

Compensation claims were filed. The total medical cost for twenty-four cases was \$35,230.00. Other economic indicators were indemnity payments from the WCB and OSHA fines. Seventy-one percent of those interviewed reported no prevention training was provided following their CO exposure.

Discussion: The data demonstrated that the benefits of the MDOL "SafetyWorks" outweigh training costs (time away from work) incurred by employers who send their employees to CO poisoning prevention training. The study also showed that research on the economic impact of work-related injuries could not be systematically collected under the current system.

PS.05 Integrating Injury Research With Industry Experience to Develop Measures for Preventing Worker Injuries From Vehicles and Equipment in Highway Work Zones—Fosbroke DE, Pratt SG, Burkhart JE, Marsh SM, Casini VJ, Moore PH, Smith GJ,

Highway workers are exposed to injury from moving construction vehicles and equipment within the work zone and from motor vehicle traffic passing through the work zone. Census of Fatal Occupational Injuries (CFOI) data indicate that of the 600 work-related fatalities in the U.S. highway construction industry between 1992 and 1996, 328 (55%) were vehicle or equipment-related incidents that occurred in a work zone. Historically, prevention has been based on the premise that worker injuries are minimized when work zone traffic collisions are minimized. However, only half of the vehicle-related fatalities among highway workers involve a motorist.

To better understand highway worker injury risks, NIOSH reviewed current highway safety literature, analyzed worker fatality data, investigated selected fatalities, and held a workshop with government, labor, industry, academia, and State transportation departments. Workshop participants were asked to discuss measures that would reduce or eliminate hazards to highway workers. By bringing together people with diverse interests in work zone safety, NIOSH hoped to improve our understanding of the hazards faced by highway workers, raise the industry's awareness of these hazards, and initiate discussion about hazard reduction measures. The resulting NIOSH document outlines specific measures that contractors, contracting agencies, policy makers, manufacturers, law enforcers, and researchers can take to reduce occupational injuries in highway work zones. Though the efficacy of this intervention has yet to be evaluated, the development process is a model of how to develop pragmatic recommendations by combining injury research with industry experience.

PS.06 Pilot Study of Transient Risk Factors for Sharps-Related Injuries in Health Care Workers—Fisman DN, Harris AD, Sorock GS, Gordon K, Brandt G, Mittleman MA

Healthcare workers in the USA sustain approximately 400,000 injuries annually, due to needles and other sharp devices. Such injuries are associated with the transmission of HIV and hepatitis C. Although some factors, such as the use of gloves, modify the risk of sharps-related injuries, little is known about the potentially modifiable circumstances leading to such injuries. This is largely due to the methodological limitations of traditional case-control and cohort studies in the assessment of risk associated with repeated, transient exposures. We therefore designed a case-crossover study to evaluate the risk of sharps-related injuries associated with brief, transient exposures, including rushing, fatigue, and the provision of emergency care. Case-crossover methodology, which uses each subject as his or her own control, was developed specifically to evaluate the effects of transient exposures on the immediate risk of injury or disease occurrence. The study involves two large teaching hospitals: University of Maryland Medical Systems, in Baltimore, and Beth Israel Deaconess Medical Center, in Boston. Recruitment of subjects has been facilitated through multidisciplinary collaboration of injury epidemiologists with the hospital employee health services and infectious diseases services that oversee management of sharps-related injuries. Informed consent for interview is obtained at the time of management of the injury.

Consenting subjects participate in a telephone interview. Twenty subjects were recruited in the preliminary phase of the pilot study. Employees, trainees, and students have been enrolled, and it has been possible to contact 18 of twenty subjects within 3 days of injury reporting. The questionnaire used has permitted assessment of injuries sustained in surgical and non-surgical work environments. Participant response to the questionnaire has been favorable. Our preliminary experience with this multi-center pilot case-crossover study suggests that this methodology provides a feasible means of assessing brief, transient exposures as risk factors for sharps-related injuries in healthcare workers.

PS.07 Impact of a Changing U.S. Workforce on the Occupational Injury Experience, 1980-1994—Hartley DL, Biddle EA

The civilian labor force has increased considerably over the past quarter century—due in part to rapid population growth and an increasing retirement age. According to the Bureau of Labor Statistics projections, the number of older workers will increase by 48% between 1998 and 2008, from 17 million to 25 million workers.

Between 1980 and 1994, workers aged 65 years and older had the very highest workplace injury death rates—3 times the rate

for other workers. The National Traumatic Occupational Fatalities Surveillance system reported 6,471 fatalities of civilian workers aged 65 years and older. The number of all fatalities has decreased over time, but the proportion of older worker fatalities has increased—ranging from a low of 6% of all work-related fatalities in the early 1980's to 8% in 1994.

Characteristics of older worker fatalities during 1980-1994, suggests that interventions need to focus on those who work in agricultural settings, who work around or operate machines, and who are exposed to fall hazards and risk factors for violence. Past fatality experience and projected employment patterns can be analyzed together to better understand the impact of an aging workforce on occupational safety and health.

PS.08 Five Workers Engulfed & Suffocated in Corn in Nebraska, 1999—Hetzler WE

Background: In Nebraska, where corn production is the second highest in the nation, the land is dotted with grain bins, gravity feed bins and gravity feed wagons. When workers enter these bins and wagons they can become engulfed in corn and suffocate. In the United States, between 1980 and 1994, over 120 people (NTOF reported 88 deaths from 1980 to 1992 and CFOI reported 33 deaths from 1993 to 1994) were killed by grain engulfment.

Purpose: To identify and describe trends in grain engulfment fatalities and disseminate preventive strategies to those who can intervene in the workplace.

Methods: Nebraska entered into a cooperative agreement with NIOSH in 1994. Using protocols developed by the NIOSH FACE program, corn engulfment cases were identified and on-site investigations were conducted. Using the Haddon model, investigators were able to identify multiple causes and develop multiple prevention strategies to help prevent similar types of deaths.

Results: Five cases were identified. Three cases involved entry into corn bins; one case dealt with a bin that burst, burying the victim, and another case involved a semi grain hopper engulfment.

Conclusions: Recommendations to prevent future similar fatalities include complying with national safety standards, installing locks on access doors to bins and silos, and equipping workers with two-way communications equipment. To disseminate the recommendations, the NE FACE program developed a FACE FACTS sheet that summarized these cases and detailed the prevention recommendations and collaborated with the Omaha and Nebraska Safety Councils who distributed 2,500 FACE FACTS to businesses throughout Nebraska and Western Iowa. This poster will also be presented to the regional meeting (Iowa, Nebraska, Colorado and Kansas) of Farm Safety 4 Just Kids, in June, 2000. The

FACE FACTS sheet was placed on the NE FACE website and numerous presentations were given to the Nebraska agricultural community.

PS.09 Fatality Assessment and Control Evaluation (FACE) Program: Recommendations for Preventing Injuries and Deaths of Workers Who Operate or Work Near Forklifts—Higgins DN, Braddee RW,

Background: Forklifts, also known as powered industrial trucks, are used in numerous work settings, primarily to move materials. Each year in the United States, nearly 100 workers are killed and another 20,000 are seriously injured in fork-lift related incidents [BLS 1997,1998].

Purpose: To identify and describe trends in forklift-related fatal incidents and to use data collected in fatality investigations to formulate and then disseminate preventive strategies to those who can intervene in the workplace.

Methods: Data from the National Traumatic Occupational Fatalities (NTOF) data base are used to describe trends and rates of fatalities over a 15 year period. It is estimated that NTOF, which is based solely on death certificates, identifies about 80% of work-related deaths. Through investigations done in the Fatality Assessment and Control Evaluation (FACE) program, additional characteristics such as safety practices, standards, and equipment are detailed. Through surveillance and investigations, potential risk factors are identified and prevention strategies are developed.

Results: From 1980 to 1994, 1,021 workers died from traumatic injuries suffered in work-related incidents that involved forklifts. The majority of these deaths were due to forklift overturns (22%), workers struck by forklifts while working nearby (20%), victims crushed by forklifts (16%), and falls from forklifts (9%). Between 1983 and 1999, the NIOSH FACE program investigated 13 fatalities that involved workers who died as a result of forklift injuries.

Conclusions: Recommendations include working in compliance with national safety standards, establishing and implementing written safe work procedures, retrofitting roll-over protective structures and seat belts (where applicable), and providing appropriate worker training.

PS.10 Eye Injury Prevention Among Mechanical Contractors—Hsu L, Hunting KL, Welch LS

A survey on eye injury prevention was distributed to approximately 2000 mechanical contractors; 171 completed surveys were received. Each contractor reported the number of eye injuries during 1998 which required first aid or medical care. The aggregate eye injury rate (total) was 4.6/100 workers. Rates varied by size of contractor and the type of work done by the contractors.



NOIRS 2000

*Pittsburgh, Pennsylvania
October 17-19, 2000*

ABSTRACTS

**National Occupational
Injury Research Symposium**

