

Guest Editorial

Musculoskeletal Disorders Among Children and Adolescents Working in Agriculture

Thomas R. Waters, Ph.D.

Chief, Human Factors and Ergonomics Research Section

Division of Applied Research and Technology

National Institute for Occupational Safety and Health

Cincinnati, Ohio

E-mail: trwl@cdc.gov

Agriculture is one of the few industries in which children and adolescents are considered an integral component of the workforce, yet children and adolescents are often asked to perform physically demanding jobs that are typically designed for adults. These tasks include lifting and moving materials and equipment, operating farm equipment, and performing jobs requiring moderate to high levels of strength and coordination. It has been estimated that more than two million youth less than 20 years of age are potentially exposed to agricultural hazards each year, as farm residents, farm family workers, hired workers, children of migrant or seasonal workers, or farm visitors (NIOSH, 2001). In 1998, it was estimated that 1.9 million youth lived or worked on farms, and thousands more youth were engaged in migrant or seasonal agricultural labor. In 1998, more than 32,800 of these youth suffered a serious unexpected work-related injury or fatality as a result of exposure to farm/agricultural work hazards. It is not known, however, what proportion of the exposed youth experienced an injury or work-related musculoskeletal disorder (WMSD) due to excessive physical demands or repetitive exertions/movements of the work rather than to an unexpected acute event.

The term musculoskeletal disorder (MSD) refers to health conditions or disorders that involve the nerves, tendons, joints, and supporting structures of the body (NIOSH, 1997). These disorders can be caused by an acute unexpected event, such as a slip, trip, fall, or being struck by an object, or they may be caused by more predictable events, such as a single excessive physical exertion or by repeated physical exertions, such as repetitive manual material handling or repetitive movements. These disorders generally involve severe pain and discomfort in the low back, neck, hands, wrists, arms, shoulders, or legs and can interfere with activities of daily living. It is conceivable that these work-related health problems could be just as important for the overall long-term health of youths as the more dramatic acute unexpected injuries.

There is evidence that WMSDs represent a significant health problem for adults who work in agriculture, such as disability and lost work time, yet little is known about the risk of WMSDs for children and adolescents who do similar work. Few studies have evaluated the physical demands associated with jobs performed by children and adolescents, and even fewer studies have examined the magnitude and

severity of risks that these jobs represent for young workers. Moreover, there are no surveillance systems in place to monitor and evaluate the magnitude of risk for this population. Even more striking is the lack of information available about effective interventions for reducing the risk of WMSDs for young workers. Lastly, there is a notable gap regarding the potential long-term risks associated with children and adolescents performing physically demanding work in agriculture, such as chronic musculoskeletal disorders in adulthood.

At a recent meeting in Cincinnati, Ohio, May 6–7, 2002, co-sponsored by NIOSH and the Great Lakes Center for Agricultural Safety and Health at The Ohio State University, a number of agricultural safety and health experts identified research gaps and risk factors for WMSDs among children and adolescents working in agriculture. The research areas explored at the meeting included: (1) identification of potentially high risk jobs; (2) quantification of the level of risk for jobs performed by children and adolescents in agriculture; (3) developing, evaluating, and implementing surveillance systems for measuring and tracking the magnitude of risk for children and adolescents working in agriculture; and (4) developing and evaluating ergonomic interventions for reducing risk of WMSDs for children and adolescents working in agriculture.

The most important research gaps identified at the meeting are summarized below.

Issues Related to Assessment of High-Risk Jobs

1. Develop an "enterprise classification" and evaluate risk of WMSD based on this classification (e.g., determine risk by region, agriculture sector, or size of enterprise).
2. Determine the number of exposed youth and what jobs they are doing in each commodity area.
3. Identify the hazards or physical work factors in each job or task, and determine the number of hours worked per year.
4. Evaluate the effectiveness of different methods of risk assessment, including self-assessment, professional judgment, and objective quantitative methods. Use "health outcome" or "level of exposure" as a measure of risk.
5. Evaluate risk in non-mechanized production (e.g., tool usage in manual labor).

Surveillance Issues

1. Develop a National Registry of musculoskeletal hazards and health outcomes (e.g., National Health and Hazard Exam).
2. Supplement existing surveillance systems (e.g., NHIS, NHANES, BRFSS, California Department of Health, and prospective community-based surveys such as Keokuk and Iowa Safe Farm).
3. Conduct *ad hoc* population-based health and hazard surveys, such as clinic- or school-based methods or face-to-face interviews.
4. Partner with those who know, and are known by, the population under study.
5. Conduct quality cross-sectional and longitudinal studies and develop and validate a consensus list of jobs and health outcomes.

Intervention Issues

1. Develop more solutions. NIOSH should encourage private industry and academic-industry partnerships and develop a vocational agriculture awards program for interventions at the high school or college level.
2. Improve information dissemination.
3. Address liability, cultural, ethical, and economic barriers.
4. Encourage more intervention evaluations using randomized trials, quasi-experimental, and blended evaluations.
5. Adopt successful models for implementation of solutions, such as the tobacco model for increasing awareness of interventions.

Etiological Issues

1. Studies to assess pl needed.
 2. Studies are needed of the magnitude of exposure (e.g., sports, 2nd exposures (e.g., sports, 2nd
 3. Instrument development other outcomes measurement
 4. Population, clinical, of risk factors on WMSDs, risk and early indicators, st
 5. Population, clinical, a repeated exposure, (e.g., st with non-farm workers, ev include groups with maxim
- As a follow up to the proceedings of the meeting form the basis for a research prevention of WMSDs for y additional research funding safety and health problem i

NIOSH. 1997. *Musculoskeletal Epidemiologic Evidence for Extremity, and Low Back*. D National Institute for Occupational Safety and Health. 2001. *Injuries Among* Publication No. 2001-154. Health.

workers. Moreover, there are no data on the magnitude of risk for this population based on the information available about effective interventions for young workers. Lastly, there is a lack of information on the risks associated with children and adolescents working in agriculture, such as chronic

In 2002, co-sponsored by NIOSH and Health at The Ohio State University, experts identified research gaps for adolescents working in agriculture. The gaps identified were: (1) identification of potentially high-risk jobs performed by children and adolescents; (2) evaluating, and implementing interventions to reduce the magnitude of risk for children and adolescents; and (3) developing and evaluating ergonomic interventions for children and adolescents working in

The meeting are summarized below.

To evaluate risk of WMSD based on this information (e.g., by sector, or size of enterprise), and to identify what jobs they are doing in each

and to identify each job or task, and determine

methods of risk assessment, including qualitative and quantitative methods. Use of qualitative methods of risk assessment (e.g., tool usage in manual labor).

to identify potential hazards and health outcomes

e.g., NHIS, NHANES, BRFSS, and other community-based surveys such as

hazard surveys, such as clinic- or

by, the population under study. Longitudinal studies and develop and evaluate interventions.

to encourage private industry and vocational agriculture awards at the state level.

to identify barriers. Conduct randomized trials, quasi-experimental

of solutions, such as the tobacco

Etiological Issues

1. Studies to assess physical, cognitive, and developmental capabilities are needed.

2. Studies are needed of the dose-response relationships for WMSDs to determine the magnitude of exposures and symptoms, including examination of multiple exposures (e.g., sports, 2nd job).

3. Instrument development and laboratory work to improve exposure, health, and other outcomes measurements are needed.

4. Population, clinical, and laboratory studies to evaluate the short-term impact of risk factors on WMSDs, such as effects of different types of exposures on WMSD risk and early indicators, such as bone density, stiffness, and pain are needed.

5. Population, clinical, and laboratory studies to evaluate the long-term impact of repeated exposure, (e.g., study to compare health status of retired farmers compared with non-farm workers, evaluation of the permanent effects of physical loading, and include groups with maximal exposures, etc.).

As a follow up to the meeting in Cincinnati, NIOSH plans to publish the proceedings of the meeting as a NIOSH numbered document. These proceedings will form the basis for a research agenda that will provide a framework for research on prevention of WMSDs for youth in agriculture for the next decade. It is our hope that additional research funding could also be directed toward this critical occupational safety and health problem in the near future.

References

- NIOSH. 1997. *Musculoskeletal Disorders and Workplace Factors: A Critical Review of Epidemiologic Evidence for Work-Related Musculoskeletal Disorders of the Neck, Upper Extremity, and Low Back*. DHHS(NIOSH) Publication No. 1997-141. Cincinnati, Ohio: National Institute for Occupational Safety and Health.
- NIOSH. 2001. *Injuries Among Youth on Farms in the United States, 1998*. DHHS(NIOSH) Publication No. 2001-154. Cincinnati, Ohio: National Institute for Occupational Safety and Health.