n=107). This differs from non-occupational immersions, such as recreational, with greatest numbers in Ontario and Quebec. Activities: 37% occurred during commercial fishing (n=276), 58 in marine shipping, 29 during commercial diving and 22 were commercial pilots. Cause of death: 89% of occupational immersion victims died from drowning (n=656), while a smaller number died from cold/ hypothermia (n=22). Trauma of air crash into water, air embolism (n=11) or trauma of boating collision (n=10). Personal factors: 96% of immersion victims were males, 706 of 731 immer-

sions. 73% (n=535) were classified as non-indigenous and 10% (n=71) definitely or probably indigenous. Of 156 victims with known swimming ability, 43 were non-swimmers and 17 weak swimmers. 7% (n=49) of victims had alcohol levels above the legal limit, while 50% (n=361) had an alcohol reading of zero. 5% of victims (n=39) were found or suspected to have consumed an illegal drug. Environment/ built environment: Most deaths occurred in oceans (n=372), followed by Lakes or ponds (n=153), and river/ stream/ creek/ waterfall (n=106). 30% occurred while wave conditions were Choppy (n= 41), Rough (n=84) or Storm/ Gale force (n=91). 24% of deaths occurred at dawn (n=91) or during darkness (n=84).

Discussion: For occupational immersions, particular attention should be paid to maritime provinces with the highest number of deaths. Special attention should be made in training individuals who work near or in water to be proficient swimmers.

P20

Title: Trends in Injuries and Fatalities for Electric Power Workers

Authors: Tiffani Ann Fordyce, Megan Leonhard, Ximena Vergara, Eric Bauman

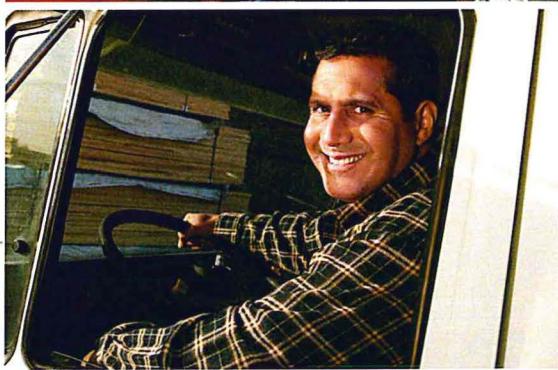
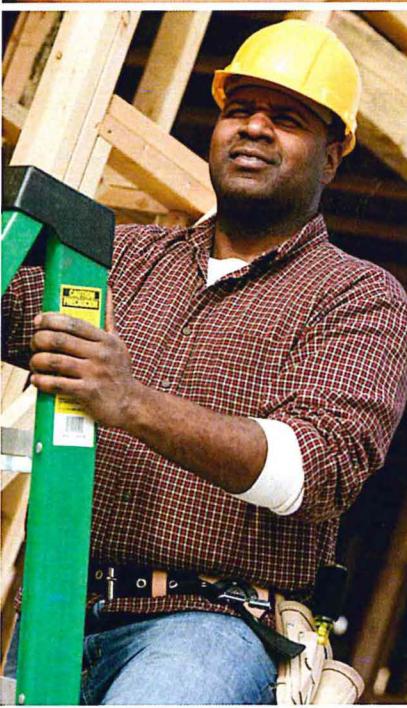
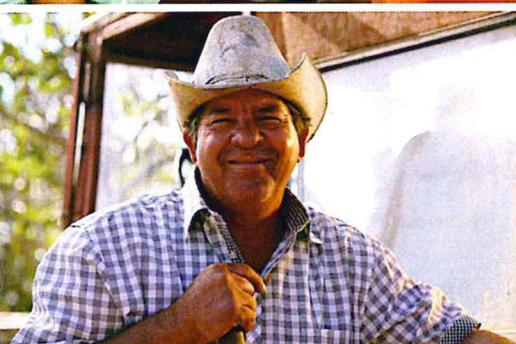
Background: The Electric Power Research Institute (EPRI), as part of the Occupational Health and Safety Program, established an ongoing surveillance and research project in 1999, called the Occupational Health and Safety Database (OHSD), to provide information on the occurrence of workplace injury and illness among workers in the electric power industry. The OHSD includes 2,118,459 employee-years of follow-up and 64,903 observed lost time and recordable injury/ illness events among nineteen participating companies over a 22-year period (1995–2016).

Methods: Data were standardized into a consistent format to compare across different companies. Injury rates were calculated and primarily expressed in terms of the number of injuries per 100 employees during a year of follow-up except for rare injuries, which were expressed per 10,000 employees. Given the deviance and dispersion estimate criteria, 95% confidence (CI) intervals were calculated assuming an underlying Poisson distribution. Throughout the report, proportions and rates were examined by year groupings. Years 1999–2014 were broken into five year ranges and the remaining, most recent



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