Final Progress Report

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List of Terms and Abbreviations

AOL	Associated Oregon Loggers
BRFSS	Behavioral Risk Factor Surveillance System
CFOI	Census of Fatal Occupational Injuries
COSS	Consortium of Occupational State-based Surveillance
CROET	Center for Research on Occupational and Environmental Toxicology
CSTE	Council of State and Territorial Epidemiologists
DCBS	Oregon Department of Consumer and Business Services
DPSST	Department of Public Safety Standards and Training
MSD	Musculoskeletal disorder
NIOSH	National Institute for Occupational Safety and Health
OCHIN	Oregon Community Health Information Network
OHSU	Oregon Health & Science University
OPC	Oregon Poison Center
OR-FACE	Oregon Fatality Assessment and Control Evaluation
Oregon OSHA	Oregon Occupational Safety and Health Division
OSHA	U.S. Occupational Safety & Health Administration
OWIIPP	Oregon Worker Illness & Injury Prevention Program
O[yes]	Oregon young employee safety
PHEP	Public Health Emergency Preparedness
PNASH	Pacific Northwest Agricultural Safety and Health Center
USCG	United States Coast Guard
USDA	United States Department of Agriculture
WRA	Work-related asthma

Abstract

This final progress report summarizes accomplishments for the fundamental, burn injury, and fatal work-related injury state-based surveillance projects of the *Oregon Worker Illness & Injury Prevention Program (OWIIPP)* cooperative agreement (U60 OH008472) between July 1, 2005 and June 30, 2010.

During the 5-year project period, the Oregon Department of Human Services sought to assess the magnitude of and characterize work-related injuries and illnesses in the state by conducting occupational health surveillance. In addition, the agency used findings to raise awareness about occupational health issues and prevent new injuries, conditions, and deaths.

Through fundamental surveillance, staff generated the 19 occupational health indictors from 2000 through 2008, obtained and analyzed numerous sources of work-related injury and illness data to better calculate the magnitude of and characterize work-related injuries and illnesses in the state, and evaluated the surveillance system. In addition, staff made efforts to estimate the cost associated with specific work-related injuries, such as carpel tunnel syndrome. Staff established and regularly convened a state-wide advisory committee to guide prioritization of the state's occupational health issues, raise awareness and discuss emerging occupational health issues, and brainstorm and develop prevention strategies. Staff worked closely with program partners through the advisory committee, coalitions, and other groups to utilize and leverage expertise and resources to improve worker health and safety. Staff developed a wide-range of articles and publications on various occupational health issues for health care providers, employers, workers, researchers, legislators, and more.

Through multiple collaborative partnerships and continued surveillance activities, staff obtained and analyzed data on work-related burn injuries in the state. Activities from the burn surveillance program culminated in two important projects: (1) a peer-reviewed journal article describing the scope of Oregon's occupational burn injuries, with a methodical listing of the different sources of data for the surveillance system; and (2) an independent evaluation of Oregon's burn injury surveillance system by a National Institute for Occupational Safety and Health (NIOSH) Epidemic Intelligence Service Officer, Matthew Groenewald, using the "Updated Guidelines for Evaluating Public Health Surveillance Systems." Staff shared the results of both projects in multiple venues, including presentations at conferences, partner meetings, advisory committee meetings, and the Consortium of Occupational State-based Surveillance (COSS) occupational health listserv. Staff developed other articles for employees and employers as well as health care providers and public health researchers and met with partners to increase their knowledge about work-related burns.

The Oregon Fatality Assessment and Control Evaluation (OR-FACE) program continued its core activities in occupational fatality surveillance, investigation, assessment, and outreach. Surveillance activities were expanded with online resources. In the 4-year grant period, OR-FACE published and circulated 20 investigation reports, plus 4 earlier reports translated into Spanish; 4 annual reports; 2 hazard alert brochures in both English and Spanish; and 3 safety booklets. Members of the OR-FACE team attended conferences and events to give presentations on safety issues and provide safety materials. OR-FACE materials were featured in news stories, and used in company safety meetings and distributed as handouts. Principal areas of concern in OR-FACE safety materials related to parked vehicles, driver distraction, logging, young workers, agriculture, and crab fishing.

Section 1

I. Highlights/Significant Findings

Through fundamental surveillance activities, staff disseminated important information about occupational injuries and illnesses. One particular incident led to a wide range of data driven and collaborative prevention efforts. In 2005, a commercial pesticide applicator treated a home in Oregon with a pyrethrin and pyrethroid. Upon re-entry into the home, one of the occupants died; the other occupant was hospitalized overnight; and five emergency responders experienced symptoms related to their entry into the home. In response, staff created an educational narrative that was distributed to over 7,000 police and firefighters and that is now used in all first responder trainings in the state. OWIIPP also published a newsletter and an article in an Emergency Medical Services trade journal about the hazards associated with responding to pesticide/chemical events, and published a peer-reviewed journal article in collaboration with Washington State colleagues in *Public Health Reports*.

The burn injury surveillance program summarized the scope of work-related burn injuries in Oregon through a peer-reviewed journal article, "Characteristics of occupational burns in Oregon, 2001-2006." The findings suggest that these injuries continue to be a problem in Oregon and that additional data sources are needed to augment the disabling workers' compensation claims data. The burn surveillance system was evaluated during the project period by Matthew Groenewald, an Epidemic Intelligence Service Officer from the surveillance branch of NIOSH. Mr. Groenewald called attention to the timely and reliable information generated by the program, but noted that a bias towards disabling injuries and a need for more data exists, findings that were echoed in the peer-reviewed publication. Results of our burn injury program evaluation were made available to other states via the COSS listserv.

OR-FACE developed targeted mailing lists for its publications and circulated materials through cooperative arrangements with industry associations and government agencies, often renewed in successive years. Notably, the OR-FACE agriculture hazard alert brochure, *Can you identify fatal hazards on your farm or ranch?* (April 2008) received an enthusiastic response in its first mailing, and cooperative arrangements the following year with at least six rural organizations helped distribute the printed alert by direct mail, as newspaper inserts, and hand delivered at local events; and online via web links and subscriber lists. Circulation amounted to over 40,000.

II. Translation of Findings

Findings from the fundamental surveillance program were shared at many venues for a wide variety of audiences. Articles, newsletters, peer-reviewed journal manuscripts, the program website and listserv, and presentations were some of the ways data were disseminated. In particular, dissemination of information about injuries to young workers in Oregon highlights the success in this arena. Using workers' compensation claims, staff analyzed disabling injuries to workers younger than 25 years. This information was shared with the Oregon young employee safety (O[yes]) coalition to inform topic areas of interest for the young worker public service announcement video contest. In addition, findings were shared in a presentation at the *2010 Council of State and Territorial Epidemiologists (CSTE) Annual Conference*. We also shared information with public health partners, such as our agency's Adolescent Health Section, to maximize resources and learn how our findings could be applicable to their research. An article was published in the *American Journal of Industrial Medicine*, as well as the OWIIPP *Putting Data to Work* newsletter.

Data from the work-related burn injury surveillance program was shared in many venues. Oregon's data on occupational burn injuries were analyzed and published in the *American*

Journal of Industrial Medicine. Findings from this research paper were shared at the *2008 CSTE Annual Conference*. We also met with partners to share information about the program and to disseminate surveillance findings. Staff met with the Oregon Burn Center and developed a short, 5 question survey to evaluate their educational module on electrical burns. This evaluation was carried out at the *2009 Governor's Occupational Safety and Health Conference*. We also agreed to link to the Oregon Burn Center's website as well as house materials on our site that cannot be displayed on theirs.

All OR-FACE safety materials followed the NIOSH template, combining narratives, artwork, and safety recommendations. OR-FACE safety booklets were produced to be easily preserved as a resource and field guide. Brochures were popular as handouts and appealed to safety trainers. The agriculture hazard alert brochure was developed in response to a request by a safety trainer, who wanted a brochure similar to an earlier OR-FACE brochure on parked vehicles. A different safety trainer from SAIF, the state's chief workers' compensation insurer, used the agriculture hazard alert with audiences around the state. By request, OR-FACE produced a new brochure on cell phones and driver distraction, which is now in final prepublication review.

III. Outcomes/Relevance/Impact

Through the activities of fundamental surveillance, we expanded our publication and outreach activities. Publications ran the gamut from our own newsletter, *Putting Data to Work*, to peer-reviewed manuscripts in *Public Health Reports* and the *American Journal of Industrial Medicine*. Staff provided a broad view of worker health in the state with the publishing of the comprehensive report *Occupational Health in Oregon*. During the project period, special efforts were made to share this information with local county health departments and legislators to bring greater attention to occupational health issues in the state. Outreach activities, including collaborative partnerships were enhanced during the project period. OWIIPP worked with the O[yes] coalition on a number of projects, including the planning, marketing, and executing of the public service announcement video contest for high school students across Oregon. The entire effort was significant because various social marketing techniques, such as Facebook advertisements, were used to reach teens, raise their awareness of occupational hazards and safety issues, and promote the contest. The contest was also structured in a way that enabled the students to learn about the most common work-related injuries to youth and methods for prevention while making their 45-second video.

The occupational burn injury surveillance program was successful in characterizing work-related burns in Oregon, and in showing how the surveillance system could be improved. Through partnerships with such entities as the Oregon Burn Center and SAIF, we were able to disseminate the poster "First Aid for Burns in Restaurants" in both English and Spanish translations. Prevention strategies were suggested in the peer-reviewed journal article "Characteristics of occupational burns in Oregon, 2001-2006;" staff presented on this article at the *2008 CSTE Annual Conference*.

OR-FACE expanded its publication and outreach activities, and contributed to a normative culture for safety. Cooperative relationships were strengthened with the Oregon Occupational Safety and Health Division (Oregon OSHA), Oregon Department of Motor Vehicles and Transportation Safety Division, Oregon Census of Fatal Occupational Injuries (CFOI), Pacific Northwest Agricultural Safety and Health Center (PNASH), the U.S. Coast Guard (USCG), and industry associations in logging, fishing, construction, and agriculture.

Section 2

I. Fundamental Scientific Report

Background
Work can impact your health. The hours you work, the tasks you perform on the job and your workplace environment can be healthy and safe, or these factors can lead to injury, illness, or death. Of Oregon's 1.8 million workers, approximately 54,400 were hurt on the job or experienced a work-related illness in 2008. That same year, 55 workers in the state died as a result of workplace hazards.

Specific aims
To prevent future injuries, illnesses and deaths in Oregon, the Department of Human Services established a fundamental surveillance program called the Oregon Worker Illness & Injury Prevention Program (OWIIPP) through the state-based occupational health and safety surveillance cooperative agreement. Through this cooperative agreement, program staff conducted occupational health surveillance to better gauge the extent of and characterize work-related injuries, illnesses, and deaths. Occupational health indicator data and other findings were shared with partner and stakeholder groups to raise awareness about occupational health and safety issues and inform prevention efforts. Staff also worked in collaboration with partners to devise and implement intervention strategies.

The specific aims of the fundamental occupational health and safety surveillance program are listed below:

Aim 1: Establish a fundamental occupational surveillance system in Oregon through occupational health indicator activities
Aim 2: Evaluate and enhance fundamental occupational surveillance with data from the existing surveillance system
Aim 3: Develop and implement a comprehensive communications plan for OWIIPP
Aim 4: Establish the OWIIPP advisory committee to enhance and expand collaboration
Aim 5: Analyze the economic costs associated with indicator-related conditions
Aim 6: Evaluate the fundamental surveillance system and other aspects of OWIIPP

Significant program activities

1. Surveillance
During the project period, staff obtained access to numerous data sources to build an occupational health surveillance system. These data were used to generate the occupational health indicators and carry out a wide range of other analyses. Ultimately, the surveillance system improved our understanding of the magnitude of work-related injuries and illnesses in the state as well as enabled staff to better characterize these occupational health issues. Findings and results were regularly shared with partners and stakeholder groups using various types of media and have influenced the work of others.

Occupational health indicators. Staff obtained access to all of the data sources required to produce the 19 occupational health indicators and successfully generated these indicators for 2000-2007. The occupational health indicators were disseminated to potential partners/stakeholders and used as a platform to describe occupational health and safety issues in the state, make the case for better surveillance and prevention, and introduce the occupational public health program and its goals. In addition, the occupational health indicators

were the impetus for OWIIPP staff to further investigate specific occupational injuries and conditions and vulnerable populations.

Beyond the occupational health indicators. Throughout the entire project period, staff worked to identify and access data sources beyond those required to generate the indicators to improve occupational health surveillance. These supplemental data sources were often compared to those used to generate the occupational health indicators and enabled staff to understand their respective strengths and weaknesses. Examples of this ongoing effort include: 1) obtaining Oregon Community Health Information Network (OCHIN) data to assess the magnitude of physician under-reporting of pesticide exposures in the state and estimate occupational pesticide poisonings among vulnerable populations; and 2) examining Oregon Poison Center (OPC) data for cases of work-related carbon monoxide poisoning.

OWIIPP worked with OCHIN, an organization of safety-net clinics in the region that provides electronic medical records software and data centralization for the clinics that use its services, and obtained suspected/confirmed diagnoses of pesticide poisoning from 2000 through 2008. Staff intended to match OCHIN cases to those captured in the state public health department's pesticide surveillance system to identify the magnitude of physician under-reporting in the state and estimate occupational pesticide poisonings among vulnerable populations. Despite our efforts to develop a comprehensive list of query criteria, only a handful of cases were identified in the OCHIN database and successfully matched to the agency's pesticide cases. While the results of the analysis were disappointing, staff recognize that additional efforts are needed to 1) understand the reasons so few cases of pesticide poisoning are captured and/or documented among the OCHIN clinics and 2) identify alternative ways to gauge worker health among vulnerable populations.

To augment OWIIPP's occupational health surveillance activities, staff negotiated access to OPC data. These data were initially used to identify cases of work-related carbon monoxide poisoning in the state. The number of cases was low and staff were unable to access the confidential case notes that would allow case validation. Without this validation, it was determined that OPC data may not be the best source for assessing the magnitude of work-related carbon monoxide poisonings. In the future, these data may enable staff to identify other types of work-related poisonings. In addition, these might be useful for obtaining occupational health information in real-time and identifying incidents that result in multiple worker poisonings.

Epidemiological analysis of commercial insurance carrier data. OWIIPP regularly received commercial insurance carrier data and conducted analyses to characterize and monitor trends in non-disabling occupational injury claims. For example, staff used these data to identify the "top 10" injuries that occurred between 2004 and 2006 and generated demographic data by the nature of injury for the period of interest. OWIIPP produced descriptive statistics about accepted claims among young workers in the restaurant industry. In addition, staff generated a list of policy holders who had accepted claims filed by young workers. The findings were used by the insurer to identify policy holders that employ young workers and to do targeted prevention.

The findings from these analyses were shared with the Loss Prevention staff of the commercial insurance carrier at annual partner meetings or as requested by the commercial insurance carrier. The Loss Prevention staff used these findings to help them discern which industry and occupation groups or specific policy holders should receive targeted education and outreach.

Economic analysis of work-related injuries and conditions. Staff matched Oregon workers' compensation claims and medical encounter data to calculate the economic cost associated

with certain work-related injuries and conditions. In particular, staff were able to generate demographic data on the costs associated with amputations and carpal tunnel syndrome. Pesticide and lead poisonings were also analyzed; however, there were not enough claims to generate valid results. During the latter half of the project period, staff negotiated access to a cost model database. This database uses medical and indemnity costs, plus an algorithm to estimate costs incurred after closure, and then merges them with claims data. Although staff has not received the database in its entirety, findings from analysts at the Department of Consumer and Business Services show that in 2009, amputations cost an average of $22,340, with a mean of 56 temporary disability days. In 2008, the value was $16,660 with a mean of 39 temporary disability days.

2. Education/outreach

Occupational Health in Oregon. During the period, staff published *Occupational Health in Oregon*, a comprehensive report about worker health in the state. The occupational health indicators that OWIIPP generates are a small portion of their surveillance activities; the report was intended to provide a broader perspective on occupational health issues. The report includes sections on workforce characteristics, fatal and non-fatal injuries, toxic exposures, occupational diseases, and special populations. *Occupational Health in Oregon* was widely disseminated to partners and stakeholder groups and special efforts were made to share this information with local county health departments and legislators to bring greater attention to occupational health issues in the state.

Putting Data to Work. Staff developed *Putting Data to Work*, a quarterly publication that highlights an occupational health issue. Each edition specifically provides data, a description of the condition or issue, case studies, prevention recommendations, and resources. During the period, staff published editions on responding to pesticide/chemical-related events, work-related asthma, burn injuries, noise-induced hearing loss, musculoskeletal disorders, and young and older workers. Every issue was disseminated to partners through our program list serve. In addition, specific editions were disseminated at regional and state conferences.

3. Collaborations

Behavioral Risk Factor Surveillance System (BRFSS), workers' compensation module. Early in the project period, OWIIPP, in conjunction with nine other states (California, Connecticut, Kentucky, Massachusetts, Michigan, New Jersey, New York, Texas, and Washington) developed questions about workers' compensation and added them to the 2007 BRFSS survey. Respondents indicating that they had been employed for wages during the preceding 12 months were asked if they had sustained a work-related injury and whether they sought medical care/advice. Respondents that sought medical attention were asked whether workers' compensation insurance paid for those medical services.

The BRFSS analysis found Oregon's work-injured persons rate to be 5.9 per 100 employed, and that just 62% of those injured had their treatment paid for by workers' compensation. The article concluded that more research is needed to examine the reasons for nonpayment of work-related injury by workers' compensation insurance. Data sources like the SOII and OSHA logs are important for occupational health surveillance; however, these data are based on reports from employers that can result in undercounts of work-related injuries. To augment and improve occupational injury surveillance, data sources that utilize employee self report, like the BRFSS, should be used.

A description of the survey, analysis methods, results, and conclusions were published in the July 30, 2010 edition of *Morbidity and Mortality Weekly Report*.

4. Areas of emphasis

OWIIPP staff collected data on and examined a wide range of occupational health injuries and conditions. However, a handful of these injuries and conditions received greater attention than others because they were a priority area for our partners or they were emerging occupational public health issues that required immediate attention. During the period, there were five areas of emphasis (musculoskeletal disorders, pandemic influenza, pesticide poisonings, young worker injuries, and work-related asthma). Activities specific to each of these areas are described in greater detail below.

Musculoskeletal disorders (MSDs). MSDs make up a significant portion of the work-related injuries in the state and they are a priority area for the OWIIPP advisory committee and other partners, like commercial insurance carriers and the Oregon Coalition for Healthcare Ergonomics. As a result, OWIIPP carried out numerous analyses on the condition during the period.

In the first year of the project, staff analyzed accepted disabling and non-disabling claims from Oregon workers' compensation and commercial insurance carriers for MSDs. The analysis showed that the following industries had the highest rate of MSDs: trucking & courier services, excluding air; residential care; nursing & personal care facilities; and hospitals (the latter 3 groups constitute "health care"). Staff followed this analysis with an in-depth examination of these four industry groups and compared MSD injuries between registered nurses and nursing aids. Between 2003-2005, sprains, strains, and tears caused by overexertion were by far the most frequent reason for an MSD claim in health care, with 1,589 claims or 75% of total MSD claims. The part of body most commonly injured was the back at 53%. The rate of accepted disabling claims ranged from 8.6 per 1,000 workers in 2003 to 8.3 in 2005. As in health care, sprains, strains, and tears caused by overexertion was the most common injury to truckers between 2003 and 2005 (66% of total MSD claims). The rate of accepted disabling claims in trucking ranged from 11.2 per 1,000 workers in 2003 to 10.5 in 2005. In examining registered nurses verses nursing aides, staff found that the rate of MSD claims was 5.6 times higher for nursing aides than for registered nurses. Nursing aides were also significantly younger than nurses, drawing attention to a needed education component in training. The results of these analyses were presented to the OWIIPP advisory committee.

Later, OWIIPP combined accepted medical only claims from two large commercial insurance carriers for 2002-2006 and conducted a preliminary analysis on non-disabling claims among nursing aides and nurses. The purpose of this analysis was to use commercial insurance carrier data to describe the epidemiology of minor injuries that may have occurred during direct patient care and handling. We found that the most common source of a non-disabling claim was an injury suffered while transferring or lifting a patient (44%) followed by assisting a patient (22%) and bodily motion (13%). However, nursing aides are significantly more likely to suffer an injury while transferring/ lifting a patient than nurses; nurses are significantly more likely to suffer an injury due to bodily motion than nursing aides (bodily motion includes injuries that do not directly involve patient care such as bending or reaching for an object, or repetitive motion injuries).

In addition to gauging the extent of and characterizing MSDs, staff gave attention to prevention of MSDs. Specifically, staff published an edition of *Putting Data to Work* that addressed MSDs. The issue was disseminated through the OWIIPP list serv and at conferences and meetings throughout the state. OWIIPP worked in collaboration with the Oregon Coalition for Healthcare Ergonomics to conduct a survey on safe patient handling programs in acute care and long term care facilities in Oregon. The objective of the survey was to assess the proportion of Oregon

health care facilities that have safe patient handling programs and to identify additional tools/resources that are needed to improve worker health and safety.

Pandemic influenza. Before H1N1 arrived, OWIIPP and the Oregon Public Health Emergency Preparedness (PHEP) Program joined together to raise awareness about pandemic influenza and its potential impact on Oregon's workforce. Specifically, OWIIPP and PHEP published *Preparing for Pandemic Flu*, a booklet that provides an overview of pandemic flu, tips for individuals and employers to prepare for pandemic flu, prevention recommendations, and additional references. The booklet was disseminated at the fall 2008 *Pandemic Flu Summit* that drew employers from all over the state. The booklet was such a huge success that it was reprinted and distributed to more than 500 attendees at the *Governor's H1N1 Influenza Preparedness Summit* in the summer of 2009.

Pesticide poisonings. In 2005, a commercial pesticide applicator treated a home in Oregon with a pyrethrin and pyrethroid. Upon re-entry into the home, one of the occupants died; the other occupant was hospitalized overnight; and five emergency responders experienced symptoms related to the pesticide exposure. After this incident, OWIIPP staff took a wide range of actions to prevention similar incidents from happening in the future.

Immediately after the incident, OWIIPP staff took steps to remind emergency responders about the potential hazards associated with responding to pesticide/chemical incidents. Specifically, staff wrote a training narrative for distribution to emergency responders through the Department of Public Safety Standards and Training (DPSST) in collaboration with Oregon OSHA. DPSST distributed this training narrative through their list serv which consists of approximately 7,000 police officers and firefighters. The training narrative was also incorporated into the DPSST 'play book' of scenarios, as well as into computer training modules. The Oregon Emergency Medical Services and Trauma section converted the narrative into a PowerPoint presentation and used it to train emergency medical technicians and firefighters.

Also in response to this incident, program staff published an edition of *Putting Data to Work* that focused on responding to pesticide and other chemical-related incidents. This edition detailed the pyrethrin/pyrethroid case described above, listed the symptoms associated with pesticide poisonings, and provided information about responding to pesticide/chemical-related incidents and preventing exposure. The publication was shared with emergency responders at professional conferences and through newsletters from their licensing agency.

To build on this work, staff collaborated with the Pesticide Program at the Washington State Department of Health to conduct an in depth analysis of acute pesticide poisoning cases from 2001 – 2005 that involved at least one pyrethrin or pyrethroid product. The methods, results, and prevention recommendations were synthesized into a manuscript, "Pyrethrin and pyrethroid illnesses in the Pacific Northwest: A five-year review" and published in a January 2009 edition of *Public Health Reports*. In addition, staff presented the results of this five year analysis at the annual *Western Regional Epidemiology Network Conference* and the *CSTE Annual Conference*. This five year review of pyrethrin and pyrethroid poisonings in Oregon and Washington was significant because the human respiratory symptoms associated with these pesticides were not well documented in the toxicology literature. Also, the case study included in the manuscript describes a death attributed to inhalation of a pyrethroid in an older person with pre-existing health conditions. To our knowledge, this is the first recorded case of a fatality due to re-entry after a commercial pesticide application. This data is useful to our understanding of the risk of these pesticides to special populations, such as the elderly.

Young worker injuries. Special attention was given to young workers in the state during the period. In particular, staff conducted an array of young worker injury analyses for various purposes using Oregon workers' compensation claims and commercial insurance carrier data. Examples of these analyses are described below:

- Using Oregon workers' compensations claim data, staff examined work-related injuries, illnesses, deaths among young workers from 2002-2006. These findings were presented to O[yes] coalition members and OWIIPP advisory committee members.

- At the request of our commercial insurance carrier partner, staff analyzed their data and produced descriptive statistics about accepted claims among young workers in the restaurant industry. Staff also used these data to generate a list of policy holders who had accepted claims filed by young workers. The findings were used to identify policy holders that employ young workers and to do targeted prevention.

- OWIIPP staff examined accepted disabling claims from 2000-2005 and prepared the findings for inclusion in the young worker edition of *Putting Data to Work*. This analysis was repeated two years later, the data were updated to reflect a larger time period (2000-2007), and the issue was reprinted.

  The young worker edition of *Putting Data to Work* was one of the most widely distributed issues because the data clearly illustrated that young worker injuries are a public health issue and efforts to prevent future injuries among this population are needed. For instance, the Labor Education and Resource Center at the University of Oregon used the data contained in *Putting Data to Work: Young Workers* at conferences and seminars to describe the scope of young worker injuries and make the case that young worker injuries are an issue that deserves attention. A large commercial insurance carrier also disseminated this edition to all of their restaurant industry policy holders that employed teens.

- OWIIPP carried out a special epidemiologic analysis of young worker injuries in the state. Staff specifically analyzed accepted disabling workers' compensation claims among Oregon young workers by age group (10-18, 19-21, and 22-24 year olds) and calculated rates by employment using Quality Workforce Indicators (QWI) data from the U.S. Census Bureau and Local Employment Dynamics. The results of this analysis demonstrate that targeted prevention strategies need to be developed for older teens and young adult workers, especially because child labor laws do not apply and offer protection after 18 years of age.

  The findings were presented at regional and national conferences, including the annual *Western Regional Epidemiology Network Conference* and the *2010 CSTE Annual Conference*. In addition, the results and prevention recommendations were synthesized into a manuscript, "Occupational injuries to Oregon workers 24 years and younger: An analysis of workers' compensation claims, 2000-2007," and published in a July 2010 edition of the *American Journal of Industrial Medicine*.

- To expand on the above mentioned epidemiologic analysis of young worker injuries, staff conducted a spatial analysis using workers' compensation data and then produced maps of injury rates by county, an industry hazard index, a spatial statistic indicating areas of high or low injury clusters, and socioeconomic indicators related to health. The

analysis is significant since it provides important information about the distribution of young worker injuries and other factors that may influence their distribution in the state. Staff intend to conduct additional spatial analyses using medical only claims from commercial insurance carriers and share the results with partners and stakeholder groups like local county health departments and legislators.

Several agencies and organizations with an interest in improving the health and safety of young workers in Oregon assembled and formed the O[yes] coalition several years ago. OWIIPP has been a member of the coalition since it was formed and has worked in collaboration with other O[yes] members on various education/outreach efforts since the coalition's inception.

Specifically, OWIIPP staff provided assistance with the development of the O[yes] website. Staff also took the lead on developing a Facebook account/page on the behalf of O[yes] as a way to involve teens and young adults in the coalition and raise awareness about worker health and safety.

OWIIPP also assisted the coalition with planning, marketing, and executing the first and second annual public service announcement video contest for high schools students across Oregon. The entire effort is significant because various social marketing tools, like Facebook pages, were used to reach teens, raise their awareness of occupational hazards and safety issues, and promote the contest. The contest was also structured in a way that enabled students to learn about the most common work-related injuries to youth and methods for prevention while making their 45-second video. The second annual contest was considered a huge success with more than four times as many video submissions than the first year. Efforts are already underway to promote the third year of this contest.

OWIIPP, in collaboration with O[yes], participated in a day-long track for youth at the biennial *Oregon Governor's Occupational Safety & Health Conference*. Staff also attended the annual *Women in Trades Career Fair* and led 45-minute interactive demonstrations with middle and high school female students about workplace safety. OWIIPP participated in the *Crack the Case of Good Health* event at the Oregon Museum of Science and Industry to encourage kids to think about and take steps to protect their health and safety. In particular, staff used "Dezi Bell", an interactive manikin that has a dosimeter, to measure the child's exposure levels to the sound from an Ipod to show when noise can begin to damage hearing. Other activities and demonstrations were also utilized to illustrate hazards and safety while at work.

Also with the O[yes] coalition, OWIIPP has begun efforts to conduct four focus groups with young workers in construction and health care industries. The results will provide preliminary information about how young workers experience work and their knowledge and attitudes of workplace health and safety. The information gathered from the focus groups will be disseminated to partners and young worker programs and used to develop education and intervention strategies to prevent work-related injuries among young workers.

Work-related asthma (WRA). WRA is a serious public health issue that is preventable. In an effort to raise awareness about this issue, staff published edition of *Putting Data to Work* that focused on WRA. The issue described asthma, gives examples of jobs and types of workplace exposures that can cause and exacerbate WRA, prevention recommendations, and resources. This issue was posted on the web and distributed to advisory committee members, coalitions, partner and stakeholder groups with an interest in WRA and the industry, occupation, or population groups that are most often affected. In addition, hard copies were disseminated at conferences throughout the state.

In order to better understand the number and proportion of asthma cases that are attributable to workplace exposure, staff obtained access to and analyzed Oregon's 2005 BRFSS asthma call-back survey data. The findings from this survey indicate that 52.8% of those reported having current asthma said that their asthma was caused or aggravated by a job they had. However, only 13.5% of those reporting asthma said that they had discussed with their health care provider that their asthma was related to their work.

The findings were synthesized and published in the October 14, 2008 edition of *Communicable Disease (CD) Summary* and entitled "Winded at Work." *CD Summary* is a bi-monthly publication of the Oregon Public Health Division and is distributed to health care providers and public health professionals throughout the state. In addition, the Oregon-specific findings were presented to OWIIPP advisory committee members and staff of the Oregon Asthma Program.

Like Oregon, Michigan and Minnesota ran the BRFSS asthma call-back survey in 2005. The three states joined together to develop an analysis plan and analyze these data. The methods, results, and conclusions of this analysis were assembled into a manuscript, "Prevalence of work-related asthma in Michigan, Minnesota, and Oregon" and published in the March 2010 edition of the *Journal of Asthma*. The findings indicate that over 50% of all adults with current asthma reported that their asthma was caused or made worse by workplace exposures, but only 13.5% told or were told by a health provider that their asthma was work-related. In addition, only 25.1% of adults reporting that their asthma was caused or made worse by a job ever discussed the work-relatedness of their asthma with a health professional, and in most instances, adults with WRA reported poorer asthma control and higher health care utilization than those without WRA. The paper points out the need for improvements in public and clinician awareness of WRA, and for implementation of WRA prevention strategies in the workplace.

II. Burn Injury Scientific Report

Background

Work-related burn injuries are a public health concern. Each year, thousands of men and women are burned during the course of their employment. According to the Bureau of Labor Statistics, 15,630 workers in the U.S. sustained an occupational burn in 2008; the incidence rate for that year was 1.6 per 10,000 workers. Burn injuries can also be very serious and may result in thousands of dollars in healthcare costs and lost work days. The Bureau of Labor Statistics reported that the median number of days lost due to work-related burn injuries was 6 days in 2008.

Specific aims

To prevent future occupational burns and reduce the incidence rate of this injury in Oregon, the Oregon Department of Human Services established a burn injury program through the state-based occupational health and safety surveillance cooperative agreement. To achieve these program goals, staff developed a burn injury surveillance system and used the system to better assess the magnitude of work-related burns in the state and understand the industry, occupation, and population groups that are adversely affected by this injury. In addition, staff also made efforts to calculate the economic cost associated with burn injuries. All data findings were shared with partners and stakeholders and used to develop targeted intervention strategies for prevention.

The specific aims of the burn injury program are listed below:

Aim 1: Maintain and enhance the existing partnership-based occupational burn surveillance system
Aim 2: Collect, analyze, and interpret data to better characterize burn injuries
Aim 3: Evaluate the economic costs associated with burn injuries
Aim 4: Provide surveillance findings to partners and stakeholders, and collaborate to develop targeted intervention strategies
Aim 5: Evaluate the burn surveillance model, data findings and intervention outcomes and disseminate results to partners and stakeholders locally, regionally and nationally

Significant program activities

1. Surveillance

During the project period, staff established a burn injury surveillance system and carried out numerous analyses using accepted disabling and non-disabling claims from Oregon workers' compensation and commercial insurance carriers. Staff also used hospital discharge data and sentinel case data from the Oregon Burn Center. The findings from each analysis were used to improve our understanding of the magnitude of work-related burn injuries in the state and enabled staff to better characterize groups that are disproportionately affected by this injury as well as identify risk factors.

While all of these analyses were important and provided meaningful information to staff about burn injuries, a subset of these surveillance activities and projects are worth describing in greater detail since they influenced the work of others or have the potential to do so in the future.

Economic analysis of burn injuries. Staff calculated the economic cost associated with burn injuries in the state by matching Oregon workers' compensation claims and medical encounter

data and then generating demographic data on the cost associated with hospitalized burns. During the latter half of the project period, staff explored the feasibility of access to a cost model database. This database uses medical and indemnity costs, plus an algorithm to estimate medical costs incurred after claim closure, and then merges these with claims data. Although staff has not received the database in its entirety, findings from analysts at the Department of Consumer and Business Services show that in 2009, burn injuries cost an average of $6,200, with a mean of 18 temporary disability days. In 2008, the value was $10,390 with a mean of 31 temporary disability days.

Epidemiological analysis of burns injuries. In order to characterize burn injuries in the state, staff analyzed Oregon workers' compensation claims and medical only claims from a commercial insurance carrier from 2001-2006. Staff also compared the primary burn injury data source, Oregon workers' compensation, to hospital discharge and Oregon Burn Center data to ensure that workers' compensation captured all occupational burns that led to a hospitalization during the period of interest.

The methods employed for this analysis are useful to others conducting burn injury surveillance. Staff reviewed the current occupational health literature to establish the most methodologically sound approach to construct denominators for their rate calculations. In addition, the methods used to evaluate the completeness of the Oregon workers' compensation claims data can be repeated by others to evaluate the sensitivity of a surveillance system.

The findings from this in depth analysis showed that work-related burn injuries are still a concern in Oregon and other data sources are needed to augment Oregon workers' compensation data. The incidence rate of occupational burns, based on Oregon workers' compensation claims data, ranged from 1.8 per 10,000 workers in 2001 to 1.4 per 10,000 workers in 2006. Analysis of the commercial insurance carrier data for the period yielded 2,165 cases and 85% of these were non-disabling.

The methods and results of this analysis were prepared as a manuscript, "Characteristics of occupational burns in Oregon, 2001-2006," and published in the January 2009 edition of the *American Journal of Industrial Medicine*. In addition, the methods and findings were also presented at various conferences and meetings, including the *2008 CSTE Annual Conference*.

Epidemiological analysis of burn injuries among young workers. Staff conducted a special analysis of injuries to young workers (<25 years of age) in Oregon from 2000-2007. One of the findings from this analysis showed that workers 10-18 years old were much more likely to get burned on the job as compared to 19-21 and 22-24 year olds. This finding and others from this analysis were written up as a manuscript, "Occupational injuries to Oregon workers 24 years and younger: An analysis of workers' compensation claims, 2000-2007" and published in a July 2010 edition of the *American Journal of Industrial Medicine*. This eight-year review of young worker injuries in Oregon is significant because it illustrates that there are differences in the types of work-related injuries sustained between groups of young workers (10-18, 19-21, and 22-24 year olds) and each of these age groups would benefit from targeted prevention strategies.

Epidemiological analysis of commercial insurance carrier data. Staff regularly received commercial insurance carrier data and conducted analyses to characterize and monitor trends in non-disabling occupational burn claims. Staff also used these data to identify clients with a high occurrence of burn injuries and shared significant findings with the Loss Prevention staff of the commercial insurance carrier as needed. In addition to periodic updates about potential

occupational health issues, OWIIPP met with the Loss Prevention staff annually to share findings, discuss trends, and brainstorm opportunities for targeted prevention. During the majority of the project period, attention was given to the restaurant industry, young workers, and flash burns among welders.

Our partnership with the commercial insurance carrier is significant because it has enabled us to leverage each other's resources for prevention. The commercial insurance carrier provides valuable data that augment our surveillance system. In return, we analyze these data and share findings with them. The commercial insurance carrier has used these results to prioritize their occupational health and safety activities and inform their prevention efforts.

Evaluation of the burn injury surveillance system. The burn injury surveillance system was evaluated by an Epidemic Intelligence Service Officer using CDC's "Updated guidelines for evaluating public health surveillance systems." The evaluation indicated that efforts should be made to increase the surveillance systems sensitivity by obtaining additional data sources that will capture uncompensated and non-disabling burns. Efforts should also be made to integrate and harmonize the various data sources to produce a more cohesive surveillance system. This independent evaluation of the burn injury surveillance system informed our future activities/efforts to improve the surveillance system.

2. Education/outreach

Occupational Health in Oregon. Staff published *Occupational Health in Oregon*, a report about worker health in the state. Several occupational injuries and illnesses were given attention in the report and burn injuries were among the non-fatal injuries that were highlighted. During the period, efforts were made to raise awareness about occupational injuries, illnesses, and deaths in the state by disseminating the report to local county health departments and state legislators.

Putting Data to Work: Burn Injuries. In 2008, staff published *Putting Data to Work: Burn Injuries*. This newsletter provided information about the scope of the burn injuries, data about this work-related injury in Oregon, a description of the types of burns, case studies, prevention recommendations, and resources. The newsletter was widely disseminated throughout the state at conferences and accessed via the internet.

3. Collaborations

Oregon Burn Center. In addition to collecting cases of work-related burns from the Oregon Burn Center, OWIIPP partnered with the Center on several efforts throughout the project period. For instance, OWIIPP and Oregon Burn Center examined the feasibility of adding burn injury safety questions to the food handler examination. OWIIPP and Oregon Burn Center staff attended conferences, like the 2009 *Governor's Occupational Safety & Health Conference*, together to raise awareness about occupational burn injuries and safety measures. Also during the period, Oregon Burn Center developed an electrical burn education module and OWIIPP staff conducted an independent evaluation of the tool by developing a short, 5-question survey. The survey assessed level of knowledge gained about electrical burns and the impact of the graphic images use to convey prevention messages.

Oregon Young Employee Safety (O[yes]). Burn injuries among young workers are a major occupational health issue. In an effort to prevent burns and other injuries among teens, OWIIPP has played an active role in the O[yes] coalition. The coalition is a consortium of representatives from academia, industry, labor, state agencies, and commercial insurance carriers that is dedicated to preventing injuries and promoting safe work practices among young workers. During the period, staff in collaboration with other O[yes] members worked on various

education/outreach efforts that included a focus on burn injuries. OWIIPP activities with the coalition included planning and implementing the first and second annual public service announcement video contest for high school students. Burns were one of the work-related injuries that students were encouraged to focus on and develop prevention messages about.

In addition, OWIIPP and O[yes] members have begun to conduct focus groups with Oregon young workers. The qualitative project will help us explore and understand their views about workplace health and safety and discover sector-specific information about injury risk in priority industries, like the leisure and hospitality industry. This information will be shared with other O[yes] members and young worker programs and used to develop intervention strategies to prevent burns and other common young worker injuries.

III. Oregon Fatality Assessment and Control Evaluation Scientific Report

Background

Oregon Fatality Assessment and Control Evaluation (OR-FACE) conducts surveillance, investigation, and assessment of traumatic occupational fatalities in Oregon, and engages in educational outreach activities to help prevent traumatic occupational fatalities and promote safety. The second OR-FACE 4-year grant period – July 1, 2006 to June 30, 2010 – operated with the following aims.

Aim 1. Maintain and improve core activities in fatality surveillance, investigation, assessment, and outreach.
Aim 2. Perform strategic intervention to reduce occupational fatalities in logging.
Aim 3. Perform strategic interventions to reduce occupational fatalities in other high-priority worker populations.
Aim 4. Evaluate program performance and effectiveness.

Procedures/Methodology

1. Surveillance

The OR-FACE surveillance system expanded during 2006-2010, and now uses: (a) an internet search engine that creates daily lists of items from keywords, (b) a daily search of numerous websites, (c) Oregon OSHA fatality notification reports, (d) quarterly reports of death certificates marked “at work” obtained directly from Oregon Vital Records, (e) an OHSU news clipping service, and (f) incidental fatality reporting from Douglas County Farm Service Agency and Oregon Emergency Response System.

Primary data sources include death certificates, medical examiner and police reports, Oregon OSHA investigation reports and news clippings when available, and occasionally other records, such as photo disks, business profiles, hospital or emergency response records, or investigation reports from other sources.

2. Investigation

Incident investigation continued with two independent expert investigators, one for logging and one for machine-related and other incidents. The OR-FACE investigator and a research editor developed the first review of draft of each investigation report, using relevant printed materials, and input from the Oregon OSHA investigator when applicable, and from industry experts or other safety professionals as necessary. Reports were published following an iterative review process, with final review by the program director and the OR-FACE review board, composed of epidemiologists, safety and health professionals, and agency regulators.

Fatalities were analyzed using a root cause model to find ideal ways to eliminate or control the hazard, considering factors from the broad environment to individual perspectives. Safety recommendations in the investigation reports were ranked to focus first on the immediate conditions and actions the worker could control – to make the reports immediately relevant – followed by conditions and actions the employer could control; and finally, if appropriate, regulatory controls that government or other agencies should consider implementing.

3. Assessment

OR-FACE assesses occupational fatalities in an annual report that produces a tag and abstract for each incident; summary charts of demographic characteristics and codes for industry, occupation, and event; and a selection of hazard alerts for notable clusters of incidents. Safety

recommendations for particular incidents are developed in investigation reports, hazard alerts, safety booklets, and other materials.

4. Outreach
OR-FACE safety materials were published on the OR-FACE website (www.ohsu.edu/croet/face), and in printed products. Along with electronic circulation by e-mail notification, materials were also circulated by regular mail, and included in industry publications and local newspapers, and at conferences and events. Direct mail lists were developed, and samples were mailed along with a postage-paid card for individuals to order additional copies. Members of the OR-FACE team attended conferences and events to give presentations on safety issues and provide safety materials. OR-FACE also participates in CROET outreach activities; the CROET outreach team maintains tables at numerous work and safety conferences and presents OR-FACE safety materials.

Results

Aim 1. Maintain and improve core activities in fatality surveillance, investigation, assessment, and outreach.

In 4 years, 2006-2009, OR-FACE recorded 262 traumatic occupational fatalities in 249 incidents – an average of 66 fatalities in 62 incidents per year. OR-FACE regularly reported about twice the number of fatalities reported by Oregon OSHA as "program-related" fatalities covered by Workers' Compensation. In the 4-year grant period, to June 30, 2010, OR-FACE published 20 investigation reports. OR-FACE reports covered established priority areas, with an emphasis on industrial and mobile machinery, and including a number of fall incidents (see Table 1).

Following 2007, OR-FACE summarized its first 5 years of data, 2003-2007. All coding was reviewed and 5-year summary charts were produced to document trends. Incidents were also posted on the website with abstracts and links to investigation reports, when available, so users could assess incidents themselves by accessing the base data.

In 2007, OR-FACE began producing a series of safety booklets and brochures, all published on the website and in print. A number of links to OR-FACE materials were established at other organization websites. Investigation reports were featured in news stories, and user feedback or requests for information indicated OR-FACE reports and other materials were used in company safety meetings and distributed as handouts.

Sending samples to targeted mailing lists with a postage-paid card to order additional copies was effective (see Table 2). For evaluation purposes, the order card also provided information on how the materials would be used, and allowed user feedback, as in orders for the *Fallers Logging Safety* booklet, following a mailing in April 2010: "… useful information" (Charles Gann, National Wildfire Suppression Association); "Excellent asset to industry" (County Stihl, Inc.); "Written very well, user friendly" (Anonymous); "Very good booklet" (EHSS Tree Farms); "As an amateur wood cutter, this was a super read" (Anonymous).

Table 1. OR-FACE Priority Areas and Investigation Reports, July 2006-June 2010

Priority Areas	Reports published Jul 2006 to Jun 2010	Reports in draft
Machine-related	10	1
Forestry/Logging (industry)	6	2
Construction (industry)	3	
Hispanic	3	1
Highway work zone	2	
Youth (age 18 and under)	2	
Agriculture (industry)	1	
Other (4 Fall, 1 Exposure, 1 Fire)	5	1
Total (columns do not sum to total)	20	4

Table 2. Circulation of OR-FACE Safety Materials by Mail Order, July 2006-June 2010

OR-FACE Safety Materials	Copies Ordered
Fallers Safety booklet	2,137
Young Workers safety booklet	3,482
Agriculture hazard alert (and Spanish version)	5,270 (1,410)

Further information about the circulation of safety materials is provided under subsequent aims in specific areas of concern, and in the annotated list of publications. Other outreach activities are itemized below.

Safety Regulations

1. A research report was prepared to inform the 2007 session of the Oregon Legislative Assembly, related to driver cell-phone use and the risks of driver distraction (see publications). The Oregon legislature passed a law banning cell phones for teens in 2007, and banned handheld phones for all drivers in 2009.

Conference Presentations

1. Workshop: Represented OR-FACE at journalists' workshop (Children and Agriculture: Telling the Story, Wenatchee WA, Oct 2006).
2. Leading Causes of Traumatic Workplace Injuries in Oregon (Northwest Occupational Health Conference, Seaside OR, Oct 2007)
3. Youth@Work: Talking Safety: collaborated with team of safety professionals to present safety curriculum adapted to Oregon teachers (Oregon Coalition for Young Worker Health and Safety, Portland OR, Oct 2007)
4. Young Worker Safety (Oregon OSHA, Salem OR, Dec 2007; and other presentations at meetings with teachers around the state)
5. The OR-FACE program (Oregon Governor's Occupational Safety & Health Conference, Portland OR, March 2009)
6. Staying Safe and Healthy at Work [youth] (OHSU Health Science Careers panel, Portland OR, Feb 2010)
7. Facilitated six occupational safety workshops for young women (Oregon Tradeswomen Career Fair, Portland OR, Apr 2010), and participated in the planning committee for the fair.

Posters

1. Trees Kill: Key Factors in Logging Safety (NIH International Fogarty Trauma Research Networking meeting, Portland OR, Aug 2007)
2. Young Workers: Stay Alive on the Job! (Oregon Tradeswomen Annual Conference (Portland OR, May 2008)
3. Commercial Crab Fishing in Oregon (Pacific Commercial Fisherman's Festival, Astoria OR, Sep 2009)

News Media

1. *Occupational Hazards* online journal featured stories from OR-FACE investigation reports, related to a log truck driver unloading (2004-21) and a mill worker fall (2005-18), by Josh Cable (Jan and Nov 2007).
2. The PNASH annual newsletter, *Northwest Forest Worker Safety Review* included news on publication of the OR-FACE *Fallers Logging Safety* booklet (Mar 2007).
3. *Northwest Automotive Journal* (circ. 4,000), a trade publication, included news on the OR-FACE Parked Vehicle Kill brochure available in Spanish (Jun 2007).
4. The National Safety Council journal *Safety + Health* (circ. 86,000) featured an OR-FACE report, *Shipyard Welder Ignites Hydraulic Fluid and Is Fatally Burned* (2003-22)(Feb 2010); subsequently, the Hydraulic Safety Authority of Canada reproduced the investigation report on a hydraulics safety training CD.
5. *The Oregonian* daily newspaper (circ. 265,000) featured OR-FACE in a front-page story that discussed priority areas from the OR-FACE Annual Report 2007, by Anne Saker (OHSU program tracks, analyzes workplace deaths in Oregon; Jun 1, 2010).
6. The CROET semi-annual newsletter (circ. 14,000) regularly features OR-FACE safety materials and activities.

Safety Break

OR-FACE produced a safety message for 11,000 OHSU employees as part of the annual Oregon OSHA Safety Break campaign.

1. Violence Prevention (May 2007)
2. Building a Foundation for Safer Workplaces (May 2008)

Aim 2. Perform strategic intervention to reduce occupational fatalities in logging.

Following the printing of Fallers Logging Safety (Apr 2007), OR-FACE and the CROET outreach team developed ideas for evaluation that resulted in a postage-paid order card and a separate evaluation card inserted in the back of each booklet to confirm readership in target audiences and elicit feedback. The booklet was mailed to about 1,000 addresses (Dec 2007), mostly to a list of about 850 logging firms provided by Associated Oregon Loggers. Returned cards indicated the booklets were reaching mostly loggers and safety trainers, but also interested a number of private landowners who used a chainsaw at home. A second mailing of the booklet to 250 sawshops and equipment dealers in Oregon and Washington state (Apr 2010) reached this wider audience and generated considerable response.

Directly observing fallers at work in the woods, using new video technology, emerged as another idea to evaluate safety training, resulting in the Fallers Point-of-View Video Observation Study, funded by PNASH in fall 2007. Video data were obtained for pairs of fallers at four different skill levels, including students (beginning, at 6 months, advanced) and professional fallers. Five critical action steps outlined in *Faller Logging Safety* were coded, along with direction of view while falling each tree. Significant differences were observed in safety behaviors among fallers at different skill levels, and between individual fallers. The helmet camera worked well for observing work behavior in a rugged, remote location (see news story

on the study in the PNASH *Northwest Forest Worker Safety Review* (http://depts.washington.edu/pnash/files/forest_news/2010_NWFWSR.pdf). A poster on the project was presented at the PNASH New Paths Conference (Nov 2008).

Two Oregon OSHA small grants were obtained (fall 2008), to develop logging safety publications. As a result, an updated edition of the Oregon OSHA *Yarding and Loading Handbook* (Jun 2010) was published online (www.orosha.org/pdf/pubs/1935.pdf). The *Yarding Logging Safety* booklet, a companion volume to the OR-FACE *Fallers Logging Safety* booklet, is complete and awaiting publication.

Aim 3. Perform strategic interventions to reduce occupational fatalities in other high-priority worker populations.

Parked Vehicles. OR-FACE addressed the pervasive hazard of parked vehicles in a hazard alert, Parked Vehicles Kill (HA2), with seven narratives of fatal incidents involving a variety of vehicles. In fall 2007, the alert was redesigned as a brochure to place at Department of Motor Vehicle field offices. By request, the brochure was also translated into Spanish. A second distribution to DMV field offices occurred in 2008. Seven of 10 narratives in the agriculture hazard alert (HA7, Apr 2008) involved vehicles, with 1 parked vehicle and 2 other operators outside a moving vehicle. A Parked Vehicles Kill poster, produced earlier, was redisplayed at an Oregon Trucking Association conference (Apr 2007), at a weeklong Body Worlds science display at Oregon Museum of Science & Industry (Aug 2007), and occasional other venues.

Young workers. Publication of *Young Workers: Stay Alive on the Job!* (HA4, Oct 2007) provided a basis for an OR-FACE collaboration with the Labor Education Resource Center (University of Oregon) to develop a Coalition for Young Worker Health and Safety, including individuals from several public and private agencies dedicated to safety, health, youth, and labor issues. The coalition began with a curriculum workshop for teachers (Oct 2007) that involved materials and presentations from OR-FACE, LERC, the Young Worker Safety Resource Center (UC Berkeley), The Children's Safety Network (Newton MA), and NIOSH. Recent OR-FACE activities in the coalition — now called the Oregon Young Employee Safety Coalition – included (a) conducted worker safety sessions for about 150 high school students at a health science career program (Feb 2010), (b) helped with the young worker safety video contest (Apr 2010; view the top 7 videos online at http://oregonyoungworkers.org/home/2010videowinners.html), (c) participated in the planning committee for the Oregon Tradeswomen Career Fair (Apr 2010), and facilitated six occupational safety workshops for young women at the fair, and (d) represented the coalition at the Youth Careers Expo (May 2010), and (e) designed a focus group protocol and established contact with a union and a local technical high school to engage young workers, aged 15-24, in discussing their knowledge of workplace hazards, issues of health and safety, and effective communication strategies (spring 2010). Focus groups are planned for November 2010.

The first edition of the *Young Workers* booklet printed 2,000 copies, paid by Oregon OSHA, which took half the booklets. The run was quickly exhausted. A second, updated edition of the *Young Workers* booklet was printed (Apr 2009) to expand outreach to all Oregon high schools. Mailings also targeted technical schools, workforce development sites, and safety professionals; plus tabletop distribution at a number of youth safety conferences and events. A promotional blurb for the young workers safety booklet was delivered to the Oregon School-based Health Centers listserve (Mar 2010), which resulted in additional book orders.

Agriculture. The OR-FACE agriculture hazard alert brochure, *Can you identify fatal hazards on your farm or ranch?* (HA7, Apr 2008) was developed in response to a request by a private safety trainer for a brochure with narratives and recommendations similar to the *Parked Vehicles Kill* brochure (HA2, Aug 2007). The ag alert was published online, and printed and circulated on demand, sending samples with a postage-paid order card to a targeted mailing list. By request, the brochure was translated into Spanish (Oct 2008), and samples were resent. Enthusiasm for the brochure encouraged cooperative arrangements in fall 2009 with six rural organizations and associations, and others, to distribute the ag alert in print by direct mail, as newspaper inserts, and hand delivered at local events; plus, electronically as web links and to subscriber lists. Circulation amounted to over 40,000 – certainly the most successful OR-FACE publication to date. One collaborator wrote: "Thanks again for the information … farmers and ranchers were really glad I had that to share with them" (Shelby J. Filley, Oregon State University Extension Service). The alert was also used in safety training sessions with audiences around the state by a trainer from SAIF, the state's chief Workers' Compensation insurer.

Crab fishing safety. Over 6 years, 2003-2009, OR-FACE recorded 14 worker fatalities in 8 incidents involving crab boats along the Oregon Coast, including 3 incidents involving a fall overboard at sea, and 5 incidents involving capsized boats while crossing a bar or in the surf near shore, often with multiple fatalities. Acting on this trend, OR-FACE sent a letter (Apr 2009) endorsing three proposals to improve crab boat safety to 18 addressees, including the U.S. Coast Guard, federal OSHA, the governor, a selection of state officials, and the Oregon Dungeness Crab Commission (see appendix). Policy recommendations in the letter included expanded requirements for use of PFDs, vessel stability reports, and dockside safety examinations. Several responses were received. Subsequently, OR-FACE (a) posted a comment (Jun 2009) to a proposed U.S. Coast Guard regulation to restrict bar crossings along the coasts of Oregon and Washington in hazardous conditions, (b) attended an Oregon Dungeness Crab Summit (Jul 2009), (c) sponsored a booth at the Pacific Commercial Fisherman's Festival (Sep 09) and partnered with the U.S. Coast Guard Commercial Fishing Vessel Safety coordinator to demonstrate personal flotation devices, (d) shared ocean fishing fatality data with the NIOSH Alaska field station, and expanded collaboration to begin adapting crab fleet safety research in Alaska to Oregon, and (e) developed a questionnaire for a crab fishing safety survey, with review comments from the Oregon Dungeness Crab Commission, the NIOSH Alaska field station, and USCG safety coordinators. A pilot test of the survey is planned, sponsored by CROET. A grant proposal was submitted to PNASH to administer the survey to crab fishermen (Jun 2010). The grant was approved in September 2010, in a collaborative project with researchers at the University of Washington.

Ladder Safety. Steps were taken to develop a future focus on ladder safety in construction. OR-FACE attended two Construction Advisory Committee meetings (Sep-Oct 2009) – which bring together Oregon OSHA officials and industry leaders – and met with safety directors for Associated General Contractors, a large construction firm, and a roofing company to develop partnerships and an intervention strategy. A source was obtained for a specific ladder safety tool – an inclination indicator – through correspondence with NIOSH researcher Peter Simeonov.

Older workers and heavy vehicles. In accordance with the new OR-FACE 5-year plan, a project was initiated to conduct research on older workers in rural settings who work with heavy trucks or mobile machinery. A grant proposal has been prepared (Jun 2010), involving collaboration with a researcher at Portland State University, and the Oregon Rural Practice-based Research Network. Applications in progress.

Aim 4. Evaluate program performance and effectiveness.

OR-FACE tracks performance of surveillance activities with a summary in the annual report of the source and timing of notification, and separately, comparison to CFOI totals for the year. A overall comparison to CFOI totals for the period 2003-2007 showed a slight difference in totals, due to interpretation of inclusion criteria. Coding of incidents showed more variance. Closer cooperation with CFOI is now being explored to standardize coding, within the terms of the federal agency's confidentiality restrictions. A concern in surveillance procedures arose following 2007, when notice for two incidents in agricultural settings arrived by word of mouth, with no corresponding notice from other sources. OR-FACE sent out letters (Sep 2008) to solicit cooperation from USDA Farm Service Agency and Oregon State University Extension offices in rural areas to report local work-related fatalities; but informal conversations with rural sources indicate a number of incidents may remain unrecorded.

Ongoing evaluation of the OR-FACE website through tracking the number of visits, and feedback from responses to the website survey, was interrupted in 2009 by a long redesign process initiated by OHSU to standardize all departmental websites. Tracking data and survey operation were down for about 6 months. Links to documents were broken and needed repeated adjustment. The system was restored in December 2009, with added features to track more information about visitors and downloaded documents. In June 2010, the number of recorded visitors was 103. Current investigation reports regularly appear as the most downloaded documents.

OR-FACE tracks circulation of all safety materials. The development of postage-paid cards to order sample publications provided an opportunity for user comments that helped evaluate the quality of the materials. User comments on the order cards, and in other feedback by letter or phone, have been very encouraging, indicating the OR-FACE safety materials are an appreciated resource and well used. A separate evaluation card in each *Fallers Logging Safety* booklet asked respondents to rate the booklet. the results indicate OR-FACE materials are reaching their target audiences, and are appreciated. Positive response for the fallers booklet was higher than other materials (see Table 3).

Table 3. Public Rating of OR-FACE Safety Materials

	Website	**Online Reports**	**Fallers Safety booklet**	**Young Workers booklet**
	N=36	N=35	N=39	N=35
Overall				
Excellent	25%	34%	54%	34%
Very Good	58%	60%	36%	43%
Good	17%	6%	10%	14%
Usefulness				
Excellent	22%	26%	56%	
Very Good	69%	69%	33%	
Good	8%	6%	10%	
Readability				
Excellent	25%	34%	74%	
Very Good	69%	57%	21%	
Good	6%	9%	5%	

Source: Website and online reports rated in web survey; Faller Safety booklet rated in postage-paid evaluation card inserted in each booklet; Young Workers booklet rated in postage-paid order card.

Response on order cards also provided a rough view of how materials were being used (multiple boxes could be checked, so totals in the figures below do not necessarily add to 100 percent).

1. Fallers Logging Safety (N=75) – Loggers were the largest audience, identified on 77% of the cards; students 16%; and trainers 12%. About half of the orders (57%) indicated the booklets would be used at safety meetings; about one-quarter (27%) were for customers at saw and equipment shops; and others for personal use by amateur cutters.
2. Young Workers: Stay Alive on the Job! (N=35) — Educators were the largest audience, identified on 83% of the order cards; safety professionals 26%; government 17%; and business 6%. Use was mostly at high schools (77%); post-high school (34%); for teachers, staff, and managers (29%); work training centers (26%); employees (20%); and middle-school students (11%).
2. Agriculture safety brochure (N=56) — The general public in rural areas was the largest audience, identified on 73% of the order cards; employees 39%; students 14%; colleagues 13%; and association members 7%. About half (57%) were distributed as a handout — which this type of publication favored; also used at safety meetings (21%); for reference (18%); and for new workers (16%).

A few of the positive comments on order cards were listed above. A full listing is not included here to avoid repetition. The website survey allowed longer responses and a fuller picture of reader views, including negative reactions that required consideration by the OR-FACE team (see Table 4). Nearly all respondents indicated OR-FACE reports off the website were used for training (94%), distribution to employees (81%), and reference (89%). Most indicated the reports helped to identify hazards (89%), and choose tools or gear (89%), and also affected work planning and processes (50%). Recorded addresses indicate OR-FACE materials published online are reaching a surprisingly widespread international audience.

Table 4. Comments from the Website Survey

Summary of Survey Respondents (N=36) **Sector:** Industry 56% — Government 36% — Consulting 8% **Position:** Health & Safety Professional 72% — Management 11% — Owner 3%
Govt-HS prof: I very much appreciate the program and all that is done to make it happen. Thank you
Ind-HS prof: Employees have made comments about the length of time between the fatality and the publication date. Is there anyway to decrease the length of time between the fatality and the publication date? Other than that, excellent information which we use to try to prevent similar accidents. Response: OR-FACE investigators responded at once to incidents where they were called, and obtained fresh information. The reports themselves, however, were subjected to considerable research and a series of separate reviews, occasionally negotiating controversial topics where reviewers disagreed (as in when it may be acceptable to jump from a runaway truck). The OR-FACE team decided to relinquish timeliness to ensure report quality.

Ind-Mgmt: I notice you indicate the race and gender of the worker when they are other than a white male. Is there a reason for this? I find this unnecessary and insulting to women and people of color. Is it possible for you to discontinue this practice? I look forward to your response. Thank you. Response: OR-FACE discontinued identifying race/ethnicity in the narrative abstracts, except when language or other distinguishing characteristics appeared to be a risk factor. Choice of pronoun, of course, readily identifies female workers. Such distinguishing characteristics are still included in the text of the investigation reports, and all databases, to assist general assessment of risk factors that may apply to certain categories of vulnerable workers.
Ind-HS prof: I think this is a very valuable tool for Oregon employers. It is virtually the only way for me to stay in tune with what is happening in my Industry. The depth of information is not available anywhere else. Valuable!
Ind-HS prof: The reports can be used to serve many purposes. Among my varied jobs here, I write operator instructions for the industrial machines we design and produce. Many of the hazards and recommendations identified in the reports are written in a clear language that I can use to get ideas for the operator manuals. Being the safety lead, I also use the ideas conveyed in the FACE investigations to be able to convey some of the actual dangers we're trying to prevent. Finally, I find the reports themselves, including how incidents are investigated and reported, serve as a good model for our own investigations when an incident happens, such as a fall or a cut hand. Thanks.
Ind-HS prof: The Fatality Report information with the photographs are very useful to educate the personnel, including contract personnel. The messages give a good punch and [provide the] thought process to identify hazards and risk in the work activity. It helps them to amalgamate safety into their normal activities.
Ind-HS prof: This is an invaluable source of information for the safety professional. Your investigative reports set the standards for the safety industry. The free exchange of information and ideas that you foster with this site no doubt saves human misery and lives. THANK YOU!
Ind-HS prof: We use these messages in our training programme to educate the employees, contractors, and visitors too. The messages throw a lot of light to hazard identification, adequacy of procedure, employees understanding of procedure, correct tool for job, etc.
Ind-HS prof: My relationship with you so far has been a divine intervention … Your publication has been a very useful instrument in planning my accident investigation reporting system.
Govt-HS prof: Reports are very well done. Crews seem to react & respond with more interest because the events happened in Oregon rather than in other locations nationally or internationally.
Govt-HS prof: When addressing an audience, nothing gets their attention like a fatality in THEIR line of work. FACE breaks down the industries (like agriculture) into their own category (vs. DCBS data - Forestry, Logging, Agriculture). This allows me to bring home a very personal message when it comes to safety ... It is useful that FACE includes self-insured and self-employed as agriculture has many individuals on farms falling into those categories. It is a more comprehensive look at what is going on in our state vs. DCBS reports.
Govt-HS prof: As a librarian, I am always looking for "case studies" to help answer research questions from our workplace safety/health staff and the general public. The FACE reports (federal and OR-FACE) give real world examples of how things "go wrong" in the workplace when training isn't provided, machinery isn't maintained, and so on.

A separate effort was made to evaluate the effect of the OR-FACE booklet, *State Regulation of Cell Phone Use While Driving and the Risks of Driving Distraction* (HA5, Feb 2007), mailed to Oregon legislators, transportation committee chairs in other states, and safety professionals. A

follow-up postage-paid card was sent 6 months after the initial mailing. With an 11% response rate, about half reported seeing the booklet, and of those who saw the booklet, over three-fourths reported learning important information that influenced policy decisions. Safety professionals were about 3 times more likely to have actually seen the booklet. The follow up resulted in three Oregon legislators asking for another copy to be sent.

A more ambitious evaluation effort was made with the Fallers Logging Safety booklet (HA6, Apr 2007). OR-FACE developed an 11-question knowledge survey to be used when passing out the booklet as a baseline measure; the questionnaire was sent to logging firms with each booklet order, along with instructions and a postage-paid envelope to return them. Thirty packets were sent out, until it became clear the procedure was not working. Response was zero. Additional experience later with logging work settings made it clear the environment was not conducive for a paper-and-pencil exercise. We will apply this knowledge to future evaluation efforts.

Discussion

OR-FACE has developed its core activities into standard procedures. During this second 4-year period, the program has definitely gained the support and confidence of its institutional partners at CROET, OPHP, and PNASH; at state agencies, such as Oregon OSHA and SAIF; and in industry sectors, such as logging. Continual assessment of incidents and trends has led to new initiatives, such as the activities directed toward crab fishing safety. External funding has helped expand OR-FACE activities in areas of concern — as in logging during this period.

In terms of outreach, OR-FACE is dedicated to both online and print publishing. Printing costs have been shared by CROET, Oregon OSHA, and others who have contributed to on-demand production of easily reproduced brochures. Partnership with the CROET outreach team has assured OR-FACE materials are represented at virtually all local safety and work-related conferences. Positive feedback from evaluation materials has helped encourage continuation of various kinds of materials, producing online investigation reports, brochures, and booklets. Reviewers and readers helped re-orient details in the materials.

OR-FACE is presently developing new features for the website — first, summary charts and descriptions of trends — as is found on other FACE state websites.

Several reports and other materials have been translated into Spanish, in two cases by request. The demand for the materials has been modest, but apparently appreciated by those who can use them.

Conclusions

OR-FACE has become a valued community resource. The OR-FACE team has shown initiative to continue expanding its activities to new areas, while also repeating successful outreach efforts in existing areas. New sources of funding are being sought to augment future activities, using the OR-FACE team and CROET infrastructure as a central strength.

Publications
Below is a complete list of publications that were produced from this cooperative agreement.

Journal articles

Centers for Disease Control and Prevention (CDC), Thomsen C, McClain J, Rosenman K, Davis L: [2007] Indicators for occupational health surveillance. Morbidity and Mortality Weekly Report 56(RR-1):1-7.
OWIIPP collaborated with the Council of State and Territorial Epidemiologists (CSTE) and CDC's National Institute for Occupational Safety and Health (NIOSH) to convene a work group that identified priority occupational health conditions to be placed under surveillance, addressed cross-cutting surveillance concerns, and made recommendations regarding the role of states in a comprehensive nationwide surveillance system for work-related disease, injuries, and hazards. CSTE recommendations led to the generation of 19 occupational health indicators (OHIs) and one Employment Demographic Profile, which were developed during 2001--2003. The OHIs complement other guidelines for state-based occupational health surveillance to address overall state and national goals to improve public health. These OHIs are intended to help states build occupational health capacity by providing them with tools to collect and generate important, basic information concerning the occupational health status of the state population and to identify areas in which to focus prevention efforts.

Centers for Disease Control and Prevention (CDC), Bonauto DK, Fan JZ, Largo TW, Green MK, Walters JK, Flattery J, St. Louis T, Yu L, Fang S, Davis LK, Rosenman KD, Valiante DJ, Cummings KR, Hellsten JJ: [2010] Proportion of workers who were work-injured and payment by Workers' Compensation Systems – 10 states, 2007. Morbidity and Mortality Weekly Report 59(29): 897-900.
OWIIPP collaborated with 9 other states to add questions to the Behavioral Risk Factor Surveillance System (BRFSS) survey about workers' compensation. Individuals who acknowledged employment in the past 12 months were asked if they were injured seriously enough to seek medical advice or treatment. If so, they were then asked who paid for the treatment. Among the 10 states, the median proportion of workers who were work-injured during the preceding 12 months was 5.9 per 100 employed persons, and a median of 61% of self-reported work injuries had treatment paid by workers' compensation (Oregon was 5.9 per 100 and 62%, respectively). We found that worker injury surveillance can be complemented through the use of population-based surveys.

Lutzker LA, Rafferty AP, Brunner WM, Walters JK, Wasilevich EA, Green MK, Rosenman KD: [2010] Prevalence of work-related asthma in Michigan, Minnesota, and Oregon. Journal of Asthma 47(2):156-61.
OWIIPP collaborated with Michigan and Minnesota to analyze 2005 data from the Behavioral Risk Factor Surveillance System (BRFSS) Asthma Call-Back Survey (ACBS). Six questions addressing work-related asthma (WRA) were analyzed to generate estimates of the proportion of adult asthma that is work-related and compare those with and without WRA. Over half of all Oregon adults with asthma (53%) reported that their asthma was caused or made worse by any job they ever had, and among these respondents reporting WRA, only 25.1% reported ever telling or being told by a health professional that their asthma was work-related. Additionally, adults with WRA consistently reported poorer asthma control and higher health care utilization than adults with non-WRA. We found that WRA is a common but frequently unrecognized health problem, and this lack of recognition might contribute to poorer asthma control among adults with WRA.

Walters JK: [2009] Characteristics of occupational burns in Oregon, 2001-2006. American Journal of Industrial Medicine 52(5):380-390.
OWIIPP analyzed and compared Oregon workers' compensation (WC) claims, medical only claims from a commercial insurance carrier (CIC), Oregon Burn Center (OBC) data, and Hospital Discharge Index (HDI) data for burns in order to characterize this type of injury in the state. The findings suggest that work-related burn injuries are still a concern in Oregon and other data sources are needed to augment Oregon WC data. The methods that are described in the manuscript will be useful to others conducting burn injury surveillance. For example, OWIIPP evaluated the completeness of the primary burn data source (Oregon WC claims data) by matching these claims to CIC and OBC data. Staff also reviewed the current occupational literature to establish the most methodologically sound technique to construct denominators for rate calculations.

Walters JK, Boswell LE, Green MK, Heumann MA, Karam LE, Morrissey BF, Waltz JE: [2009] Pyrethrin and pyrethroid illnesses in the Pacific Northwest: A five year review. Public Health Reports 124(1):149-159.
Staff used acute pesticide poisoning data from Oregon and Washington from 2001-2005 to analyze cases of acute pyrethrin and pyrethroid poisonings. This is significant because the human respiratory symptoms associated with these pesticides are not well documented in the toxicology literature. Also, the case study included in the manuscript describes a death attributed to inhalation of a pyrethroid in an older person with pre-existing health conditions. To our knowledge, this is the first recorded case of a fatality due to re-entry after a commercial pesticide application. In addition, this case study is useful to increase our understanding of the risk of these pesticides to special populations, such as the older adults. The findings contribute to knowledge of health risks associated with pesticide exposures, especially to vulnerable populations.

Walters J, Christensen C, Green M, Karam L, Kincl L: [2010] Occupational injuries to Oregon workers 24 years and younger: an analysis of workers' compensation claims, 2000-2007. American Journal of Industrial Medicine 53(10):984-994.
Staff conducted a special analysis of injuries to young workers (younger than 25 years of age) in Oregon from 2000-2007 using workers' compensation data. Staff specifically analyzed accepted disabling workers' compensation claims among Oregon young workers by age group (10-18, 19-21, and 22-24 year olds) and calculated rates by employment using Quality Workforce Indicators (QWI) data from the U.S. Census Bureau and Local Employment Dynamics. The results of this analysis demonstrate that targeted prevention strategies need to be developed for older teens and young adult workers, especially because child labor laws do not apply and offer protection after 18 years of age. This eight-year review of young worker injuries in Oregon is significant because it illustrates that there are differences in the types of work-related injuries sustained between groups of young workers (10-18, 19-21, and 22-24 year olds) and each these groups would benefit from the development and implementation of targeted prevention strategies.

Reports

Oregon Department of Human Services: [2009] Occupational health in Oregon.
The occupational health indicators that OPHP generates for the Consortium of Occupational State-based Surveillance grant are a small portion of our surveillance activities; the profile is intended to provide a broader perspective. The report includes sections on our workforce characteristics, fatal and non-fatal injuries, toxic exposures, occupational diseases, and special

populations. This report about worker health in the state includes sections on workforce characteristics, fatal and non-fatal injuries, toxic exposures, occupational diseases, and special populations. Since the report was published, it has been widely disseminated to partners and stakeholder groups. During the project period, special efforts were made to share this information with local county health departments and legislators to bring greater attention to occupational health issues in the state.

Investigation Reports

All investigation reports are published online, and sent to an electronic mailing list of about 200 OR-FACE subscribers. Selected reports are printed for tabletop distribution at relevant conferences and events.

1. Logger killed by swinging tree in yarding operation (2004-52; Aug 2006)
2. Excavation worker killed by flying rigging when hook fails (2005-24; Aug 2006)
3. Window cleaner killed in fall due to unsecured line (2005-38; Oct 2006)
4. Temporary mill worker dies in fall from tower catwalk (2005-18; Oct 2006)
5. Truck driver crushed by front-end loader in mill yard (2004-21; Dec 2006)
6. Mechanic killed when collar caught on PTO driveline (2006-05; Dec 2006)
7. Mechanic dies from lack of oxygen in transport tank (2004-02; May-07)
8. Novice drywall installer dies in 7-foot fall from scaffolding (2006-03; Jun-07)
9. Worker killed when jacket pocket activated machinery (2006-06; Jun-07)
10. Machine operator dies after head crushed in machine (2006-26; Oct-07)
11. Logger killed by 41-foot pole sliding down steep hill (2006-09; Oct-07)
12. Logging worker killed while riding on step of skidder (2005-39; Dec-07)
13. Mill worker killed by flying chunk of wood from chipper (2005-43; Dec-07)
14. Ranch worker killed by pressurized water striking eye (2006-25; Dec-07)
15. Young warehouse worker killed by backing forklift (2006-44; Apr-08)
16. Mechanic killed pouring gasoline on fire (2006-01; Sep-08)
17. Log truck driver killed when brakes fail on steep road (2006-14; Sep-08)
18. Highway worker crushed by swinging backhoe boom (2007-17; Mar-09)
19. Young logger killed when yarder topples during setup (2006-19; Sep-09)
20. Salesman killed when forklift falls off truck loading ramp (2007-11;Oct-09)

Spanish translations

1. *Trabajador hispano se ahoga después de caer en la laguna de un jardín* (Nov 2006) ["Hispanic laborer drowns after falling into landscaping pond"]
2. *Conductor agrícola vuelca camión en zanja de riego y se ahoga* (Nov 2006) ["Farm driver overturns truck in irrigation ditch and drowns"]
3. *Trabajador de vivero muerto en cargador de dirección derrapante* (Nov 2006) ["Nursery laborer killed in skid-steer loader"]
4. Montecargas estacionado atropella al operador contra un camión (Nov 2006) ["Parked forklift crushes operator against semi-trailer"]

Annual Reports

Printing: 2,000. Each annual report is mailed to a list of about 1,300 addressees, including subscribers to the OR-FACE network, Oregon legislators, safety professionals, labor unions, and priority industry sectors such as logging, agriculture, and construction.

1. OR-FACE Annual Report 2004 (Jul 2006)
2. OR-FACE Annual Report 2005 (Nov 2007)
3. OR-FACE Annual Report 2006 (Jul 2008)
4. OR-FACE Annual Report 2007 (Mar 2010)

Hazard Alerts

Parked Vehicles Kill (HA2 reformatted as brochure, Aug 2007)
Printing: 12,500. Distributed through 64 Department of Motor Vehicle field offices statewide, in both English and Spanish (Aug 2007; Oct 2008). Inserted in annual report mailings.

Can you identify fatal hazards on your farm or ranch? (HA7, Apr 2008)
Printing on demand. Distribution by sending electronic samples to targeted individuals and organizations. Samples mailed with postage-paid order card (Jul 2008; May 2009), the second in both English and Spanish. Substantial circulation initiated by rural organizations.

Spanish translations
1. *Los vehiculos estacionados matan* brochure (Nov 2006) ["Parked Vehicles Kill"]
2. *La Gravedad Mata* flyer (Nov 2006) ["Gravity Kills"]
3. *Podria identificar riesgos fatales en su granja o rancho?* (Oct 2008) [Can you identify fatal hazards on your farm or ranch?]

Safety Booklets

State regulation of cell phone use while driving and the risk of driver distraction (HA5, Feb 2007)
Printing: 1,000. Print costs paid by CROET. Mailed (Mar 2007) to all Oregon legislators, chairs of transportation committees in all other states, and to safety professionals. Remainder largely distributed through the Oregon Transportation Safety Division at 150 driver education train-the-trainer sessions across the state (providing direct access to teen drivers most at risk); and to transportation advisory committees.

Fallers Logging Safety (HA6, Apr 2007)
Printing: 7,500. Print costs shared by CROET. Direct circulation through Associated Oregon Loggers, Oregon OSHA, and others. Samples mailed with postage-paid order card (Dec 2007) to AOL mailing list and safety professionals. Mailed samples with order cards to saw shops and equipment dealers in Oregon and Washington (Apr 2010).

Young workers: Stay Alive on the Job! (HA4, Oct 2007)
Printing: 2,000. Printed by Oregon OSHA and divided equally. Distributed through Oregon Coalition for Young Worker Health and Safety networking and events.

Young workers: Stay alive on the job! (HA4 2nd ed, Apr 2009)
Printing: 10,000. Samples mailed with postage-paid order card (Jun 2009) to schools, work programs, and safety professionals; and through the electronic listserve of Oregon School-based Health Centers (Mar 2010).

Inclusion of gender and minority study subjects

Male and female subjects were included in the fundamental, burn injury, and FACE projects. The distribution of study subjects by gender is provided on the *PHS 2590, Inclusion enrollment report*. A separate report has been prepared for each project of the cooperative agreement.

Nearly all of the secondary data used for the fundamental and burn injury projects did not include ethnic or racial origin and so this information can not be provided for this closeout report. However, staff was able to collect this information for the FACE project. This data can be found in the *PHS 2590, Inclusion enrollment report*.

Program Director/Principal Investigator (Last, First, Middle): Douglas, Jae, Patricia - FUNDAMENTAL

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Oregon Worker Illness & Injury Prevention Program

Total Enrollment: 139,426 **Protocol Number:**

Grant Number: U60 OH008472

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Females	Males	Sex/Gender Unknown or Not Reported	Total
Hispanic or Latino	0	0	0	**
Not Hispanic or Latino	0	0	0	
Unknown (individuals not reporting ethnicity)	47,780	91,616	30	139,426
Ethnic Category: Total of All Subjects*	47,780	91,616	30	139,426 *
Racial Categories				
American Indian/Alaska Native	0	0	0	
Asian	0	0	0	
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	0	0	
White	0	0	0	
More Than One Race	0	0	0	
Unknown or Not Reported	47,780	91,616	30	139,426
Racial Categories: Total of All Subjects*	47,780	91,616	30	139,426 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Sex/Gender Unknown or Not Reported	Total
American Indian or Alaska Native	0	0	0	
Asian	0	0	0	
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	0	0	
White	0	0	0	
More Than One Race	0	0	0	
Unknown or Not Reported	0	0	0	
Racial Categories: Total of Hispanics or Latinos**				**

* These totals must agree.
** These totals must agree.

Program Director/Principal Investigator (Last, First, Middle): Douglas, Jae, Patricia - BURN

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Oregon Worker Illness & Injury Prevention Program

Total Enrollment: 2,314 **Protocol Number:**

Grant Number: U60 OH008472

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Females	Males	Sex/Gender Unknown or Not Reported	Total
Hispanic or Latino	0	0	0	**
Not Hispanic or Latino	0	0	0	
Unknown (individuals not reporting ethnicity)	735	1,579	0	2,314
Ethnic Category: Total of All Subjects*	735	1,579		2,314 *
Racial Categories				
American Indian/Alaska Native	0	0	0	
Asian	0	0	0	
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	0	0	
White	0	0	0	
More Than One Race	0	0	0	
Unknown or Not Reported	735	1,579	0	2,314
Racial Categories: Total of All Subjects*	735	1,579		2,314 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Sex/Gender Unknown or Not Reported	Total
American Indian or Alaska Native	0	0	0	
Asian	0	0	0	
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	0	0	
White	0	0	0	
More Than One Race	0	0	0	
Unknown or Not Reported	0	0	0	
Racial Categories: Total of Hispanics or Latinos**				**

* These totals must agree.
** These totals must agree.

Program Director/Principal Investigator (Last, First, Middle): Douglas, Jae, Patricia - FACE

Inclusion Enrollment Report

This report format should NOT be used for data collection from study participants.

Study Title: Oregon Worker Illness & Injury Prevention Program

Total Enrollment: 281 **Protocol Number:**

Grant Number: U60 OH008472

PART A. TOTAL ENROLLMENT REPORT: Number of Subjects Enrolled to Date (Cumulative) by Ethnicity and Race

Ethnic Category	Females	Males	Sex/Gender Unknown or Not Reported	Total
Hispanic or Latino	2	22	0	24 **
Not Hispanic or Latino	17	240	0	257
Unknown (individuals not reporting ethnicity)	0	0	0	
Ethnic Category: Total of All Subjects*	19	262		281 *
Racial Categories				
American Indian/Alaska Native	0	5	0	5
Asian	1	1	0	2
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	2	0	2
White	18	254	0	272
More Than One Race	0	0	0	
Unknown or Not Reported	0	0	0	
Racial Categories: Total of All Subjects*	19	262		281 *

PART B. HISPANIC ENROLLMENT REPORT: Number of Hispanics or Latinos Enrolled to Date (Cumulative)

Racial Categories	Females	Males	Sex/Gender Unknown or Not Reported	Total
American Indian or Alaska Native	0	0	0	
Asian	0	0	0	
Native Hawaiian or Other Pacific Islander	0	0	0	
Black or African American	0	0	0	
White	0	0	0	
More Than One Race	0	0	0	
Unknown or Not Reported	2	22	0	24
Racial Categories: Total of Hispanics or Latinos**	2	22		24 **

* These totals must agree.
** These totals must agree.

Inclusion of children
Children 15-21 years of age were included in the fundamental, burn injury, and FACE projects since many 15-21 year olds have a job and there is evidence that this population is at greater risk for suffering a work-related injury than their older counterparts. For this cooperative agreement, cases of work-related injury, illness, and death among children were collected from existing data.

Materials available for other investigators
Several materials and publications were created and published during the period. Among these, the "Yarding and Loading Handbook" is the most notable of these and can be accessed through the OR-FACE website (www.ohsu.edu/croet/face). This booklet was produced with support from Oregon OSHA.