tential confounding variables. We will also have a comparison of the results obtained via the traditional case-control study as contrasted with the case-crossover study. Multivariate analysis (conditional logistic regression) will be presented to examine the relation between specific risk factors or protective factors and the occurrence of veterinary work-related injuries.

Case-Referent Study of Injuries in the Wood Products Industry—Punnett L

A case-referent study was carried out of risk factors for injuries to workers in sawmills and other wood product manufacturing facilities to identify ergonomic, safety, and organizational causes of injury in the work environment. A population-based, case-control study design was employed, in which all First Reports of Injury from the wood products industry to the Workers' Compensation Commission in the state of Maine were identified as potential cases. Controls were randomly selected from production workers in participating workplaces and union locals. Interviews of 157 cases and 251 controls obtained information on demographics, work history, usual production tasks, equipment and tool characteristics, and physical and psychosocial features of the work environment. Workplace characteristics were obtained from supplementary databases. Crude odds ratios and multivariate logistic regression analyses estimated associations with task and work environment factors. Among the interviewed cases, about one-half of the lost-time injuries were acute traumatic incidents and one-half were musculoskeletal disorders. Cases were more likely than controls to be employed in machine-paced jobs, to experience louder noise levels and faster work pace, to have higher lifting demands and more frequent postural stress, and to experience lower decision latitude and social support at work. The three strongest risk factors in the multivariate models were processing of hard wood (vs. soft), working in earlier stages of production (eg., sawmills), and high physical demands. Decision latitude and social support appeared to have small protective effects. The other variables that were significantly associated with injury occurrence in the multivariate analyses were being male, having one year or less on the current job, inability to take a break when tired, and a lockout/tagout program in effect. Inferences from these results may be limited by the potential for information bias and for non-representative participation of workplaces and of individuals. Nevertheless, the evidence suggests that many work-related injuries in sawmills and other wood processing plants are preventable. High physical work load, noise levels, machine-pacing, production quotas, decision latitude, and the quality of supervision can all be addressed by proper engineering and administrative organization of the workplace. The higher risk for workers with low seniority suggests a healthy worker effect in the study population or an effect of less experience with actual job conditions, or both; to the extent that the latter is true, training and other programs targeting the newer worker might also help to reduce injury rates.

Session 34: Safety Communications and Training

Educational Programs for Musculoskeletal Work Injury Prevention—Bohr PC

There is a rising trend toward disability associated with work-induced trauma. The need for valid preventive measures is apparent. Prevention intervention programs have been established and widely implemented, but not well documented or regarded. Training and education programs are considered to be an essential component of prevention strategies aimed at reducing musculoskeletal injuries. With the current emphasis on worker education and the shift into a managed care environment, there is a need to demonstrate the value of current educational programming for prevention of injury.

The purpose of this survey research was to create a data base of available musculoskeletal work injury prevention programs including information on program content, program parameters, and methods of evaluation to assess effectiveness of the programs. Based on a thorough literature review, a scripted survey with structured open ended questions was created. The questions were used to obtain respondents' answers and explanations without bias or limits imposed by the researchers. The scope of the survey included type, method of construction or philosophy, content, pre-program data collected, intended outcome, effectiveness of the program, and how the program was evaluated.

A list of companies offering musculoskeletal injury prevention programs was compiled from the Internet and through personal contact with experts in the field. Of the companies identified, ten met the inclusion criteria that they offered musculoskeletal injury preventions programs which specifically targeted the worker and that they were willing to participate in the telephone survey. A representative from each company answered survey questions and provided information. Responses from each participating company were typed and sent to the company for verification and accuracy. The descriptive information from the survey was then assimilated into common categories.

The results of the surveys indicated a tremendous variability in programming and evaluation. Programs differed in terms of program mechanics, presentation styles, content, and intent. Although there is some agreement that educational programs are important components of injury prevention, there was an overall lack of evaluation measures to assess the effectiveness of educational programming as a prevention strategy.

This presentation will provide an overview of survey results. Based on the information collected and review of literature, recommendations for the design of programs and measurement of effectiveness will be given.

Promoting Safety and Health in Vocational, Industrial, and Technical Education Programs: Guidelines and Curricula
Palassis J

Accident statistics indicate that in any given year, approximately half of occupational injuries are sustained by employees with less than one year of job experience. NIOSH estimates that in the USA 200,000 adolescents suffer work-related injuries each year, out of them, 64,000 require treatment in hospital emergency rooms, and 70 die of work-related injuries. More than half of the injured adolescents reported that they had not received any training in how to prevent the injury they sustained. Adolescents have a high risk for work-related injury compared with adults. There are more than 11 million students that attend vocational/ technical schools in the USA, and the majority of them are employed after school hours.

The purpose of this NIOSH-EID project is to increase the safety awareness and safety education of the vocational school teachers

and administrators so that information can be passed on to the students during vocational training and prior to entering the work environment; to produce informed students capable of recognizing, controlling, and remediating vocational safety and health hazards, applying safe work practices, and consequently becoming safer future workers.

The methods of this project are accomplished via partners who: 1) develop, and evaluate safety and health curriculum materials and student learning activities, including intervention and prevention programs for injury and illness in vocational schools; 2) collaborate with vocational associations and agencies to develop, endorse, promote, and support national safety and health curricula and guidelines for all vocational schools. 33 general safety and health modules relating to vocational shops are under various stages of development and evaluation. Additional modules will be developed in the next two years. The finalized products are compiled into an instructors' training resource manual. They are also electronically being installed and featured in the Internet in the NIOSH Home Page. Video training materials and interactive CD-ROMs are planned to be produced. Working with partners in safety and health education, the products are being disseminated and evaluated. Implementation of safety and health curricula and guidelines will be monitored through the departments of education in every US state and territory. Much work is needed to develop and evaluate the 50+ remaining curricula. The effectiveness of the program will be evaluated via multiple surveys. Close monitoring of injury statistics of adolescent workers over the period of next 10+ years will also indicate the efficacy of the program.

Makin' it Real: How to Develop Effective Educational Methods and Materials on Workplace Health and Safety for Adolescent Workers—Brown MP

Introduction. Occupational injuries for teenage workers is a serious problem in the United States. OSHA estimates that 200,000 adolescents suffer such injuries/illnesses each year; 64,000 of these end up in the emergency room and 70 die from work-related injuries. Most young workers receive little or no health and safety training from their employers or at school. Many of these injuries occur in the workplace where employers are violating safety and health or child labor laws.

Purpose. The aim of this presentation is to describe methods one NIOSH-funded young worker project used to tailor educational methods and materials to the needs/interests of 9th graders in one high school's required education and career planning class. These health educators will discuss how to make such materials useful/relevant, culturally sensitive, highly graphic, and "hip."

Results. The authors will analyze what worked and what did not as they involved their target audience in educational methods and materials development. They will talk about the need to incorporate other related issues—such as sexual harassment, workers' compensation and child labor laws—into a health and safety educational program and how they accomplished this.

Conclusions. How to insure the adoption of these lesson plans and materials by other schools and employers will be discussed. How the lessons learned from this project can be applied to adult worker health and safety education and materials development also will be examined.

Determining the Safety and Health Curriculum Needs of Secondary Vocational Agriculture Teachers: A Collaborative Approach—Thompson RW, Shiflett S

There is not an effective, systematic approach to agricultural safety and health education for secondary students in the United States. To address the problem, the Teaching Agricultural Safety to Kids program at the University of Missouri-Columbia surveyed 260 secondary agriculture teachers to determine their need for safety and health materials in eighteen subject areas. Findings from the descriptive study were used to guide the development of safety and health instructional materials, including student reference guides, teacher demonstrations, and student competency assessments. A four-step process was used to develop the safety and health instructional materials: Needs Assessment-Development-Technical Review-Evaluation. Professionals that collaborated on the project included secondary agriculture teachers, public health professionals, extension staff, state education personnel, agricultural safety specialists, agricultural education staff and private industry safety engineers.

Session 35: Injuries and the Military

Use of Surveillance Databases for Analytic Research: Hospital Databases in the Army—Smith GS, Lincoln AE, Baker SP, Forney CK

Introduction. Hospital discharge databases are an important tool for injury surveillance research. However, they usually measure prevalence rather than incidence of hospitalized injuries because the lack of personal identifiers prevents identification of duplicate admissions for the same problem. Linkage to other exposure data and the ability to follow individuals over time is also not possible with most hospital discharge data.

Purpose. This study seeks to demonstrate the value of hospital discharge data for: identifying injury priorities; evaluating injury risks between males and females, controlling for exposure; and conducting case-control or cohort studies to evaluate injury risks.

Method. Hospital discharge data were analyzed from 1982 to 1994. These now contain a scrambled social security number that permits identification of individuals and linkage of admissions over time. Causes of injury are available on all admissions using STANAG E-codes, a modified E-code with more detail on military hazards. Demographic data on rank, occupational title, length of service, and other data are used to calculate person years of service. Injury rates are calculated to include adjustment of injury risk by exposure as measured by occupational title. Repeat hospitalizations for the same injury can be identified and cohorts of people followed over time. For example, data on all homicides occurring to women in the military are being linked to hospital discharge data to examine if these women have higher rates of prior injury hospitalizations. Analysis by injury type will be used to develop a predictive index of risk of subsequent homicide for specific hospitalizations.

Results. Injury hospitalization rates were higher in men than women (16.1 vs 11.0/1000 PY) while musculoskeletal hospitalizations were higher in women (27.2 vs 34.4). Musculoskeletal problems (ICD Code 710-730) are an increasing problem in the Army with hospitalization rates that are increasing while injury hospitalizations (ICD